ADVANCING HUMANITY

10th

ABSTRACT BOOK GEOICON2025

The 10th GEOMATICS INTERNATIONAL CONFERENCE

GEOSPATIAL TECHNOLOGY FOR MAPPING THE FUTURE:
Enhancing Collaboration and Interoperability in Geospatial Science

Cadastral Mapping - Geodesy and Geodynamics - Geology and Geophysics - Spatial Data Infrastructure - Geography and Urban Environment - Marine Environment - Mining and Energy - Agriculture and Forestry

Supported by

PREFACE

The 10th Geomatics International Conference (GEOICON) 2025 is an annual scientific meeting in the field of geomatics engineering held by Department of Geomatics Engineering, Institut Teknologi Sepuluh Nopember (ITS), Surabaya, Indonesia. The conference aims to be a forum for sharing knowledge and experience, and promoting ideas between researchers, academicians, government, and professionals in the future research of geospatial science and technology. This year, the 10th GEOICON 2025 explores the theme "Geospatial Technology for Mapping the Future: Enhancing Collaboration and Interoperability in Geospatial Science". The theme is chosen along with our belief that integrating advanced geospatial technologies is essential for addressing the pressing challenges of sustainable land development. By leveraging these technologies, we can enhance our understanding of spatial dynamics, improve decision-making processes, and develop innovative solutions that ensure the responsible use and management of land resources. The conference will be held on July 23rd, 2025, in Surabaya. The speakers of the event come from many backgrounds, such as industry and academia. These various backgrounds are expected to be suitable for discussing the main topics from many perspectives and aspects. There are 80 scientific papers from many fields of study and countries, with the authors consisting of researchers, students, government staff, professionals, and societies. They come from Indonesia, Japan, Malaysia, Taiwan, Vietnam, and the Philippines.These researches will be presented within the conference and should provide opportunities for comprehensive discussion. The abstracts are divided into eight main conference tracks, i.e. (A) Geodesy and Geodynamics, (B) Geology and Geophysics, (C) Spatial Data Infrastructure, (D) Geography and Urban Environment, (E) Agriculture and Forestry, (F) Mining and Energy, (G) Cadastral Mapping, (H) Marine Environment. The successfully selected paper will be published in the IOP Proceedings.

Finally, we would like to appreciate the fellow members of the Technical Organizing Committee, Steering Committee, and Organizing Committee for their hard work in securing substantial input of papers, preparing the conference, and encouraging participants from many fields. We also acknowledge all the authors, as without their expert input, there would have been no conference. We would also like to express our gratitude to all contributing sponsors for their many ways of assistance, namely DRPM ITS, PT Indonav Teknologi, PT Duta Pratamindo, PT. Geosolution Pratama Nusantara, Leica Geosystems, and PT Datascrip. We also acknowledge the important contributions of the Rector of ITS and the Head of the Department of Geomatics Engineering at ITS. The success of the 10th GEOICON 2025 will be a catalyst for our confidence to organize the next event in 2026.

Dr. Muhammad Aldila Syariz, S.T., M.S., Ph.D.
The 10th GEOICON 2025
Chairman

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INSTITUT TEKNOLOGI SEPULUH NOPEMBER (ITS)
SURABAYA, INDONESIA

The name of Institut Teknologi Sepuluh Nopember (ITS) is taken from the historical background of where it is located, Surabaya. On sepuluh or ten November 1945, Bung Tomo as the iconic hero of Surabaya struggled to defend Indonesia's freedom. Since then, 10 November has been celebrated as heroes' day and Surabaya is commonly known as heroes' city. Founded in 1960, ITS has become one of the best technological universities in Indonesia. It currently has 10 faculties namely the Faculty of Industrial Technology, Faculty of Marine Technology, Faculty of Electrical Technology, Faculty of Civil, Environmental and Geo-Engineering, Faculty of Information and Communication Technology, Faculty of Architecture, Design, and Planning, Faculty of Science, Faculty of Mathematics, Computation, and Data Science, Faculty of Vocational Studies and Faculty of Business and Technology Management. The total number of departments is 39.

Being the only well-known state institute of technology in East Java, Institut Teknologi Sepuluh Nopember (ITS) vision is to be a world-class university with international recognition in science, technology, and art. Meanwhile, ITS mission is to contribute the development of science, technology and art for the welfare of the community through educational activities, research, community service, and management systems based on Information on and Communication Technology (ICT).

Since 2011, ITS has started to be an Eco Campus. ITS as Eco Campus cares for and conducts systematic and sustainable environmental management. It is the reflection of the involvement of the entire academic community in order to always pay attention to aspect of health and the environment around it. ITS has many contributions to community work. In 2005, ITS contributed to the recovery Tsunami Victim by creating houses for the victims. Moreover, ITS has collaborated with Tim Kajian Kelayakan Pemukiman (KKP) to do research on the feasibility of settlement for the victims of Sidoarjo Mud Volcano, East Java since 2008. The collaboration resulted in a widened impact area as officially claimed for the mud volcano which is very helpful for the victim to get compensation from the government.

DEPARTMENT OF GEOMATICS ENGINEERING ITS

Department of Geomatics Engineering is one of many departments in Institut Teknologi Sepuluh Nopember (ITS) Surabaya that deals with education and reasearch in Geospatial Science. The Department was established in 1998 and firstly named the Department of Geodetic Engineering. In 1999, the first batch of undegraduate degree students were admitted to the Department.

In the 1960's, the science and technology in surveying and mapping and geodesy grown drastically due to the development of data processing and mapping systems using automatic or computer technology. This encouraged the emergence of discourse geodetic into science and technology called "Geo-Informatics". Thus, the current geodetic science is not just talking about the shape and size of the Earth but also in geospatial in- formation technology. General target field of Geo-Informatics is the availability of basic data and basic maps of various scale, supported by integrated infrastructure and facilities field of surveying and mapping as well as the management and presentation of geospatial data using information technology. Consequently, in 2006 the Department of Geodetic Engineering was renamed to Department of Geomatics Engineering.

Currently, the Department of Geomatics Engineering has five laboratories i.e Geospatial, Geodetic and Surveying, Geomarine, Geodynamic & Environment, and Cadastre and Land Policy. In 2009, the Department extended the education program by opening Posgraduate course in Geomatics. The Postgraduate program has four main courses i.e. Geodesy and Geodynamics, Surveying and Cadastre, GIS, Remote Sensing, and Photogrammetry, and Geomarine.

THE VENUE

The DoubleTree by Hilton Surabaya

hilton.com/en/hotels/subindi-doubletree-surabaya/

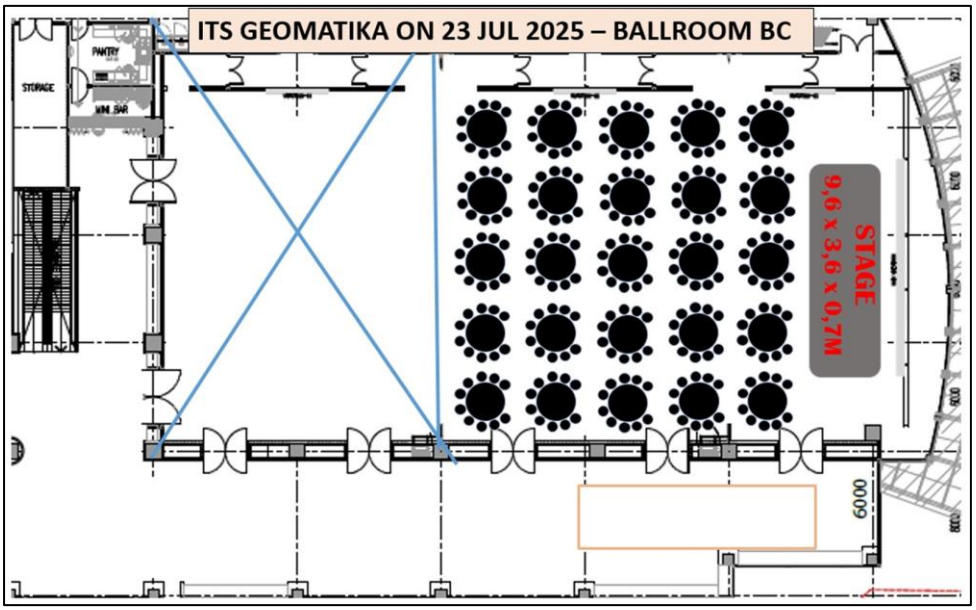
The hotel is located on the historic Tunjungan Street, across from the Siola Surabaya Museum. Tunjungan Plaza is 1km away. Tugu Pahlawan, the Submarine Monument, and Grand City Mall are within a five-minute drive. Understated rooms provide Wi-Fi, smart TVs, safes, and minibars. Some feature floor-to-ceiling windows and/or city views. Upgraded rooms have sofas, and suites add microwaves, living areas, and access to a private lounge.

There's an informal restaurant and a lobby cafe/lounge. A rooftop bar (limited opening) offers city views, as does an outdoor infinity pool flanked by a terrace. Other amenities include a gym, sauna, and kids' club, as well as breakfast and valet parking. Event space includes ballrooms.

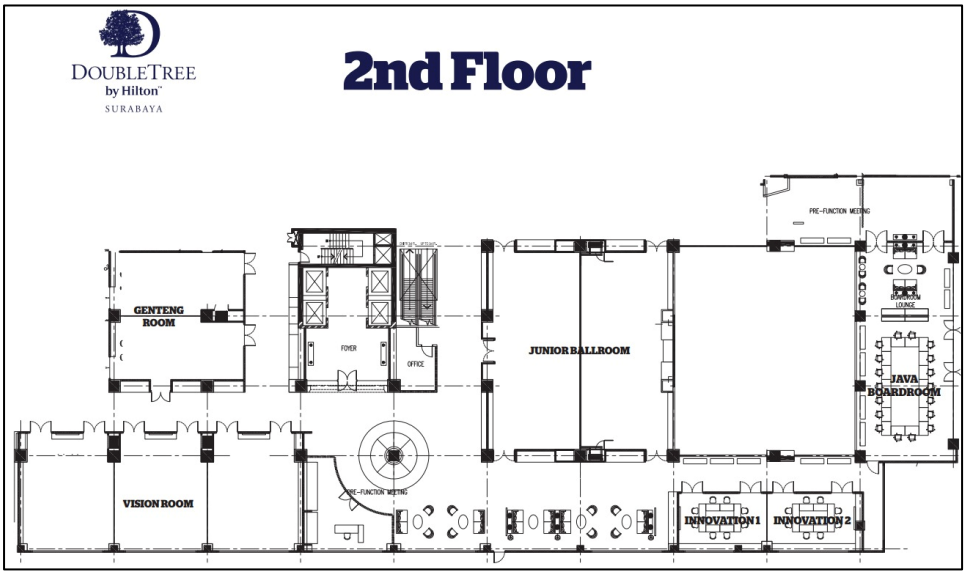
Tunjungan Street Number 12, District of Genteng Surabaya City, East Java, Indonesia – 60275
Phone : +62-31 98588888

ROOM LEVEL INDOOR

Ballroom Floor Plan



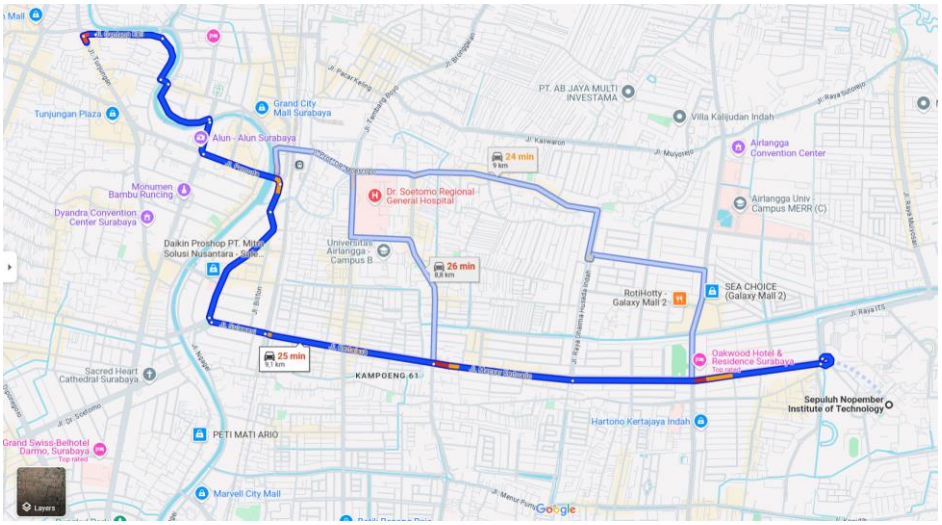
2nd Floor plan
- Parallel Rooms-



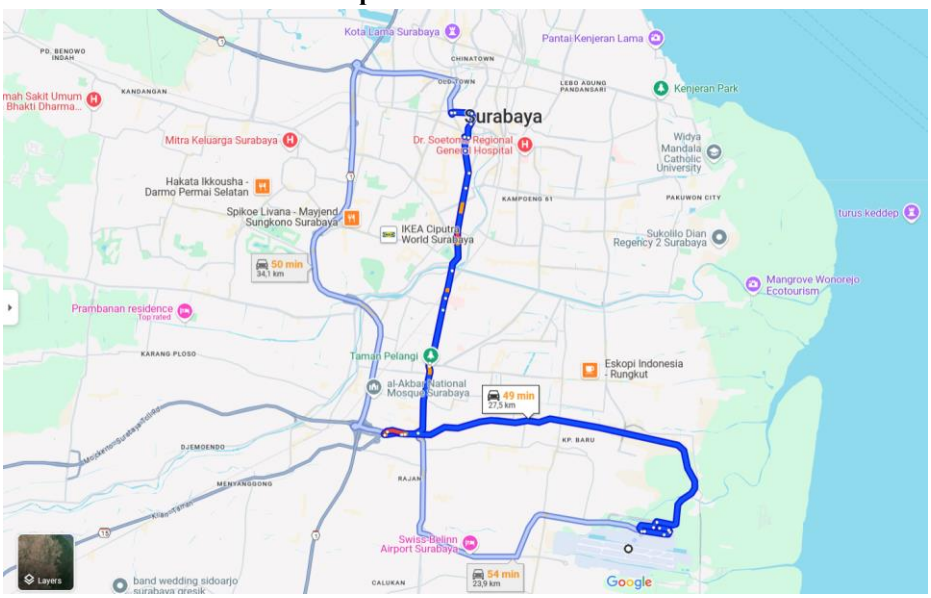
LOCATION MAP

https://its.id/DoubleTreebyHiltonSUB

From Institut Teknologi Sepuluh Nopember (ITS) – 9km



From Juanda International Airport – 22km



PROGRAM SCHEDULE

Time	Activity	Detailed Activity				
07.00 - 07.45	Registration	Registration				
07.45 - 08.20	Opening Ceremony	Opening by MC				
		National Anthem "Indonesia Raya" and Hymne ITS				
		Traditional Dance Performance				
		Speech by Chairman of GeoICON 2025				
		Opening Speech by the Rector of ITS				
08.20 - 09.05	Keynote Speaker	Prof. Ariel C. Blanco (Chair of ISRPS Working Group V/5 Director of the Space Information Infrastructure Bureau, Philippine Space Agency)				
09.05 - 10.15	Speaker	Spatial Technology Update by PT Indonav Teknologi				
		Spatial Technology Update by PT Duta Pratamindo				
		QnA				
10.15 - 10.35	**Coffee Break / Poster Presentation**	Coffee Break / Poster Presentation				
10.35 - 12.20	Invited Speaker Session	Prof. Chih-Da Wu (National Cheng Kung University, Taiwan)				
		Assoc. Prof. Abdul Rauf Abdul Rasam (Universitas Teknologi MARA, Malaysia)				
		Assoc. Prof. Danar Guruh Pratomo (Institut Teknologi Sepuluh Nopember, Indonesia)				
		QnA				
12.20 - 13.00	Lunch	Lunch				
13.00 - 14.30	Parallel Session I	Parallel Session				
		For Each Paper, Presentation, and Q&A: 15 minutes				
		Room A	Room B	Room C	Room D	Room E
14.30 - 14.50	**Coffee Break / Poster Presentation**	Coffee Break / Poster Presentation				
14.50 - 16.20	Parallel Session II	Parallel Session				
		For Each Paper, Presentation, and Q&A: 15 minutes				
		Room A	Room B	Room C	Room D	Room E
16.20 - 16.45	Closing Ceremony	Announcement of the Best Presenters and Attendee Awarding				
		Closing by Head of Geomatics Engineering Department				

SCHEDULE FOR ORAL PRESENTATIONS

Room A (Geography and Urban Environment; Spatial Data Infrastructure)				
Time (UTC+7)	**ID**	**Author**	**Title**	**Session**
13.00 – 13.15	3	Andi Wahid Nurjaman, Bangun Muljo Sukojo	Distribution of PM2.5 Concantration During Eid al-Fitr in the COVID-19 Pandemic Period in Jakarta and Bogor using MERRA-2 Satellite Data	Geography and Urban Environment
13.15 – 13.30	29	Garda Sasi Airlangga, Harmes	Modeling Urban Land Use Dynamics in Jambi City Through GIS and Cellular Automata	Geography and Urban Environment
13.30 – 13.45	39	Reyhan Dhihan Irawan, Hepi Handayani, Umboro Lasminto	Improving Digital Terrain Model Accuracy for Urban 3D Flood Modeling Using UAV LiDAR	Geography and Urban Environment
13.45 – 14.00	46	Bayu Feriaji, Fajar Setiawan, Fatuhri Syabani	Spatiotemporal Analysis of Air Pollution over Jabodetabek Using Sentinel-5P Satellite Observations and In-Situ Validation (2019–2023)	Geography and Urban Environment
14.00 – 14.15	69	Muhammad Hidayatul Ummah	Machine Learning-Based Approach for Spatio-temporal Groundwater Storage Prediction using GLDAS Time-series Data in East Java Province, Indonesia	Geography and Urban Environment
14.15 – 14.30	70	Eka Nugroho, Teguh Purnama Shidiq, Hana Syakira, R D Oriandra, Sella Lestari Nurmaulia, Mohamad Rizky Alpahrezi, Cipta Riyana, Arno Adi Kuntoro, Slamet Miftahudin, Imron Rosyidi	Flood Hazard Assessment of Flood Widening Area Due to Land Subsidence in Pekalongan, Central Java, Indonesia	Geography and Urban Environment
14.30 – 14.45	5	Nain Dhaniarti Raharjo, Lalu Muhamad Jaelani	LiDAR Applications in Structural Health Monitoring of Cable-Stayed Bridges: A Systematic Review	Spatial Data Infrastructure

Coffee Break				
Room A (Geography and Urban Environment)				
Time (UTC+7)	**ID**	**Author**	**Title**	**Session**
14.50 - 15.05	77	Anisa Nabila	Mobile Mapping System (MMS) with LiDAR AU20 Sensor-Based Approach for Comprehensive Urban Road Inventory Extractions	Geography and Urban Environment
15.05 - 15.20	78	Muchamad Nur, Khomsin Khomsin, Giarno	Comparison of Extreme Rainfall Characteristics Between CHIRPS and Observational Data in North Sumatra in Relation to IOD and ENSO Events	Geography and Urban Environment
15.20 - 15.35	79	Gatot Rudiantoro, Khomsin Khomsin, Giarno	Comparison of the Performance of Four Bias Correction Methods for Climate Hazards Group InfraRed Precipitation with Station Data (CHIRPS) in Sumatra Island	Geography and Urban Environment
15.35 - 15.50	80	Yuli Ernani, Bangun Muljo Sukojo, Yesi Ratnasari, Mochammad Donny Anggoro	Analysis of Low-Level Wind Shear (LLWS) Triggers Using Radar and LIDAR Data at Soekarno-Hatta International Airport: Case Studies of 30 January and 20 February 2023	Geography and Urban Environment
15.50 - 16.05	65	Chelsea Taslyanto, Filsa Bioresita, Noorlaila Hayati	Flood Inundation Analysis of Gresik Regency, Indonesia Using Sentinel-1 InSAR Coherence Ratio And Backscatter	Geography and Urban Environment
16.05 - 16.20	84	Mahyan Danu Kusuma	Total Suspended Solid (TSS) estimation using Sentinel-2 imagery for the analysis of water quality in Cengklik Reservoir, Boyolali	Geography and Urban Environment

Room B (Geology and Geophysics)				
Time (UTC+7)	**ID**	**Author**	**Title**	**Session**
13.00 – 13.15	10	Mohammad Hadi Syahputra, Ayi Syaeful Bahri, Maryadi Maryadi, Yustinus Heru Pratomo, Budi Yulianto	Analysis of Laterite Nickel Distribution Using the Ground Penetrating Radar (GPR) Method in Kolaka Regency	Geology and Geophysics

Room B (Geology and Geophysics)				
Time (UTC+7)	**ID**	**Author**	**Title**	**Session**
13.15 – 13.30	13	Vicka Winda Avrilla, Dwa Desa Warnana, Mohammad Heriyanto, M. Haris Miftakhul Fajar	Identification Of Porphyry Deposits Based On Aeromagnetic Data, Magnetic Susceptibility, And Mineralization In Prospect "X"	Geology and Geophysics
13.30 – 13.45	19	Angelina Pinto Tontoiyo, Ferryati Masitoh, Fania An Nisaa, Kurniawan	Conceptual Model of Hydrogeological System in Parts of Bahomotefe and Onepute Jaya, Morowali, Central Sulawesi	Geology and Geophysics
13.45 – 14.00	20	Berlian Kandi, Ferryati Masitoh, Abdullah Nurdien Syaiful Islam, Kurniawan	Seismic Land Capability Evaluation in Coastal Palu, Indonesia: A Post-Disaster Approach Using Weighted Score Method	Geology and Geophysics
14.00 – 14.15	21	Alief Izzul Haq Muhammad, Eki Komara, NIta Ariyanti, Benedictus Dicky Pradnya Agung Pramudhita	Implementation of Automatic Fluid Interpretation for Hydrocarbon Identification in Reservoirs with Various Water Salinities in The Alf Field	Geology and Geophysics
14.15 – 14.30	26	Suratman, Suratman Ratman, Lalu Muhamad Jaelani, Muhamad Sawal	Performance Evaluation Of Satellite Rainfall Data Against In-Situ Rain Gauge Observations In Riau Islands Province	Geology and Geophysics
Coffee Break				
14.50 - 15.05	27	D S Wicaksana, Juan Pandu Gya Nur Rochman, Dwa Desa Warnana	Identification of Seismic Vulnerability for Foundation Design at the 500 kV Bangil Substation Using the Microtremor Method	Geology and Geophysics
15.05 - 15.20	28	Khusnul Nur Rochmah, Ayi Syaeful Bahri	Potential Detection of Groundwater Recharge Zone with APLIS Method in the Karst Area of Pringkuku Pacitan	Geology and Geophysics
15.20 - 15.35	49	Avita Arin Nur Fatima, Juan Pandu Gya Nur Rochman, Andy Khoiril Aziz, Galih Bagus Wicaksono, Alfiyan Syahrul Lathif	Integrated Magnetic and Gravity Methods to Delineate Subsurface Structures of the Wringinanom Mud Volcano, East Java	Geology and Geophysics

Room B (Geology and Geophysics; Marine Environment)				
Time (UTC+7)	**ID**	**Author**	**Title**	**Session**
15.35 - 15.50	71	Farah Aziz, Nurnaning Aisyah, Agnis Triahadini, Putra Maulida, M. Haris Miftakhul Fajar	Estimation of Magma Supply Volume at Merapi Volcano During 2022-2024	Geology and Geophysics
15.50 - 16.05	83	Abdullah Ammar, Danar Guruh Pratomo, Khomsin Khomsin	Plankton Distribution Analysis Using Underwater Accoustic Remote Sensing	Marine environment
16.05 - 16.20	45	Bayu Saputra, Danar Guruh Pratomo, Marina C. G. Frederik	Geomorphological signatures reveal hidden décollement beneath accretionary wedge along the aceh–andaman subduction zone	Marine environment

Room C (Geodesy and Geodynamics)				
Time (UTC+7)	**ID**	**Author**	**Title**	**Session**
13.00 – 13.15	15	Azfa Rifad Fathan, Brian Bramanto, M. Angga Hadi Pratama, Rafly Maharazi, Syifa Kamiliya Rosyad, Zulfia Tri Tungga Dewi, Dudy Darmawan Wijaya, Hasanuddin Z. Abidin, Wiwin Windupranata, Bagas Triarahmadhana, Lukman Jundi Fakhri Islam	On the Development of a Precise and Web-Accessible Geoid Model for Java Island, Indonesia	Geodesy and Geodynamics
13.15 – 13.30	31	Eko Nurcahyono, Eko Handoko	Investigating the Relationship Between Zenith Tropospheric Delay and Volcanic Ash SIGMETs During Eruption Events in Indonesia	Geodesy and Geodynamics
13.30 – 13.45	32	Teguh Purnama Sidiq, Estu Kriswati, Hasanuddin Z. Abidin, Irwan Gumilar, Vera Sadarviana, Muhammad Faizal Rafli	Deformation History Of Kelud Volcano During 2006-2011 Revealed By Sar Interferometry	Geodesy and Geodynamics

Room C (Geodesy and Geodynamics)				
Time (UTC+7)	**ID**	**Author**	**Title**	**Session**
13.45 – 14.00	35	Bambang Setyadji, Vera Sadarviana	Correlation Of Land-Based Environmental Carrying Capacity And Landslide Vulnerability (Case Study: Garut Regency)	Geodesy and Geodynamics
14.00 – 14.15	37	Muhammad Dzun Nurwinas Saepudin, Sella Lestari Nurmaulia	Terrestrial vs Drone: comparison of LiDAR, photogrammetry, ETS, and RTK	Geodesy and Geodynamics
14.15 – 14.30	40	Endro Sigit Kurniawam, Eko Handoko, Ira Mutiara Anjasmara	Synergy of Satellite Altimetry and Tide Gauge Data for Coastal Flood (ROB) Prediction: A Case Study in Banten Bay	Geodesy and Geodynamics
Coffee Break				
14.50 - 15.05	53	Dina Sarsito, Vera Sadarviana, Heri Andreas, Sidik Tri Wibowo, Puguh Sarwanto , Dhota Pradipta, Brian Bramanto, Rio Raharja	The Geological No Net Rotation System Implemetation in Sumatra as an Alternative Coordinate Reference Frame Realization for Exploration and Exploitation activities	Geodesy and Geodynamics
15.05 - 15.20	55	Raihan Fajar Adiwijaya, Estu Kriswati, Muhammad Faizal Rafli	Deformation of Mt Dukono from Interferometric Synthetic Aperture Radar Observation from 2021-2024	Geodesy and Geodynamics
15.20 - 15.35	58	Septya Zahrina Azatil Ismah, Mokhamad Nur Cahyadi, Putra Maulida	Analysis of Accuracy Positioning Performance of Low-Cost and Geodetic GNSS Using Precise and Broadcast Ephemeris	Geodesy and Geodynamics
15.35 - 15.50	59	Nilam Komalasari, Mokhamad Nur Cahyadi, Buldan Musilm, Ihsan Naufal Muafiry	Directivity of Coseismic Ionospheric Disturbances Propagation Following the 2024 Hualien-Taiwan Earthquake Using GNSS-TEC	Geodesy and Geodynamics

Room C (Geodesy and Geodynamics; Marine Environment)				
Time (UTC+7)	**ID**	**Author**	**Title**	**Session**
15.50 - 16.05	64	Ossy Maulita Budiawati, Eko Prasetiyo, Ariq Rafi Adnanto, Eko Prasetiyo, Jati Pria Hambali, Denny Hariyadi, Sidik Tri Wibowo, Irwan Gumilar	The effect of tectonic plates movement on the accuracy of datum transformation parameters from SRGI2013 epoch 2012.0 to SRGI2013 epoch 2021.0	Geodesy and Geodynamics
16.05 - 16.20	48	Retnowati Sriwardani, Muhammad Aldila Syariz	Analysis of the Distribution of Chlorophyll-A, Dissolved Oxygen, and Total Suspended Solid (TSS) in the Madura Strait Shipping Channel 2019-2024	Marine environment

Room D (Agriculture and Forestry)				
Time (UTC+7)	**ID**	**Author**	**Title**	**Session**
13.00 – 13.15	82	Widodo Eko Prasetyo, Hepi Hapsari Handayani, Agus Budi Raharjo, Dian Saptarini	Tree Structural Parameter Extraction and Aboveground Biomass Estimation Using Low-Cost Backpack LiDAR	Agriculture and Forestry
13.15 – 13.30	14	Lintang Ayu Puspitaningrum, Filsa Bioresita	Utilization of Sentinel-1 Imagery for Burnt Area Detection and Impact of Forest Fires in Penajam Paser Utara Regency 2019	Agriculture and Forestry
13.30 – 13.45	6	Lino Garda Denaro, Muhammad Aldila Syariz, Cho-ying Huang	Deep Learning for Improved SWIR-2 Spectral Prediction of Fresh Green Leaves	Agriculture and Forestry
13.45 – 14.00	47	Efsa Valika, Hepi Hapsari Handayani, Mukhammad Muryono	Terrestrial Laser Scanner Data Development For Tree Diameter And Tree Height Measurement (Case Study: Kebun Bibit Wonorejo, Surabaya)	Agriculture and Forestry

Room D (Marine and Agriculture)				
Time (UTC+7)	**ID**	**Author**	**Title**	**Session**
14.00 – 14.15	60	Qarina Putri Amelia Nuri Ila, Mokhamad Nur Cahyadi, Dian Saptarini	Tree Morphology And Structure Analysis Based On 3d Point Cloud Density With Backpack And Drone Lidar Integration	Agriculture and Forestry
14.15 – 14.30	57	Keith Ann E. Cabello, Angelo Ryan S. Velasco, Ariel C. Blanco, Dr. Engg.	Mapping Grassfire Burn Severity in Zambales, Philippines: A normalized Burn Ratio index and K-means Approach with Sentinel-2 and BlackSky Imagery	Agriculture and Forestry
Coffee Break				
14.50 - 15.05	8	Bagus Satrio Wicaksono, Danar Guruh Pratomo, Aida Sartimbul, Widodo Setiyo Pranowo	Analysis of the Relationship Between Temperature, Salinity, and Depth on the Distribution of Lemuru Fish (Sardinella lemuru) in the Coastal Waters of Trenggalek	Marine Environment
15.05 - 15.20	12	Rozaimi Che Hasan, Mohd Zainee Zainal, Nurul Ain Mohd Zaki	Analysis of Different Backscatter Normalization Angles from a Multibeam Echosounder System Using Deep Learning Features for Seafloor Characterization	Marine Environment
15.20 - 15.35	23	Muhammad Rafly Rahardian, Khomsin, Danar Guruh Pratomo	Sensitivity Analysis Of Hydrodynamic Modeling In Coastal Areas Using Global Sensitive Analysis With Sobol Analysis	Marine Environment
15.35 - 15.50	30	Shofa' Amaliah Putri, Danar Guruh Pratomo, Khomsin	Analysis Of The Use Of Global Tidal Models For The Development Of Hydrographic Separation Models	Marine Environment

Room D (Marine Environment)				
Time (UTC+7)	**ID**	**Author**	**Title**	**Session**
15.50 - 16.05	36	David Beta Putra	Estimation of Chlorophyll-a Concentration in Laguna Lake, Philippines, Using Extreme Gradient Boost Model	Marine Environment
16.05 - 16.20	42	Kayla Rashieka Noer, Muhammad Aldila Syariz	Estimation of Surface Water Temperature In Laguna De Bay, Philippines and Its Relationship With ENSO Index Using Artificial Neural Network	Marine Environment

Room E (Spatial Multidisciplinary: Cadastral, Geography, Agriculture, and Spatial Data Infrastructure)				
Time (UTC+7)	**ID**	**Author**	**Title**	**Session**
13.00 – 13.15	4	Muhamad Milzam Muharam	Automation Of Land Parcel Boundary On Analog Letter Measurement Using The SAM (Segment Anything Model) Algorithm	Cadastral Mapping
13.15 – 13.30	16	Ditho Tanjung Prakoso	Evaluation of Cloth Simulation Filter (CSF) for Ground Filtering in UAV-Based DTM Generation to Support Urban 3D Cadastre	Cadastral Mapping
13.30 – 13.45	33	Adinda Karina Raihanadya Murtriandari	Analysis Of Village Boundary Accuracy On Complete Village Map Based On Permendagri No. 45 Year 2016 Using Real Time Kinematic Method (Case Study Of Gading Rejo Utara Village, Gading Rejo District, Pringsewu Regency, Lampung Province)	Cadastral Mapping
13.45 – 14.00	76	Rizka Dita Samsudin Al Chodiq, I Made Andi Arsana, Fajar Buyung Permadi	Development of "Deteksi Dini Tanahku" Land Information System to Accelerating Spatial Analysis at Land Services Counter	Cadastral Mapping
14.00 – 14.15	52	Willy Widyatmaka Ardi, Chantika Dwi Novita, Rian Nurtyawan	Land Use Change Analysis Due to Reclamation Using Multitemporal Satellite Imagery on Kelapa Island, Thousand Islands	Cadastral Mapping

Room E (Spatial Multidisciplinary: Cadastral, Geography, Agriculture, and Spatial Data Infrastructure)				
Time (UTC+7)	**ID**	**Author**	**Title**	**Session**
14.15 – 14.30	11	Dessy Rachmadani	3d Modeling Using Aerial Photo Processing, Area And Feature Based Correlation Method And Lidar Data As Comparative Data For The Application Of Topographic Mapping	Spatial Data Infrastructure
Coffee Break				
14.50 - 15.05	38	Nala Gladisa, Monica Maharani	Enhancing Surface Precision: A Comparative Evaluation Of Digital Surface Models From Neural Radiance Fields (Nerf) And Multi-View Stereo (Mvs)	Spatial Data Infrastructure
15.05 - 15.20	62	Amelia Rizky, Monica Maharani	Enhancing Aerial Image Texture for Better 3D Reconstruction: A Comparison of Histogram Equalization and Contrast Limited Adaptive Histogram Equalization Techniques	Spatial Data Infrastructure
15.20 - 15.35	50	Joko Raharjo, Lalu Muhamad Jaelani	Spatial Assessment of Drought Using VTCI Based on Landsat 8 Imagery in the ENSO Period in West Nusa Tenggara	Geography and Urban Environment
15.35 – 15.50	61	Farida Nuraini Fathimah, Muhammad Taufik	Built-Up Area Identification in Suburban Region Using Modified PRISI Index of Sentinel-1 Data (Case Study: Surabaya-Sidoarjo, Indonesia)	Geography and Urban Environment
15.50 - 16.05	56	Rena Anggita Damayanti, Hepi Hapsari Handayani, Mukhammad Muryono	Integrating Terrestrial and Airborne LiDAR for Estimation Carbon Stock from Aboveground Biomass	Agriculture and Forestry
16.05 - 16.20	57	Miko Cahya Laksmana, Mokhamad Nur Cahyadi, Hepi Hapsari Handayani	A Comparison Between LiDAR-UAV and DJI Zenmuse L2 Image Dense Cloud for Elevation Accuracy in Harvester Terrain	Agriculture and Forestry

SCHEDULE FOR POSTER PRESENTATIONS

First Round			
07.00 – 11.30 (UTC+7)			
ID	**Author**	**Title**	**Session**
1	Nguyễn Thị Cẩm Ly, Dinh Thi Ngoc Minh, Nguyen Van Manh, Vo Trong Hoang, Dinh Hoang Duong	An integrated multi-sensor approach to flood mapping and loss assessment during Typhoon Yagi in Bao Yen District, Lao Cai Province, Vietnam Using Sentinel-1 and Planet Imager	Geography and Urban Environment
2	Nguyen Van Manh, Nguyen Thi Cam Ly, Dinh Thi Ngoc Minh, Vo Trong Hoang	Utilizing Sentinel-1 SAR Imagery for Flood Mapping and Rapid Damage Assessment Caused by Typhoon Yagi in Bao Yen District, Lao Cai Province	Geography and Urban Environment
7	Puguh Sarwanto, Dina Sarsito	Implementation of Underwater Topography Method to Monitor Seabed Deformation and Oil & Gas's Subsea Facilities Displacement	Geodesy and Geodynamics
9	Hardwin Bintang Suyono, Dwa Desa Warnana, Ayi Syaeful Bahri	Sediment Analysis Using The Sub Bottom Profiler Method In The Porong River	Geology and Geophysics
24	Raa Ina Sidrotul Munthaha, Alkindi Gifty Ramadhan, Bagas Triarahmadhana, Lukman Jundi Fakhri Islam, Brian Bramanto	Performance Evaluation Towards Field Calibration of Terrestrial Relative Gravimeters	Geodesy and Geodynamics
25	Putu Tantri Kumala Sari, Yudhi Lastiasih, Esti Kusuma Wardani	The Influence of Soil Water Traps on Slope Stability Based on Geotechnical and Geophysical Observations in a Landslide Case	Geology and Geophysics
34	Farouki Dinda Rassarandi, Muhammad Marshall Al Karim, Nurhadi Bashit	Web-Based Visualization of Politeknik Negeri Batam Campus using WebODM Open source Software	Spatial Data Infrastructure
41	Anita Fatmawaty Effendi, Faik Sofyan, Antonius Kristanto, Hermawan Yuli Sriyanto, Fika Prasty P, Donna Rizky Amora P, Ratna Ningsih	Evaluation of Vegetation Indices Based on Satellite Imagery for Monitoring Oil Palm Crop Health	Agriculture and Forestry
51	Andika Rama Wijaya, Candida Aulia De Silva Nusantara	Analysis of The Impact of Coastal Reclamation Plans in Surabaya on Current Patterns and Sedimentation	Marine Environment

Second Round			
12.00 – 16.30 (UTC+7)			
ID	**Author**	**Title**	**Session**
43	Aaron Fung Antasena, Mohamad Bagus Ansori, Mahendra Andiek Maulana	Flood Risk Assessment and Sustainable Mitigation Strategies for the Wulan River Using HEC-RAS 1D-2D Modeling	Geography and Urban Environment
44	Mohamad Bagus Ansori, Umboro Lasminto, Putu Tantri Kumala Sari, I. D. Bagus JBS	Flood Modeling and Inundation Mapping using the HEC-RAS 2D Hydrodynamic Model with a Meteorological Rain-on-Grid Approach: A Case Study of the Banyakan Area, Kediri Regency	Geography and Urban Environment
54	Yesha Puri Salsabilla, Udiana Wahyu Deviantari, Nafisatus Sania Irbah	Modelling Spatial Land Value Dynamics Around Airports with Neural Networks	Cadastral Mapping
66	Reza Salsabila Az Zahra, P. Pangi, Syachril Warasambi Mispaki, Reny Yesiana, Martanti Aji Pangestu	An Assessment of Protected Rice Field Policy (LSD) in Semarang Regency on Rice Production to Support the Food Estate Program	Agriculture and Forestry
68	Priandaru Kurnia, P. Pangi, Khristiana Dwi Astuti, Syachril Warasambi Mispaki, Yoga Kencana Nugraha	The Prediction Modelling Analysis of Regional economic activity Based on Nighttime Lights in Centra Java Province	Geography and Urban Environment
72	Rafif Asadel Styaki Ramadhan, Candida Aulia De Silva Nusantara	Hydrodynamic Modelling As A Study For Brantas River Waterhshed Recovery Effort (Study Case: Kali Surabaya And Kali Mas)	Marine Environment
74	Yanto Budisusanto, Udiana Wahyu Deviantari, Nafisatus Sania Irbah, Fahrur Zakya Khamid Baprastyo	Land Suitability and Carrying Capacity Analysis Based on Land Vulnerability Using FL-AHP in the Relocation Area of the Bagong Dam Project, Trenggalek	Geography and Urban Environment
75	Fadia Azzahra, Bagas Triarahmadhana, Raa Ina Sidrotul Munthaha, Agustina Nur Syafarianty, Widy Putra, Safirotul Huda, Supriyanto, Moh. Fifik Syafiudin	Combination of Terrestrial and Airborne Gravity Data to Generate Complete Bouguer Anomaly Map of Northeast Sulawesi Island, Indonesia	Geology and Geophysics
81	Ages Tamara De Windys, Bangun Muljo Sukojo	Application of Geographic Information System and Analytical Hierarchy Process (AHP) in Analyzing Drought-Prone Areas (Case Study: Gresik Regency)	Geography and Urban Environment

TABLE OF ABSTRACTS

Paper ID: 001

AN INTEGRATED MULTI-SENSOR APPROACH TO FLOOD MAPPING AND LOSS ASSESSMENT DURING TYPHOON YAGI IN BAO YEN DISTRICT, LAO CAI PROVINCE, VIETNAM USING SENTINEL-1 AND PLANET IMAGER

Nguyễn Thị Cẩm Ly1; Dinh Thi Ngoc Minh[1]; Nguyen Van Manh[1*]; Vo Trong Hoang2; Dinh Hoang Duong1

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Abstract

Super Typhoon Yagi, which made landfall in Vietnam from September 6 to 15, 2024, was recorded as one of the strongest storms in recent decades, causing severe damage across various regions. The study area, Bao Yen district in Lao Cai Province, is located in the mountainous northern region of Vietnam. With complex terrain, numerous rivers and streams, and steep slopes, the area is particularly prone to flash floods and inundation during extreme weather events such as Typhoon Yagi. Bao Yen was among the hardest-hit areas in Lao Cai Province, with many villages experiencing severe flooding, landslides, and isolation. To address this, the study integrated Sentinel-1A radar satellite imagery with digital elevation models, building data, water bodies, transportation networks, and land use data to produce a highly reliable flood map. The processing and analysis were conducted using SNAP Toolbox, ArcMap, and Google Earth Pro to allow for efficient layer overlay and visual assessment. The results yielded a flood inundation map of Bảo Yên with a total affected area of 2,723.35 hectares. The most severely impacted communes and towns were located along the Red River and Chay River, particularly in low-lying areas such as Cam Con and Bao Ha, etc. The study reveals a strong correlation between flood extent and terrain elevation, with areas under 200 meters above sea level experiencing the greatest damage. The findings highlight the effectiveness of Sentinel-1 SAR data in timely flood monitoring and provide a vital scientific basis for disaster response and mitigation planning in the region.

Paper ID: 002

UTILIZING SENTINEL-1 SAR IMAGERY FOR FLOOD MAPPING AND RAPID DAMAGE ASSESSMENT CAUSED BY TYPHOON YAGI IN BAO YEN DISTRICT, LAO CAI PROVINCE

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Abstract

Super Typhoon Yagi, which made landfall in Vietnam from September 6 to 15, 2024, was recorded as one of the strongest storms in recent decades, causing severe damage across various regions. The study area, Bao Yen district in Lao Cai Province, is located in the mountainous northern region of Vietnam. With complex terrain, numerous rivers and streams, and steep slopes, the area is particularly prone to flash floods and inundation during extreme weather events such as Typhoon Yagi. Bao Yen was among the hardest-hit areas in Lao Cai Province, with many villages experiencing severe flooding, landslides, and isolation. To address this, the study integrated Sentinel-1A radar satellite imagery with digital elevation models, building data, water bodies, transportation networks, and land use data to produce a highly reliable flood map. The processing and analysis were conducted using SNAP Toolbox, ArcMap, and Google Earth Pro to allow for efficient layer overlay and visual assessment. The results yielded a flood inundation map of Bảo Yên with a total affected area of 2,723.35 hectares. The most severely impacted communes and towns were located along the Red River and Chay River, particularly in low-lying areas such as Cam Con and Bao Ha, etc. The study reveals a strong correlation between flood extent and terrain elevation, with areas under 200 meters above sea level experiencing the greatest damage. The findings highlight the effectiveness of Sentinel-1 SAR data in timely flood monitoring and provide a vital scientific basis for disaster response and mitigation planning in the region.

Paper ID: 003

DISTRIBUTION OF PM2.5 CONCANTRATION DURING EID AL-FITR IN THE COVID-19 PANDEMIC PERIOD IN JAKARTA AND BOGOR USING MERRA-2 SATELLITE DATA.

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Abstract

Particulate Matter (PM2.5) refers to fine airborne particles with a diameter of 2.5 micrometers or less, originating from various sources, including human activities. In Indonesia, Eid al-Fitr celebrations often lead to increased vehicular mobility and domestic activities, potentially raising PM2.5 emissions. The COVID-19 pandemic, which began in December 2019 in Wuhan, China, prompted widespread social restrictions, significantly reducing human mobility and economic activities. These measures contributed to notable decreases in PM2.5 levels in several regions, including Jabodetabek. This study aims to examine the distribution of PM2.5 concentrations during Eid al-Fitr amid the pandemic and to evaluate the impact of social restrictions on these concentrations. Secondary data were collected from the Cibeureum Air Pollution Station, the Meteorological, Climatological, and Geophysical Agency (BMKG), and Statistics Indonesia (BPS), and analyzed using descriptive statistics, linear regression, and spatial mapping. Previous studies reported that MERRA-2 data showed a correlation of 0.69–0.73 with an RMSE of 4.8–5.8 μg/m³ (Sayeed, 2022), and a 51% reduction in PM2.5 levels after Eid (Waryanto, 2022). Using multiple regression, this study achieved a correlation of 0.32–0.89 with an RMSE of 5.63–18.09 μg/m³, an improvement over previous models (correlation 0.28–

0.87; RMSE 5.43–20.47 µg/m³). Satellite-based PM2.5 distribution maps for Jakarta and Bogor show significant changes across three periods: stable concentrations pre-pandemic (6–10 µg/m³), sharp declines during the pandemic (0–5 µg/m³), and a dramatic rise post-pandemic, particularly during Eid (up to 36–50 µg/m³ in Bogor)... Keywords: ACSA-14, Particulate Matter (PM), MERRA-2, COVID-19, Eid al-Fitr, Mapping, Multiple Regression, DKI Jakarta, Bogor

Paper ID: 004

AUTOMATION OF LAND PARCEL BOUNDARY ON ANALOG LETTER MEASUREMENT USING THE SAM (SEGMENT ANYTHING MODEL) ALGORITHM

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Abstract

This research aims to automate the boundary delineation process of land parcels in analog letter measurement using the Segment Anything Model (SAM) algorithm, which is a state-of-the-art deep learning method. The manual digitization process, which has been traditionally used in land data processing in Indonesia, is time-consuming and prone to errors. Therefore, the application of SAM technology for automatic image segmentation is expected to improve efficiency and accuracy in determining land boundaries. The SAM algorithm offers advantages in zero-shot image segmentation, which allows for segmentation to be performed without the need for retraining or complex parameter adjustments. This study involves the development of a user interface (UI) to facilitate the automation process and geometric evaluation of segmentation results to assess its accuracy compared to manual digitization. It is hoped that this research can contribute to the digitalization of land administration, expedite the land parcel mapping process, and reduce human error in land data management.

Paper ID: 005

LIDAR APPLICATIONS IN STRUCTURAL HEALTH MONITORING OF CABLE-STAYED BRIDGES: A SYSTEMATIC REVIEW

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Abstract

Bridge Health Monitoring (BHM) represents a critical component in preserving the structural integrity and operational lifespan of infrastructural assets, particularly in relation to cable-

stayed bridges, which are distinguished by their complex structural configurations and susceptibility to fluctuations in loading conditions and the consequent structural deformations. With the advancement of remote sensing techniques, Light Detection and Ranging (LiDAR) has emerged as a groundbreaking methodology for the prompt detection of structural damage and for conducting thorough, non-invasive assessments of structural integrity. This study presents a detailed systematic literature review (SLR) of various scholarly efforts that focus on the application of LiDAR technology within BHM frameworks specifically designed for cable-stayed bridges. The literature review was conducted utilizing primary scientific databases in alignment with the PRISMA guidelines, culminating in the identification of relevant studies that were subjected to qualitative evaluation. The review reveals that LiDAR technology has been utilized across multiple monitoring dimensions, including the mapping of bridge geometry, detection of deformations in cables and decks, as well as its integration with numerical modeling and machine learning-based analytical methodologies. Despite the technology's established accuracy, challenges remain concerning data calibration, interference from environmental conditions, and the integration of real-time monitoring systems. This review outlines a trajectory for future research initiatives and advocates for the enhanced application of LiDAR technology in the health monitoring of cable-stayed bridges.

Paper ID: 006

DEEP LEARNING FOR IMPROVED SWIR-2 SPECTRAL PREDICTION OF FRESH GREEN LEAVES

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Abstract

Hyperspectral imaging and advanced machine learning techniques have revolutionized material analysis, extending beyond the visible spectrum into the near-infrared, midwave infrared, and longwave infrared regions. These advancements hold significant potential in fields such as agriculture, environmental monitoring, and materials science. This study focuses on the shortwave infrared (SWIR) spectrum, particularly the SWIR-2 region, to predict the physiological and biochemical properties of fresh green leaves. Despite the rich and detailed data provided by hyperspectral imaging, the inherent complexity and high dimensionality of the data challenge accurate prediction and classification. To address this, we employ deep learning algorithms to refine spectral signatures, improving the accuracy and robustness of predictions within the SWIR-2 range. Our approach integrates convolutional neural networks (CNNs) to capture both spatial and temporal dependencies in hyperspectral data, enhancing the precision of property predictions. The results show that deep learning models effectively utilize SWIR-2 spectra to predict key leaf attributes such as water content, chlorophyll concentration, and other biophysical properties, even in complex natural environments. This research facilitates more

precise remote sensing applications, improving plant health and productivity monitoring. The performance of the proposed approach was satisfactory, with mean root-mean-square errors (RMSEs) of 0.031 ± 0.021 (reflectance) and 0.041 ± 0.026 (transmittance) for individual spectra, and RMSEs of 0.058 ± 0.029 (reflectance) and 0.042 ± 0.033 (transmittance) for each SWIR-2 band. The method shows strong potential and could be further enhanced with a more extensive green leaf spectral database.

Paper ID: 007

IMPLEMENTATION OF UNDERWATER TOPOGRAPHY METHOD TO MONITOR SEABED DEFORMATION AND OIL & GAS'S SUBSEA FACILITIES DISPLACEMENT

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Abstract

Pursuing aggresively of Indonesia's Oil and Gas lifting target, a strategy extensive Exploration & Production particularly in deep water and then its susea facilities installation put stricter technical requirements to be took account since Indonesia geographical sit on the so-called Pacific "ring of fire", a volcanologically active terrestrial chain when earthquakes and volcanic eruptions can happen any time. In effort to encounter potential above problem and challenges, the implementation/application of a Geomatics methodology then called by "underwater topography" is able-proven more than locate and position installation of subsea facilities but also in monitoring and avoiding risk potential of seabed deformation and displacement of the its oil and gas facilities. Full set implementation of this methodology has benefitted all maters. To Indonesian government in form of achieving objective and goals including HSSE consideration against/meet dynamical-geological Indonesian conditions for management of oil & gas companies, as one of proven concept comprehensively for business decision making in stage of project-construction. Furthermore, the implementation of this methodology is able to be applied and utilized to support an offshore injection well of CCS/Carbon Capture Storage project.

Paper ID: 008

ANALYSIS OF THE RELATIONSHIP BETWEEN TEMPERATURE, SALINITY, AND DEPTH ON THE DISTRIBUTION OF LEMURU FISH (SARDINELLA LEMURU) IN THE COASTAL WATERS OF TRENGGALEK

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Abstract

Prigi Bay is recognized as one of Indonesia's National Fishery Ports (Pelabuhan Perikanan Nusantara/PPN), serving as a central hub for fishing activities in Trenggalek Regency, particularly for the catch of Sardinella lemuru. The high intensity of lemuru fishing in Prigi makes it crucial to understand the spatial distribution patterns of this species. This study aims to investigate the influence of sea surface temperature (SST), salinity, and bathymetric depth on the distribution of Sardinella lemuru. Environmental variables were derived from open-source satellite data and bathymetric models. Correlation and regression analyses were employed to determine the relationships between environmental parameters and lemuru presence. The results indicate that SST and salinity have a significant correlation with lemuru distribution, acting as key drivers of habitat preference. Depth, on the other hand, functions as a limiting factor influencing the spatial variability of temperature and salinity. These findings contribute to a better understanding of lemuru habitat dynamics and are expected to support sustainable fisheries management and optimize capture strategies along the coastal waters of Trenggalek.

Paper ID: 009

SEDIMENT ANALYSIS USING THE SUB BOTTOM PROFILER METHOD IN THE PORONG RIVER

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Abstract

The Porong River is one of the rivers that plays a strategic role for the people of East Java, especially in Sidoarjo Regency, both as a transportation route and a source of livelihood. However, the area around this river experienced a geological disaster in 2006 due to a technical error in drilling, known as the Sidoarjo Mud disaster (LUSI). To overcome the continuous overflow of mud, the government has taken a policy of dumping the mud material into the Porong River. The impact of this mud disposal has resulted in changes in the morphology of the river, including siltation due to sediment accumulation and increased risk of flooding in the surrounding area. In order to identify the accumulation of soft sediment in the Porong River, a survey was conducted using the Sub-Bottom Profiler (SBP) method. This method utilizes acoustic waves to map the surface of the riverbed as well as measure the thickness of the soft sediment layer. This research is also supported by coring data, sediment granular characteristics, and river flow speed. The results of the analysis of SBP data showed that the depth of the Porong River varied between 1 to 10 meters, with the thickness of soft sediments ranging from 0.53 to 4.75 meters. Based on coring analysis, the soft sediment in this river consists of sand, clay, and silt materials. The dominance of the soft sediment is in the transportation zone as a suspension material. The findings of this study are expected to be the

basis for sedimentation management and flood mitigation efforts in the Porong River after the Sidoarjo Mud disaster.

Paper ID: 010

ANALYSIS OF LATERITE NICKEL DISTRIBUTION USING THE GROUND PENETRATING RADAR (GPR) METHOD IN KOLAKA REGENCY

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Abstract

Laterite nickel ore is the primary source of nickel in Indonesia, formed through the weathering of ultramafic rocks. The exploration of laterite nickel is essential to support the growing demand of the nickel industry. Ground Penetrating Radar (GPR) is used as a non-destructive and efficient alternative method to identify subsurface conditions of laterite nickel deposits based on variations in dielectric constants and electromagnetic wave reflection patterns. GPR measurements were conducted along nine survey lines in Block xxx, Kolaka Regency, Southeast Sulawesi. Data processing involved several filtering techniques and topographic corrections to produce radargram cross-sections, which were then correlated with borehole data to achieve more accurate and comprehensive interpretations. The correlation results indicate that the GPR method can successfully identify laterite nickel layers, including limonite, saprolite, and bedrock. The thickness of the limonite layer ranges from 3.3 to 12.3 meters, while the saprolite layer varies between 3.1 to 20 meters. Based on estimation calculations within the study area, a significant nickel resource potential of approximately 1,609,665 tons was identified. This study demonstrates that the GPR method is effective for preliminary exploration of laterite nickel deposits, offering advantages in terms of cost and time efficiency compared to other methods.

Paper ID: 011

3D MODELING USING AERIAL PHOTO PROCESSING, AREA AND FITURE BASED CORRELATION METHOD AND LIDAR DAATA AS COMPARATIVE DATA FOR THE APPLICATION OF TOPOGRAHIC MAPPING

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Abstract

Abstrak Image matching (image matching) is one of the basic components in various digital image processing applications, especially in the fields of topographic mapping and geographic information systems (GIS). In general, image matching approaches can be classified into two main methods, namely area-based and feature-based. Area-based methods compare the spatial similarity between image pixels directly, while feature-based methods focus on detecting and matching similar points or structures between images. In recent years, technology has advanced rapidly deep learning has led to improvements in the accuracy and robustness of image matching algorithms. This study presents a systematic review of classical and modern approaches in image matching, starting from the process of feature detection, description, to matching, as well as comparing the performance of area and feature-based methods through field testing. In the context of topographic mapping, image matching has an important role in the orthorectification process, building elevation models, and extracting geospatial information. This paper also evaluates the contribution of the image matching method to the spatial accuracy of maps based on the standards of the Regulation of the Head of the Geospatial Information Agency (Perka BIG), and compares it with the results of LiDAR data processing in making topographic maps. *Kata Kunci : Cross Corelation,Image matching, Future Based, Aerial Image*

Paper ID: 012

ANALYSIS OF DIFFERENT BACKSCATTER NORMALIZATION ANGLES FROM A MULTIBEAM ECHOSOUNDER SYSTEM USING DEEP LEARNING FEATURES FOR SEAFLOOR CHARACTERIZATION

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Abstract

Backscatter intensity from multibeam echosounder systems (MBES) is widely used for seafloor and habitat mapping. Variations in seafloor types such as rock, coral, and coarse sand can be inferred from backscatter data. Constructing backscatter mosaics from raw data involves geometric and radiometric corrections, followed by angular dependence correction (normalization) to reduce the effect of incidence angle. However, the choice of normalization angle remains unresolved and may influence classification accuracy. This study aims to identify suitable normalization angles for habitat classification using deep learning features. Backscatter data from a Kongsberg EM2040C system were processed with in-house software to generate mosaics normalized at various incidence angles (10°, 15°, 20°, 25°, 30°, 35°, 40°, 45°), each covering a 10° angle range. Superpixel segmentation was applied to each mosaic, and polygons were assigned ground truth classes. Deep features were extracted using a ResNet-18 convolutional neural network. Random Forest models were then trained and evaluated via cross-validation. Results show that mosaics normalized at 25° and 30° produced the highest classification accuracy (73%) for the three habitat classes. This was followed by mosaics at

10°, 15°, and 20° (58%), 45° (55%), 35° (50%), and 40° (45%). The findings suggest that normalization at 25°–30° is optimal for distinguishing coral from other substrates and support the potential of multi-angle backscatter products for improved seafloor characterization, analogous to multifrequency or multispectral approaches.

Paper ID: 013

IDENTIFICATION OF PORPHYRY DEPOSITS BASED ON AEROMAGNETIC DATA, MAGNETIC SUSCEPTIBILITY, AND MINERALIZATION IN PROSPECT "X"

Vicka Winda Avrilla1; Dr. Ir. M. Haris Miftakhul Fajar, S.T., M.Eng.1*; Dr. Ir. Dwa Desa Warnana S.Si., M.Si.1; Mohammad Heriyanto, S.Si.1

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Abstract

Porphyry-type deposits are major global sources of copper (Cu), molybdenum (Mo), and gold (Au), typically characterized by high magnetic content. This study, conducted at the "X" prospect operated by PT Bumi Suksesindo, aims to map magnetic anomalies through aeromagnetic surveys and to identify the distribution of porphyry mineralization using magnetic susceptibility data and geochemical assays of Mo and Fe. Aeromagnetic data were acquired using a DJI Matrice 600 Pro drone equipped with a GSMP-35U magnetometer, supported by a GSM-19/19F base station. Magnetic susceptibility was measured directly on drill core samples, while Mo and Fe concentrations were obtained through laboratory geochemical analysis. Magnetic data processing was performed using specialized software to generate regional anomaly and analytic signal maps. A 3D magnetic inversion was then carried out and integrated with geochemical data for spatial correlation in multiple cross-sections. The results reveal a high magnetic anomaly zone in the central area, forming a distinct circular feature indicative of a possible porphyry center. Section RS (eastern area) shows a positive correlation between high susceptibility values and elevated Mo and Fe concentrations. However, sections VW and XY (also in the eastern area) show limited correlation due to insufficient aeromagnetic data coverage. This study highlights the value of integrating geophysical and geochemical methods in porphyry exploration. The findings contribute to improved targeting strategies and more efficient resource evaluation in similar geological settings.

Paper ID: 014

UTILIZATION OF SENTINEL-1 IMAGERY FOR BURNT AREA DETECTION AND IMPACT OF FOREST FIRES IN PENAJAM PASER UTARA REGENCY 2019

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Abstract

The function and role of forest resources are very important in supporting human life. Kalimantan is an area that has the largest forest area in Indonesia but has often experienced a decline in recent years. One of the causes is forest and land fires, such as those that occurred in Penajam Paser Utara District in 2019. Identifying the burned area and its impacts is important. Measuring the area burned and the impact of fires directly in the field is difficult to do, so an alternative that can be used is remote sensing imagery. Sentinel-1 is one of the SAR images that can be used to identify burned areas and fire impacts without being hindered by weather conditions. Burned areas identified using the Radar Burn Ratio (RBR) and Radar Burn Difference (RBD) algorithms produced accuracy values of 83.72% and 78.60%, respectively. The two results were then integrated, resulting in an increase in accuracy to 94%. This value shows that the combination of the two algorithms has a high sensitivity to burned areas and is able to produce a more representative burned area model. Based on the results of the burned area integration, the impact of the fire was analyzed using the Dual Polarization SAR Vegetation Index modification (DPSVIm) algorithm. The results of the analysis show that the vegetation around the burned area is in poor condition, indicated by the area of unhealthy plants reaching 91.4% of the burned area of the buffer integration results.

Paper ID: 015

ON THE DEVELOPMENT OF A PRECISE AND WEB-ACCESSIBLE GEOID MODEL FOR JAVA ISLAND, INDONESIA

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Abstract

The geoid is essential for mapping and infrastructure developments, especially when integrated with the Global Navigation Satellite System (GNSS) to enhance vertical accuracy. Particularly in Java, Indonesia, where 55.73% of Indonesia's population resides and serves as the center of national development, the demand for high-precision geoid models is increasing to support large-scale mapping for water management applications such as flood control and irrigation. The current geoid model for Java Island, InaGeoid2020 version 2.0, has an accuracy of 11.81 cm, which still needs improvement to minimize vertical errors. This project aims to develop a more accurate geoid model for Java Island using the Remove-Compute-Restore (RCR) method based on Fast Fourier Transform, employing three approaches, namely 2D-Planar, 1D-Spherical, and Multiband-Spherical. The process produced a quasi-geoid model, which was then converted to a geoid model by applying the quasi-geoid-to-geoid correction. Hundreds of geoid models were evaluated using GNSS/leveling data, and the one with the lowest standard deviation was selected. The 1D-Spherical approach produced a geoid model with an accuracy of 10.69 cm, surpassing the performance of InaGeoid2020 version 2.0. This model is further set up to be accessible through an interactive web platform built with Firebase (back-end) and React.js (front-end), allowing users to extract geoid undulation values for specific points or areas using vector input. In conclusion, this project delivers a more accurate geoid model for

Java Island and is expected to be accessed through a web-based interface, thereby supporting large-scale mapping and infrastructure development in the region.

Paper ID: 016

EVALUATION OF CLOTH SIMULATION FILTER (CSF) FOR GROUND FILTERING IN UAV-BASED DTM GENERATION TO SUPPORT URBAN 3D CADASTRE

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Abstract

Accurate Digital Terrain Models (DTMs) are essential for supporting land administration and 3D cadastre development in complex urban areas. This study evaluates the performance of the Cloth Simulation Filter (CSF) method, implemented in Cloud Compare, to extract ground points from UAV-derived point clouds in Candisari Subdistrict, Semarang City. The study area is categorized into regular and irregular urban patterns to assess the adaptability of CSF under varying terrain and object complexity. Ground filtering results are validated using GNSS measurements as ground truth data. The extracted DTM is further overlaid with existing cadastral parcel boundaries to assess the spatial fit and suitability for supporting surface-based land parcel analysis. The results indicate that the CSF method is capable of producing reliable DTMs in urban settings with acceptable vertical accuracy. Parameter optimization of the CSF algorithm also significantly influences the quality of ground point classification. This study demonstrates that UAV and CSF-based DTM generation can serve as a rapid and accurate foundation for surface modeling in urban land management, particularly in the absence of formal spatial planning data. Keywords: Photoogrammetry, 3D Model , Land Cadasre, Drone Imagery

Paper ID: 019

CONCEPTUAL MODEL OF HYDROGEOLOGIC SYSTEM IN PARTS OF BAHOMOTEFE AND ONEPUTEH JAYA, MOROWALI, CENTRAL SULAWESI

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Abstract

Groundwater studies in the Bahomotefe–Oneputeh Jaya area, Central Sulawesi, are still very limited. This condition indicates the need for a study that can describe the characteristics and potential of the region's hydrogeological system. This research aims to enhance understanding of the hydrogeological system as a basis for water resource management, and to support future

development planning and research programs. The methods used include water balance analysis, Kriging interpolation for mapping groundwater level patterns, geoelectrical surveys and borehole data to assess subsurface conditions. The water balance calculations show the rate of groundwater recharge. Geoelectrical and borehole data reveal the presence of several aquifer layers at certain depths. A general analysis of groundwater quality. The groundwater flow pattern shows that it follows the natural topographic gradient. The results of this study were then visualized in a conceptual model of the hydrogeological system. This study provides a reference for water resource management, serves as a basis for development planning, and supports further research in the Bahomotefe–Oneputeh Jaya area.

Paper ID: 020

SEISMIC LAND CAPABILITY EVALUATION IN COASTAL PALU, INDONESIA: A POST-DISASTER APPROACH USING WEIGHTED SCORE METHOD

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Abstract

The coastal zone of Palu City is highly prone to seismic hazards, particularly earthquakes and liquefaction. Previous disasters have shown that building collapse—often triggered by poor soil stability during seismic activity is a leading cause of fatalities. Therefore, assessing the Seismic Land Capability (SLC) of this coastal region is essential to inform post-disaster recovery strategies, land-use planning, and risk mitigation.This study focuses on analyzing the seismic resilience of land in the coastal areas of Palu through spatial zonation of earthquake-prone zones while incorporating the region's environmental carrying and supporting capacities. The research utilizes spatial analysis techniques, applying the Weighted Score Method (WSM) derived from the Analytical Hierarchy Process (AHP), within a Geographic Information System (GIS) framework. Key parameters such as soil type, seismic history, geological structures, topography, land use in built-up areas, and socio-economic aspects like building characteristics and disaster response infrastructure were integrated. The SLC results were then overlaid with ecological carrying capacity and land-use capacity data to provide a comprehensive assessment of development feasibility in a seismically vulnerable environment. Findings reveal that much of the coastal region in Palu is classified under low-development capability zones, indicating high vulnerability to seismic impacts. This conclusion is supported by long-section profiling based on borehole drilling data, which shows weak soil layering and low seismic resistance in these coastal sectors. These areas also coincide with zones under pressure from urban expansion, raising concerns for future development. This study demonstrates the importance of combining seismic land capability analysis with ecological and spatial capacity assessments to support more resilient and sustainable planning efforts. The resulting zonation provides essential insights for decision-makers in identifying safe, adaptable land for redevelopment and reducing future disaster risks. By focusing specifically on the coastal zone of Palu, the research

offers a location-specific framework that can also serve as a reference for other earthquake-prone coastal areas facing similar geotechnical and urban challenges.

Paper ID: 021

IMPLEMENTATION OF AN AUTOMATED FLUID INTERPRETATION METHOD FOR HYDROCARBON IDENTIFICATION IN RESERVOIRS WITH WIDE-RANGING WATER SALINITY

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Abstract

Resistivity logs are vital for distinguishing hydrocarbon-bearing from water-bearing reservoir zones, as formation water's conductivity results in lower resistivity than hydrocarbons. However, variations in formation of water salinity can bias interpretations, as salinity affects resistivity. In the ALF field, located in the South Sumatra Basin, varying resistivity values across reservoir intervals pose challenges in distinguishing hydrocarbon zones from water-bearing zones. This variability is attributed to diverse salinity levels influenced by depositional environments, including fluvial complex, transitional, and shallow marine settings. Formation water salinity in the study area ranges from 9 to 19 kppm, with fluctuations correlating to depositional environments. This study refines the Automated Fluid Interpretation (Autofluid) method to improve fluid typing accuracy in reservoirs with complex salinity profiles. The Autofluid approach employs multiple resistivity thresholds, including a waterline (confirmed by 100% water perforation data) and a hydrocarbon line (verified by hydrocarbon presence), integrating these cutoffs with an autofluid module to reduce errors from salinity variations. Adjustments to the module's algorithms were applied across wells in the ALF field, achieving a 93.1% success rate in fluid identification across 5 wells (44 perforation datasets). Blind tests on 2 wells (22 perforation datasets) further validated the method's robustness, yielding a 90.9% accuracy. These results demonstrate AutoFluid's reliability in adapting to new data and accurately identifying reservoir fluids, even under variable salinity conditions.

Paper ID: 023

SENSITIVITY ANALYSIS OF HYDRODYNAMIC MODELING IN COASTAL AREAS USING GLOBAL SENSITIVE ANALYSIS WITH SOBOL ANALYSIS

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Abstract

Coastal areas are located between land and water areas that are influenced by the dynamics of tides, currents, and waves. The ocean dynamics that occur make the connection with the surrounding environment complex. The approach is done by using mathematical or numerical models of hydrodynamic equations. The components in hydrodynamic modeling are highly depend on the uncertainty of each actual condition. Understanding the level of data sensitivity in modeling can reduce the level of uncertainty that occurs. Therefore, this study aims to provide consideration of sensitivity values in hydrodynamic modeling in coastal areas. The method used in this study is Global Sensitivity Analysis (GSA) with Sobol analysis. The required data are the results of mathematical calculations from hydrodynamic modeling using Delft3D software. Sensitivity values are reviewed from the results of modeling sediment buildup and current velocity changes that occur by the time. The value of flow discharge and sediment composition has an influence of 30% and 40% of the overall data used in sediment buildup modeling. While current changes are strongly influenced by wind speed in the amount of 30%, and a slight influence from the value of flow discharge by 10% at the outlet area. The resulting sensitivity level illustrates the priority of field data acquisition in achieving the best model results. It will have a very positive impact on life in water areas, especially coastal areas, in monitoring changes that have or will be happening. Thus, this research can actively support the 6th and 14th SDGs goals in providing an overview of the dynamics that occur in coastal areas and all economic activities that take place, so that sustainable development can be established. Key Words : Delft3D, Global Sensitivity Analysis, Hydrodynamic Modeling, Ocean Dynamics, Sobol Analysis

Paper ID: 024

PERFORMANCE EVALUATION AND CALIBRATION OF MULTIPLE RELATIVE GRAVIMETERS

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Abstract

Field calibration of relative gravimeters is conducted by acquiring measurements at sites with established absolute gravity values on significant elevation differentials. The procedure is essential for ensuring the precision of the gravimetric data collected. This study involved field calibration measurements along a defined trajectory extending from the Geological Museum in Bandung to the Tangkuban Parahu region, covering a total distance of ± 20 km with an elevation difference of ± 750 m. Four relative gravimeters were calibrated, including one LaCoste & Romberg (LCR) gravimeter, two Scintrex CG-5 gravimeters, and one Scintrex CG-6 gravimeter. The calibration process was further refined through accurate geodetic positioning utilizing Global Navigation Satellite System (GNSS) technology. The results indicate that each gravimeter produced distinct calibration factors of 0.9826, 0.9998, and 0.9988, respectively. These findings demonstrate that all gravimeters function effectively and are suitable for

conducting gravity surveys across a range of applications, including geoid modeling, geological structure identification, and monitoring of land subsidence.

Paper ID: 025

THE INFLUENCE OF SOIL WATER TRAPS ON SLOPE STABILITY BASED ON GEOTECHNICAL AND GEOPHYSICAL OBSERVATIONS IN A LANDSLIDE CASE

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Abstract

A landslide occurred on a cut slope along the Gempol–Pandaan toll road at KM-51. This was the fourth landslide to occur at the same kilometre point, although at different spots. The area was originally a hilly region with relatively good soil conditions, which was then cut to form the road segment. The elevation difference between the toll road and the top of the cut slope at this location is approximately 15 meters. Slope reinforcement measures, including shotcrete and gabion installations, had been previously implemented; however, landslides continue to occur. This study aims to identify the causes of the landslides using both geotechnical and geophysical approaches. Geotechnical investigations included two boreholes, Standard Penetration Tests (SPT), and laboratory testing. Geophysical investigations were conducted using Electrical Resistivity Tomography (ERT), with two longitudinal and two transverse survey lines across the slope. The geotechnical and geophysical results indicate the presence of a water trap at a certain depth, characterized by low resistivity values in that zone. Additionally, SPT N-values at that depth were generally lower compared to the surface layers. The layer with low resistivity aligns with the location of slope movement observed in the field. These findings suggest that the water trap at a particular subsurface depth has caused weathering of the soil layer, leading to a reduction in strength and triggering localized slope failures. Mitigation efforts to drain the trapped water are necessary to reduce the impact of soil weathering and subsequent landslides.

Paper ID: 026

PERFORMANCE EVALUATION OF SATELLITE RAINFALL DATA AGAINST IN-SITU RAIN GAUGE OBSERVATIONS IN RIAU ISLANDS PROVINCE

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Abstract

Riau Islands Province, which consists of a group of islands with maritime tropical climate characteristics, is vulnerable to climate change and extreme weather phenomena. In an effort

to understand rainfall patterns in this region, the availability of rainfall data is an important need. The limited rainfall measuring instruments in various regions make satellite precipitation product (SPPs) data an alternative that is often used as an alternative or complement to in-situ observation rainfall data. However, differences in spatial resolution, temporal resolution, and acquisition methods between the two data sources require a verification and validation process first to ensure the accuracy and reliability of satellite data. This study aims to validate satellite rainfall data against in-situ observation rainfall data in Riau Islands Province, in order to support further analysis in water resources management, hydrology and disaster mitigation. The methods used include collecting satellite rainfall data from CHIRPS and GSMaP satellite sources, in-situ observation rainfall data from BMKG Class I Hang Nadim Meteorological Station Batam, Class III Raja Haji Fisabilillah Meteorological Station Tanjungpinang, and cooperative rainfall station on Batam Island and Bintan Island, statistical analysis with parameters such as correlation, RMSE, and bias, and visualization of rainfall patterns using QGIS software. The expected results are the identification of the level of accuracy of satellite rainfall data and recommendations for its use in practical applications such as daily weather forecast validation. This research is also expected to contribute to water resources management, flood disaster mitigation, and climate change adaptation in the Riau Islands region.

Paper ID: 027

IDENTIFICATION OF SOIL VULNERABILITY FOR FOUNDATION DESIGN AT THE 500 KV BANGIL SUBSTATION USING THE MICROTREMOR METHOD

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Abstract

The development of the national electricity transmission network is a top priority for PT PLN to meet the growing electricity demand, including the construction of the 500 kV Bangil Substation. This project requires a strong and stable foundation, which largely depends on the soil characteristics at the construction site. This study aims to identify soil vulnerability as a basis for foundation design using the microtremor method, supported by borehole data. The microtremor method is used to measure natural ground vibrations that reflect soil vulnerability, while borehole data serve to validate the results and provide physical information on subsurface layers at specific depths. The combination of these methods is expected to offer a comprehensive understanding of subsurface conditions, allowing for the design of a safe, stable, and efficient foundation. The study also aims to minimize the risk of structural failure and enhance construction efficiency for the substation project. Based on the analysis of parameters such as dominant frequency (0,94 – 3,89 Hz), H/V amplitude (2,1 – 4,40 times), soil vulnerability index (1,10 – 12,90 s^2/cm), and average shear wave velocity (Vs30) of (274 – 396 m/s), it can be concluded that the study area is relatively safe for substation development.

Paper ID: 028

POTENTIAL DETECTION OF GROUNDWATER RECHARGE ZONE WITH APLIS METHOD IN THE KARST AREA OF PRINGKUKU PACITAN

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Abstract

Pringkuku, Pacitan, is a karst mountainous area characterized by a unique hydrological system with many underground fractures and cavities, which are potential water resources. Karst groundwater is stored in karst aquifers, which can store a lot of water. However, the complexity of karst areas and the hidden and deep location of karst groundwater cause difficulties in exploration. This study aims to determine the potential of karst groundwater resources and assess the level of groundwater recharge rate in the Pringkuku Karst Area, Pacitan. In this study, the APLIS method is applied to estimate recharge areas that depend on Altitude, Slope, Lithology, Infiltation, and Soil. By utilizing a geographic information system (GIS) for a multicriteria mapping approach, these parameters will be scored and weighted to obtain the distribution of potential groundwater zones. The results of the study will be presented in a spatial distribution map of groundwater recharge rates classified into 4 classes, i.e., very low, low, medium, and high. We also discuss lineament analysis that can support groundwater potential mapping. Lineaments are linear features that represent geological structures, such as fractures and faults, that are preferential pathways for groundwater flow. Therefore, lineament analysis becomes a tool to understand karst hydrogeological systems. This research enables mapping of groundwater recharge zones with higher accuracy and helps in the management and development of sustainable water resources in karst areas.

Paper ID: 029

SPATIAL MODELING OF LAND USE DEVELOPMENT IN JAMBI CITY BASED ON GEOGRAPHIC INFORMATION SYSTEM AND CELLULAR AUTOMATA (GIS-CA)

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Abstract

Jambi City is known as a trading hub due to its significant role in commerce, primarily because of its strategic location along the Batanghari River. Land use in this city is closely linked to sectors such as trade, agriculture, and industry, with land along the river being used for various logistics and transportation needs. The city has undergone significant changes in land use from 2009 to 2019, with rapid growth in residential areas, service trade, and industry. Industrial land use grew by 67.69 hectares, service trade by 962.73 hectares, and residential areas by 5040.09 hectares between 2009 and 2019. One of the techniques used to analyze land use changes is Cellular Automata, implemented in the LanduseSim software version 2.3.1. The exact impact of these changes on future land development is still unknown. Therefore, further research is needed to develop a model for predicting land use changes based on the trends observed in Jambi City.

Paper ID: 030

ANALYSIS OF THE USE OF GLOBAL TIDAL MODELS FOR THE DEVELOPMENT OF HYDROGRAPHIC SEPARATION MODELS

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Abstract

Hydrography is a science related to the measurement and description of marine components and coastal areas. One important aspect of hydrographic surveys is tides, which are the phenomenon of the rise and fall of sea level due to the gravitational influence of celestial bodies. Although Indonesia has 290 tidal stations managed by the Geospatial Information Agency (BIG), the large area coverage and complexity of tidal phenomena cause limitations in comprehensive understanding, especially in the deep seas. Therefore, a tidal model based on altimetry satellite data and tidal station measurements is needed to improve the accuracy of hydrographic surveys. Global Navigation Satellite System (GNSS) technology enables accurate vertical positioning, replacing the traditional tide gauge sensor-based method. One of the modern approaches in hydrographic surveys is the Hydrographic Separation Model (HSM), which integrates land-sea height references and eliminates dependence on shore-based tide stations. HSM enables better Chart Datum interpolation, improves survey efficiency, and facilitates data consistency between agencies. This research applies the TPXO10-atlas v2 and FES2014 global tide models to determine the Lowest Astronomical Tide (LAT) value as Chart Datum. The model was tested using the RMSE method with BIG tide station data to determine the best tide model. HSM implementation was carried out using GNSS data, bathymetry surveys, as well as EGM2008 Undulation data, DTU21MSS Mean Sea Surface (MSS) and DTU22MDT Mean Dynamic Ocean Topography (MDOT) to define the vertical relationship between the tidal datum and the ellipsoid. This study aims to explore the application of global tide models in developing HSM around the South Waters of Java, allowing real-time acquisition of bathymetry data without direct tidal measurements.

Paper ID: 031

INVESTIGATING THE RELATIONSHIP BETWEEN ZENITH TROPOSPHERIC DELAY AND VOLCANIC ASH SIGMETS DURING ERUPTION EVENTS IN INDONESIA

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Abstract

Because volcanic ash can put at-risk flight safety and interrupt air traffic, its identification is still a major problem in aviation meteorology. Large amounts of ash can be released into the atmosphere by explosive volcanic eruptions, which is why Volcanic Ash SIGMETs (Significant Meteorological Information) are issued to give civil aviation timely warnings. By estimating the Zenith Tropospheric Delay, recent developments in geodetic techniques have made it possible to monitor atmospheric conditions using data from the Global Navigation Satellite System (GNSS), especially using the Precise Point Positioning approach. Prior research has shown that when ash-rich volcanic instances occur, the Zenith Tropospheric Delay levels may fluctuate. By examining two case studies in Indonesia—the eruption of Mount Ibu (June 1–15) and Mount Lewotobi Laki-laki (November 1–15)—this study investigates the relationship between ZTD changes and SIGMET issuance during volcanic eruptions. The Mount Ibu incident showed a small but statistically significant negative connection (r = -0.0724) using point-biserial correlation analysis, indicating that ZTD values typically decline slightly during the SIGMET times. The Mount Lewotobi Laki-laki instance, on the other hand, revealed a somewhat higher ZTD during the SIGMET events, with a weak but statistically significant positive connection (r = 0.1274). These contrasting results highlight the complex and potentially site-specific nature of the relationship between the volcanic ash activity and the tropospheric delay, suggesting that ZTD monitoring could contribute to improving the volcanic ash detection and early warning systems in aviation meteorology.

Paper ID: 032

DEFORMATION HISTORY OF KELUD VOLCANO DURING 2006-2011 REVEALED BY SAR INTERFEROMETRY

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Abstract

In recent years, SAR technology has been widely used to observed volcano deformation which is associated with its activity. We use 26 images of ALOS PALSAR data range from 2006 to 2011, to create deformation map of Kelud Volcano. Here, Small Baseline Subset (SBAS) time series inversion algorithm is used to reveal the dynamics of the deformation in Kelud volcano. A LOS change associated with uplift pattern is observed prior to 2007 eruption inside the crater, and followed by subsidence afterwards. Our result show that the relaxation period stopped around January-February 2009, and the uplift pattern return until April 2011 with the deformation magnitude as large as 20 cm. A large deformation occur during May to October 2009, but not followed by eruption. This uplift pattern may indicate accumulation of energy on the plugged conduit, and expected to be the precursor of an eruption. We argue that this might be the onset of unrest periode prior to the 2014 eruption although more study and evidence needs to be done to support the argument.

Paper ID: 033

ANALYSIS OF VILLAGE BOUNDARY ACCURACY ON COMPLETE VILLAGE MAP BASED ON PERMENDAGRI NO. 45 YEAR 2016 USING REAL TIME KINEMATIC METHOD (CASE STUDY OF GADING REJO UTARA VILLAGE, GADING REJO DISTRICT, PRINGSEWU REGENCY, LAMPUNG PROVINCE)

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Abstract

Village boundaries are dividing marks that function as government administrative boundaries between villages in the form of a collection of coordinate points on the surface of the earth with the aim of creating governance that provides legal certainty and clarity of village territorial boundaries in accordance with technical considerations. This research was conducted in the North Gadingrejo Village area, Gading Rejo District, Pringsewu Regency with the aim of testing how accurate the coordinates of village boundaries are on complete village maps according to Permendagri No. 45 of 2016 concerning guidelines for determining and confirming village boundaries which are carried out using two methods, namely the cartometric method. and direct measurement methods in the field using GNSS RTK survey measuring instruments. The reference used is the Complete Village Map made by the ATR/BPN District Land Office. Pringsewu which contains complete mapping of land parcels that have been registered and certified. From the research carried out, it was found that there were differences in the coordinate values of village boundaries with an average value of 2,422 meters with the largest coordinate difference being 4,833 meters and the smallest being 0,363 meters. The Complete Village Map of North Gadingrejo Village has an RMSE value of 2.718714436

m, and a horizontal accuracy (CE90) of 4.125649156 m against direct measurements using RTK Radio. So it can be concluded that the Complete Village Map meets the requirements for standard deviation value accuracy and is in accordance with the classification in Perka BIG No.6 of 2018 and can be used as a base map in making the North Gadingrejo Village Boundary Map with a scale of 1: 5,000 which has horizontal accuracy class of 3.

Paper ID: 034

WEB-BASED VISUALIZATION OF POLITEKNIK NEGERI BATAM CAMPUS USING WEBODM OPEN SOURCE SOFTWARE

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Abstract

WebODM is an open-source software that was launched in 2016, this research want to study the software at the Politeknik Negeri Batam as a study location for testing the software. Data acquisition was carried out by GNSS survey, photogrammetry and measurements using a Total Station with MLM and REM functions. The method used to examine the software is through testing the geometric accuracy of the Perka BIG number 15 as a test of orthophoto image accuracy (Circular Error 90%) and DSM (Linear Error 90%). On the other hand, looking at the suitability of LOD level 2 based on the cityGML (2012) standard as a validation of the 3-dimensional model of the WebODM test with field data using the results of field measurements using a total station, with the condition that the difference must be less than two meters from all sides. Researchers succeeded in acquiring 9 BM points, 219 aerial photographs and 10 buildings as samples for LOD. Based on the results, the results of the geometric accuracy of the Perka BIG CE/LE90 are included in the 1:1000 class 1 map, but one data does not meet the LOD level 2 requirements, namely building/tower A in width with a difference of 2.9 meters.

Paper ID: 035

CORRELATION OF LAND-BASED ENVIRONMENTAL CARRYING CAPACITY AND LANDSLIDE VULNERABILITY (CASE STUDY: GARUT REGENCY)

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Abstract

During the rainy season, landslides frequently occur in several regions of Indonesia. The Garut Regency is a region that frequently experiences landslide disasters, with a notable escalation in the frequency of these events. A prevalent hypothesis posits a correlation between shifts in land utilization and changes in land function. Indeed, the phenomenon of land use change is precipitated by population growth, which necessitates the allocation of land for various activities, including regional development. Changes in the function of a given territory invariably result in alterations to the carrying capacity of the environment (CCE) that is sustained by that territory. Consequently, there is a necessity to examine the correlation between the CCE and the propensity of soil to undergo landslides. The methodology employed is a two-dimensional polynomial function correlation approach. This approach is intended to form a spatial model in an effort to reduce the risk due to landslide hazards. Additionally, it can be advantageous to assist in the management of spatial utilization by observing the fluctuations in land-based CCE. Spatial information pertaining to landslide mechanisms and alterations in land function is employed to construct the desired correlation model. The assessment of landslide hazard potential is derived from landscape data, specifically information regarding the morphological condition of the Garut district area, high-resolution satellite imagery (CSRT), and national digital elevation model (DEMNas) data. Spatial data concerning alterations in land use were retrieved from satellite imagery and field observations. This approach was employed to ascertain preliminary qualitative insights on specific regions exhibiting elevated susceptibility to landslides. This study entailed two stages of analysis: a descriptive spatial statistical analysis and an inferential study. The former was conducted to ascertain the spatial correlation between potential landslide hazard and land use change. The findings of the study demonstrated a >55% correspondence between low CCE and high vulnerability, as validated by the location of landslides. Keywords: carrying capacity environmental, vulnerability landslides, polynomial.

Paper ID: 036

ESTIMATION OF CHLOROPHYLL-A CONCENTRATION IN LAGUNA LAKE, PHILIPPINES, USING EXTREME GRADIENT BOOST MODEL

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Abstract

Lakes represent a vital freshwater resource and have historically served as key sources of water for human consumption. However, their ecological conditions have been increasingly degraded due to intensified anthropogenic activities in surrounding areas. One major impact of this degradation is eutrophication, which is closely associated with elevated concentrations of chlorophyll-a. This study aims to estimate chlorophyll-a concentrations in lake waters using the eXtreme Gradient Boosting (XGBoost) algorithm, a decision tree-based machine learning

method. XGBoost was selected due to its capability to provide feature importance, allowing for the evaluation of each input variable's significance in model performance. The methodological framework involved preprocessing Sentinel-3 satellite imagery to extract surface reflectance values, followed by training the XGBoost model using a 10-fold cross-validation approach. Model performance was assessed using Root Mean Square Error (RMSE) and the coefficient of determination (R^2). The XGBoost model exhibited stable performance, achieving an average RMSE of 1.69747 µg/L and an R^2 value of 0.29585. Comparative analysis with other algorithms, including Random Forest and Decision Tree, demonstrated that XGBoost outperformed the alternatives in terms of predictive accuracy. Spatial mapping results revealed seasonally consistent distributions of chlorophyll-a, with higher concentrations observed during the rainy season. These findings underscore the potential of decision tree-based algorithms as viable alternatives to neural network approaches, which are more commonly employed in satellite-based environmental modeling.

Paper ID: 037

TERESTRIAL VS DRONE: COMPARISON OF LIDAR, PHOTOGRAMMETRY, ETS, AND RTK

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Abstract

Accurate and efficient topographic data acquisition is foundational to a wide range of geoscientific applications. This study presents a comparative analysis of four commonly used surveying techniques—Light Detection and Ranging (LiDAR), Structure-from-Motion photogrammetry, Electronic Total Station (ETS), and Real-Time Kinematic (RTK) GNSS. Each method will be applied to a controlled survey site to generate spatial datasets, which are then evaluated based on horizontal and vertical accuracy, point density, and terrain surface continuity. We aim to quantify the systematic and random discrepancies among these methods by using ground control points (GCPs) and a high-precision reference model. Surface models (DEMs) derived from each dataset will be compared using RMSE analysis, elevation histograms, slope profiles, and residual difference maps. LiDAR will yield the most consistent terrain models in vegetated and complex areas due to its high point density and penetration capability. Photogrammetry is expected to perform similarly in open areas, but may exhibit reduced accuracy under variable lighting or low-texture surfaces. ETS is hypothesized to provide the highest positional accuracy at surveyed points but lacks full coverage. RTK GNSS offers operational efficiency and moderate accuracy but is sensitive to satellite geometry and multipath interference. The results of this study are intended to inform the selection of mapping methods based on specific geomatic and topographic objectives.

Paper ID: 038

ENHANCING SURFACE PRECISION: A COMPARATIVE EVALUATION OF DIGITAL SURFACE MODELS FROM NEURAL RADIANCE FIELDS (NERF) AND STRUCTURE FROM MOTION (SFM)

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Abstract

Digital Surface Models (DSM) play an important role in topographic mapping, disaster mitigation, and True Digital Ortho Model (TDOM) generation. Traditionally, DSMs have been produced using Structure from Motion (SfM) with dense image matching, which remains widely used due to efficiency and ability to capture large-scale surface geometry. However, its performance can be limited in areas with low texture, complex geometry, or occlusions, which can lead to reduced detail and accuracy. In this study, SfM implemented using COLMAP is compared with a more recent machine learning-based approach: Neural Radiance Fields (NeRF). NeRF has shown significant potential in generating highly detailed surface reconstruction. NeRF offers higher point density and excels at reconstructing surfaces in low-texture areas – features that are essential for producing high-quality TDOMs. The study was conducted in a complex topographic area with turbid water bodies, dense vegetation, irregular and compact residential areas, bare open land, small patterned plantations, and paved roads. Results show that the DSM generated from NeRF achieved an RMSE Z of 2.404 m and an LE90 of 3.103 m, outperforming SfM, which recorded an RMSE Z of 5.092 m and an LE90 of 8.359 m. Spatial deviation analysis further revealed that NeRF-generated surfaces more closely matched real-world conditions, whereas SfM-produced surfaces exhibited lower point density and reduced geometric detail. These findings highlight NeRF's promising capability to produce DSMs with superior spatial and visual fidelity. Nevertheless, SfM remains a robust and efficient method, particularly in scenarios where affordability and processing speed are primary concerns.

Paper ID: 039

IMPROVING DIGITAL TERRAIN MODEL ACCURACY FOR URBAN 3D FLOOD MODELING USING UAV LIDAR

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Abstract

This study aims to optimize the Digital Terrain Model (DTM) derived from UAV LiDAR data for accurate 3D flood modeling with a case study conducted on the relatively flat terrain of the ITS Campus. The DTM was generated through field measurements using the Post-Processed Kinematic (PPK) method, incorporating Ground Control Points (GCP) and Independent Check Points (ICP), achieving a vertical accuracy with a LE90 value of 0.078 meters. Strip adjustment was performed to enhance the alignment of LiDAR point clouds, resulting in a minimal mismatch value of 0.001252 meters. DTM processing was conducted semi-automatically, where point cloud filtering was carried out manually especially around drainage features to ensure correct elevation representation and drainage connectivity. This manual refinement is crucial in flat areas, where small elevation differences significantly influence flood modeling accuracy. The resulting DTM accurately reflects field conditions and provides a reliable basis for 3D flood modeling. Consequently, the flood simulations produced are more precise in representing inundation extents and flow paths. This research demonstrates the effectiveness of integrating UAV LiDAR with targeted manual processing in enhancing the reliability of flood modeling in low-relief urban environments.

Paper ID: 040

SYNERGY OF SATELLITE ALTIMETRY AND TIDE GAUGE DATA FOR COASTAL FLOOD (ROB) PREDICTION: A CASE STUDY IN BANTEN BAY

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Abstract

The present research proposes an integrative technique to predicting coastal flooding (ROB) in Banten Bay, Indonesia, using satellite altimetry and tide gauge data that are harmonized. Satellite-derived sea surface height (SSH) data from 2016 to 2022 were compared with tide gauge values from the Pulau Lima station. To guarantee uniformity between the two datasets, all sea level heights were linked to the same ellipsoidal datum. Tide gauge values were modified by a vertical offset of +15.326 meters to correspond with satellite SSH referenced to the ellipsoid, implicitly accounting for regional Mean Sea Surface (MSS) height above the ellipsoid and local datum variations. The aliasing signal, or discrepancy between satellite SSH and adjusted tide gauge levels, was calculated to find residual changes that typical tidal models could not explain. Harmonic reduction of this aliasing signal showed dominating periodic parts, allowing for comprehensive characterisation of subtidal and tidal differences. Spatial and temporal examinations of the aliasing signal indicated localized influences and patterns that could contribute to extreme sea level events. To evaluate coastal flood risk, the computed harmonic components were utilized to predict probable sea level dynamics under extreme tidal conditions, including a retrospective look at the ROB event in December 2024. The resulting model was then used to anticipate the chance of further ROB occurrences by 2025. The use of satellite altimetry data, which is integrally related to MSS models, paired with high-resolution

tidal gauge observations emphasizes the significance of vertical datum unification and MSS-aware interpretation for accurate coastal flood prediction. This study provides a comparable methodology for additional hazardous coastal areas, emphasizing the importance of harmonized multi-source sea level statistics and the use of MSS to improve regional flood forecasting skills.

Paper ID: 041

EVALUATION OF VEGETATION INDICES BASED ON SATELLITE IMAGERY FOR MONITORING OIL PALM CROP HEALTH

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Abstract

Monitoring the health of oil palm crops is essential for improving productivity and sustainability in plantations. Satellite-based monitoring provides an efficient solution for detecting crop conditions over large areas and in periodic intervals. This study aims to evaluate various vegetation indices to identify the most effective indicators for monitoring oil palm health using satellite imagery. The analyzed indices include NDVI, EVI, SAVI, GNDVI, NDRE, MSAVI, and CCCI, each with sensitivity to biophysical parameters such as canopy density, chlorophyll content, and plant nitrogen status. The research methodology involves satellite image preprocessing, calculation of vegetation indices, and correlation analysis between index values and actual crop conditions. The outcome of this study is a recommendation of the most accurate vegetation index algorithm suitable for an oil palm health monitoring system.

Paper ID: 042

ESTIMATION OF SURFACE WATER TEMPERATURE IN LAGUNA DE BAY, PHILIPPINES AND ITS RELATIONSHIP WITH ENSO INDEX USING ARTIFICIAL NEURAL NETWORK

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Abstract

As one of the largest lakes in the Philippines, Laguna De Bay exerts a significant influence on the local microclimatic conditions. The lake's surface water temperature is governed by a variety of factors, including global climatic phenomena such as the El Niño-Southern Oscillation (ENSO). Temperature fluctuations induced by ENSO can profoundly affect the stability of the lake's ecosystem and its surrounding environment, thereby underscoring the importance of monitoring the relationship between the lake surface temperature and the ENSO

index. This study estimates the surface temperature of Laguna De Bay by utilizing Sentinel-3 satellite imagery integrated with Artificial Neural Network (ANN) models, analyzes its correlation with the ENSO index, and evaluates the accuracy of these estimations. The results demonstrate that ANN produces an average error below ±0.02°C, with correlation coefficients (R) ranging from 0.8708 to 0.8855 on selected dates, alongside a lower Root Mean Square Error (RMSE) compared to the Random Forest (RF) method. Although RF achieves a higher correlation of up to R = 0.9309, it exhibits greater error variability, with errors reaching -0.7543°C and a maximum RMSE of 0.7235. During the February–March–April period, ANN's temperature estimates closely approximated actual measurements (29.9841°C versus 29.9903°C) alongside an Oceanic Niño Index (ONI) of 0.9738, indicative of a weak El Niño phase. Correspondingly, rainfall during this timeframe was near zero, reflecting the climatic influence of ENSO. These findings affirm that ANN provides more consistent and accurate surface temperature estimates and proves effective for the early detection of ENSO, thereby supporting enhanced tropical climate monitoring and improved forecasting of global climate phenomena.

Paper ID: 043

ASSESSING FLOOD RISK AND SUSTAINABLE MITIGATION STRATEGIES FOR WULAN RIVER USING HEC-RAS MODELING

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Abstract

The frequency and intensity of flood disasters in Indonesia have shown an increasing trend due to climate change and rapid urbanization. This situation has led to significant moral and material losses and damaged infrastructure. This study focuses on the flooding problem in Demak Regency, Central Java, which regularly experiences floods due to heavy rainfall and insufficient river capacity, resulting in embankment breaches at several points along the Wulan River. The study aims to analyze the hydrological conditions of the Wulan River in Demak Regency and assess flood potential in the area through hydraulic analysis. Various datasets, including daily rainfall, digital elevation models (DEM), land use, and maximum tidal levels, were used as inputs in this study. The methodology involved hydrological analysis, including rainfall frequency analysis, synthetic unit hydrographs, and hydraulic modeling using HEC-RAS 6.6 2D hydrodynamic model. The hydrological analysis of the Wulan River revealed its characteristics, with a watershed area of 4,047 km² and a main river length of 189.47 km. The 50-year return period rainfall, used for planning, was determined through frequency analysis and tested for distribution fit using the Chi-Square and Smirnov-Kolmogorov tests, resulting in an R50 value of 112.92 mm. The 50-year flood discharge, derived from the Nakayasu Synthetic Unit Hydrograph, was calculated at 1,422.67 m³/s. Hydraulic analysis using HEC-RAS provided insights into the river's capacity, flood inundation depth, and affected areas. Based on the findings, this study recommends river channel modification by deepening the riverbed to enhance the Wulan River's capacity to accommodate the design flood discharge.

Paper ID: 044

FLOOD MODELING AND INUNDATION MAPPING USING THE HEC-RAS 2D HYDRODYNAMIC MODEL WITH A METEOROLOGICAL RAIN-ON-GRID APPROACH: A CASE STUDY OF THE MARON WATERSHED, KEDIRI REGENCY

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Abstract

Sustainable water resource management requires a comprehensive hydrological approach, particularly for watersheds facing pressures from land-use changes and infrastructure development. The Maron Watershed in Kediri Regency, a crucial component of the western Brantas River hydrological system, experienced significant flooding in late 2024. This flooding event is strongly linked to watershed degradation, influenced by the construction of key infrastructure projects such as the Kediri Airport and the Kediri–Kertosono Toll Road, which are located near the Maron Watershed. This study aims to evaluate flood modeling and inundation mapping using the HEC-RAS 2D hydrodynamic model with a meteorological Rain-on-Grid (RoG) approach. Extreme rainfall data (R24) from December 24, 2024, recorded at 127 mm, resulted in a peak flood hydrograph of 86 m³/s. Inundation mapping yielded flood depths consistent with field observations, showing a maximum depth of 1.6 meters in Tiron and Mayaran villages. The results of this study are expected to enhance flood risk management by identifying the most vulnerable areas within the Maron Watershed, thereby supporting effective disaster mitigation strategies.

Paper ID: 045

GEOMORPHOLOGICAL SIGNATURES REVEAL HIDDEN DÉCOLLEMENT BENEATH ACCRETIONARY WEDGE ALONG THE ACEH-ANDAMAN SUBDUCTION ZONE

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Abstract

The Aceh–Andaman subduction margin, off the western coast of Sumatera, is among the most active and complex tectonic boundaries in the world. The margin is especially renowned for its enormous sediment input from the Nicobar Fan with thicknesses as much as 4 to 5 kilometers

constructing the Sumatra accretionary wedge. This enormous sedimentation appears to dominate the geometry of the wedge, as well as plate interface seismic dynamics. For example, the 2004 Mw 9.2 earthquake's rupture zones came startlingly near the trench, emphasizing this correlation. To investigate the structural dynamics beneath this sediment-heavy forearc, we applied quantitative geomorphological analysis using bathymetric data (BATNAS) processed with TecDEM. We found three prevailing morphotectonic features in our analysis: first, zones of uplift with gradients larger than 450 m/km of the outer-arc high trending parallel to the basins of thick sediment, possibly reflecting the position of duplex or backthrust systems associated with the décollement; second, areas of conspicuous erosion with 800 to 1,200 meters deep valleys, strongly connected to the styles of uplift ($R^2 = 0.78$); and third, complex topographic dissection signatures of active deformation typical for thin-skinned tectonics. While we did not incorporate direct subsurface data like core samples, surface topography clearly suggests that different sections of the décollement will have disparate behaviors, with some being low-friction zones and others being locked and capable of accumulating strain that would be released in great earthquakes. These morphometric records are shown to reveal how surface data could expose useful seismogenic behavior.

Paper ID: 046

SPATIOTEMPORAL ANALYSIS OF AIR POLLUTION OVER JABODETABEK USING SENTINEL-5P SATELLITE OBSERVATIONS AND IN-SITU VALIDATION (2019–2023)

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Abstract

Jabodetabek, as the largest metropolitan area in Indonesia, experiences high levels of air pollution, mainly due to dense transportation and industrial activities. This study aims to examine the spatial and temporal distribution patterns of Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), and Sulfur Dioxide (SO_2) concentrations from 2019 to 2023. The approach includes seasonal analysis and the influence of ENSO phases, along with validation of Sentinel-5P satellite data against in-situ measurements. Data processing was carried out using the Google Earth Engine platform. Validation was conducted at three in-situ locations representing urban (IPB CCROM-SEAP Bogor), sub-urban (BRIN Serpong), and rural (BMKG Cibeureum) environments. The observation instruments used were high-precision air monitoring devices calibrated with certified standard gases. Results show that the correlation between satellite and in-situ data varied. The highest correlation was found in CO ($r = 0.54$), while NO_2 and SO_2 showed lower values ($r = 0.37$ and 0.06, respectively). Correlation tended to improve during the rainy season and dropped significantly during the dry season. Linear regression was applied to correct the satellite data and used to generate seasonal spatial maps. Sentinel-5P has proven capable of capturing seasonal air pollution patterns, although further development is needed for satellite validation, especially for SO_2. Keywords: *Sentinel-5P, air pollution, Jabodetabek, ENSO, season, NO_2, CO, SO_2.*

Paper ID: 047

TERRESTRIAL LASER SCANNER DATA DEVELOPMENT FOR TREE DIAMETER AND TREE HEIGHT MEASUREMENT (CASE STUDY: KEBUN BIBIT WONOREJO, SURABAYA)

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Abstract

Forests play a vital role in maintaining ecosystem balance, supporting biodiversity, and providing economic and social benefits to humans. To ensure sustainable forest management, accurate tree inventory is needed to monitor important parameters such as Diameter at Breast Height (DBH) and tree height. Conventional measurement methods often require large labour and are prone to human error, thus the use of Terrestrial Laser Scanner (TLS) technology is more efficient and accurate solution. In this study, an analysis of DBH and tree height was conducted at the Kebun Bibit Wonorejo, Surabaya, Indonesia. This location was chosen as a study area because it has quite a lot of trees with species commonly found in Indonesia. The analysis carried out using TLS data with an automatic measurement method. Two main algorithms, namely Random Sample Consensus (RANSAC) and Gauss-Newton, were compared for DBH estimation, while tree height was calculated automatically using 3DFIN and FSCT. The TLS approach allows for more detailed observation of tree structure with high accuracy, thus it can replace manual methods in forest inventory. The results of this study are expected to identify the best algorithm which can improve the accuracy of DBH and tree height measurements and accelerate the forest inventory process. With a more sophisticated monitoring system, it is hoped that this method can be applied on a wider scale to support sustainable forest conservation and utilization. In addition, the use of TLS can be an innovative step in increasing the efficiency of community forest and production forest management.

Paper ID: 048

ANALYSIS OF THE DISTRIBUTION OF CHLOROPHYLL-A, DISSOLVED OXYGEN, AND TOTAL SUSPENDED SOLID (TSS) IN THE MADURA STRAIT SHIPPING CHANNEL 2019-2024

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Abstract

The Madura Strait is a strategic shipping route with a high intensity of ship traffic, potentially affecting water quality conditions. Heavy shipping activities can impact the distribution of water quality parameters such as chlorophyll-a, Total Suspended Solids (TSS), and dissolved oxygen (DO). However, studies that explore the relationship between shipping activities and these parameters are still limited, especially those that utilize remote sensing and machine learning approaches. Based on this, this study aims to analyze the spatio-temporal distribution of chlorophyll-a, TSS, and DO in the Madura Strait shipping lanes in the time span of 2019 to 2024. The approach used includes remote sensing methods and machine learning algorithms. Chlorophyll-a estimation was conducted using an algorithm based on previous research, while TSS was predicted using the Random Forest (RF) algorithm based on Sentinel-2 level 2 imagery. Meanwhile, DO parameters were analyzed using data from the Global Ocean Biogeochemistry Analysis and Forecast provided by Copernicus Marine Environment Monitoring Service (CMEMS). The results showed that chlorophyll-a concentrations were higher in the shipping area compared to the non-cruise area. In contrast, TSS concentration was more dominant in the non-nautical area. The DO value tends to be stable in both areas, both shipping and non shipping.

Paper ID: 049

INTEGRATED MAGNETIC AND GRAVITY METHODS TO DELINEATE SUBSURFACE STRUCTURES OF THE WRINGINANOM MUD VOLCANO, EAST JAVA

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Abstract

Wringinanom Mud Volcano is an interesting geological feature in Kendeng zone, East Java. Its presence is often associated with subsurface petroleum systems and active tectonic dynamics, particularly the activity of the Kendeng Fault, a major geological structure in the region. This study aims to analyze the Wringinanom mud volcano system by integrating magnetic and gravity methods to understand the subsurface geological structures that control the appearance of mud vulcanoes. Geophysical data measurements were conducted at 180 points for the magnetic method and 47 points for the gravity method, distributed around the mud volcano area.The results of the magnetic data analysis indicate the existence of two suspected fault zones, N-S and NW-SE directions, marked by gradients between high and low magnetic anomalies. In addition, a low magnetic anomaly was identified, characterizing the mud volcano area, with material distribution extending to the north, west, and south. Gravity data, obtained using a Lacoste Romberg gravimeter, revealed local anomalies indicating lower subsurface density beneath the mud volcano compared to surrounding areas. Further analysis using the First Horizontal Derivative (FHD) filter identified a possible NW–SE trending fault crossing the mud volcano area, consistent with the magnetic method findings. The integration of both geophysical

methods emphasizes the significant role of geological structures, especially fault systems, in controlling the appearance of the Wringinanom mud volcano. This study contributes to the limited knowledge of mud volcano systems in Java and highlights the need for further investigation, particularly through detailed subsurface modeling and fault pattern identification. *Keywords: Magnetic Method, Gravity Method, Mud Volcano, Geological Structure.*

Paper ID: 050

SPATIAL ASSESSMENT OF DROUGHT USING VTCI BASED ON LANDSAT 8 IMAGERY ON THE ENSO PERIOD AT WEST NUSA TENGGARA

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Abstract

This research aims to conduct a spatial assessment of drought variation in West Nusa Tenggara (NTB), Indonesia, across different ENSO phases—El Niño (2015), Neutral (2017), and La Niña (2022)—using the Vegetation Temperature Condition Index (VTCI). VTCI was derived from Landsat 8 satellite imagery, specifically from the LANDSAT/LC08/C02/T1_L2 Collection 2 Level-2 product. Annual GeoTIFF data on the Normalized Difference Vegetation Index (NDVI) and Land Surface Temperature (LST) were processed using Google Earth Engine (GEE). The VTCI computation was conducted in Google Colab using the cold and warm edge approach through NDVI–LST scatter plot analysis. Results revealed clear spatial and temporal variations in drought intensity. The most severe drought conditions were observed in 2015 during the El Niño phase, while the least occurred in 2022 during the La Niña phase. In 2022, NDVI values above 0.8 indicated significant vegetation recovery compared to previous years. These findings were supported by rainfall data from BMKG, which showed increased precipitation during the La Niña phase, contributing to improved soil moisture and vegetation density. This study highlights the influence of ENSO on rainfall distribution, with La Niña-linked precipitation increase correlating with lower drought intensity. The application of VTCI from high-resolution Landsat 8 imagery offers valuable insights for drought monitoring in tropical island environments. The resulting spatial drought maps are critical for early warning systems and climate disaster mitigation, especially in regions vulnerable to climatic extremes such as NTB.

Paper ID: 051

ANALYSIS OF THE IMPACT OF COASTAL RECLAMATION PLANS IN SURABAYA ON CURRENT PATTERNS AND SEDIMENTATION

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Abstract

Surabaya is one of the cities selected to be the location of the National Strategic Project. The national strategic project is a project regulated in the Regulation of the Coordinating Minister for the Economy Number 6 of 2024 concerning "Changes to the List of National Strategic Projects". This project is an island reclamation project with an area of ± 1,100 Ha located in the eastern waters of Surabaya City, stretching across the areas of Kenjeran District, Mulyorejo District, Sukolilo District, Rungkut District, and Gunung Anyar District. With the planned reclamation project, research related to the impact of the East Surabaya Coast reclamation event becomes quite relevant to study. Reclamation is a process of changing natural conditions that will affect the surrounding ecosystem. The disturbed ecosystem around the project will affect the life of marine biota and mangroves. The purpose of this study is to analyze the impact of reclamation on the hydrodynamic process in the area. Using Delft3D numerical modeling software, this study focuses on comparing changes in current patterns and sedimentation patterns before and after reclamation. This study uses the latest data on bathymetry, tides, and sediment. The data is expected to represent the impact of reclamation on changes in current patterns and sedimentation patterns in the reclamation area. Later, the results of this study are expected to be used as a reference by related policy makers.

Paper ID: 052

LAND USE CHANGE ANALYSIS DUE TO RECLAMATION USING MULTITEMPORAL SATELLITE IMAGERY ON KELAPA ISLAND, THOUSAND ISLANDS

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Abstract

Kelapa Island, located in North Thousand Islands District, has undergone significant land use changes due to reclamation and traditional landfilling activities. This study aims to identify indications of land accretion, analyse the physical, ecological, and legal characteristics of the land, and evaluate the compatibility of these changes with the Detailed Spatial Plan (RDTR) of Jakarta. The methods employed include spatial analysis of Sentinel-2 imagery from 2023 using the NDWI index, historical shoreline overlays, and integration of field inventory data (IP4T) from Kelapa Island. Results show that out of 190 land parcels, 89% were traditionally filled, 9% were unlicensed reclamation, 1% were stilt houses, and 1% were physically unstable. Land ownership was dominated by individuals (3.353 ha) and legal entities (3.528 ha), primarily for dense residential and tourism purposes. RDTR overlay analysis revealed that 3.511 ha were compliant, 0.06 ha remained unrealized, and 3.306 ha were non-compliant. The discussion addresses ecological implications, legal challenges, and recommends field validation,

integration of historical data, and further ecological assessments to support sustainable coastal spatial planning.

Paper ID: 053

THE GEOLOGICAL NO NET ROTATION SYSTEM IMPLEMETATION IN SUMATRA AS AN ALTERNATIVE COORDINATE REFERENCE FRAME REALIZATION FOR EXPLORATION AND EXPLOITATION ACTIVITIES

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Abstract

Geodetic coordinate determination and its kinematic monitoring require a stable reference frame or with known spatio-temporal rate of change. Reference systems and frames that commonly used nowadays are refer to the terrestrial geodetic systems ITRS and ITRF. Related to the exploration and exploitation of natural resources in the Sumatra region, it is necessary to define the location and its changes for planning, operational and mitigation purposes. In this study, another alternative for coordinate frame realization is proposed by using a non-geodetic reference system and frame that refers to the No Net Rotation (NNR) system based on geological geophysical data from the past to the recent. The aligment are tested by comparation with the geodetic ITRF frame. The results obtained divide the characteristics of the Sumatra frame into two major zones, namely the western region and the eastern region with Bukit Barisan as the boundaries and several minor zones in each part. The geological paleomagnetism frame models of NNR GMSR, NNR Nuvel 1A and NNR Morvel56 gave consistent results relative to the NNR ITRF model with an average deviation of (-0.76 – 0.49) mm/yr for eastern zone and (-3.13 – 0.48) mm/yr for western zone, while the geological hotspot frame model of the NNR H3S gave a larger deviation with respect to NNR ITRF with an average of 0.76 mm/yr for eastern zone and -2.65 mm/yr for western zone. Those comparisons show that in general the NNR geological frame model can be used as an alternative coordinate reference frame realization in study area.

Paper ID: 054

MODELLING SPATIAL LAND VALUE DYNAMICS AROUND AIRPORTS WITH NEURAL NETWORKS

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Abstract

The development of Dhoho Airport in Kediri Regency, East Java, has significantly impacted accessibility and economic growth in the surrounding area. One of the most notable effects is the change in land value near the airport. This study aims to analyze land value changes before and after the airport development and to model land values in 2024 using a Neural Networks algorithm. The study area covers a 1-kilometer radius from the airport, encompassing six villages: Tarokan, Bulusari, Kalipang, Grogol, Jatirejo, and Tiron. Land value changes were analyzed using an overlay method with Land Value Zone (ZNT) data from 2022 to 2024. The prediction model was developed using a NN trained on historical land value data and supporting variables, including land area, land use, road width, road classification, and distances to the airport, main roads, city center, and public facilities. Model performance was evaluated using Mean Absolute Error (MAE), Root Mean Square Error (RMSE), and Mean Absolute Percentage Error (MAPE). The findings are expected to provide insights into land value dynamics driven by strategic infrastructure development and demonstrate the potential of NN-based models for more accurate land value estimation compared to traditional methods. This study can serve as a reference for spatial planning, land management, and land value-based taxation policies in the vicinity of Dhoho Airport.

Paper ID: 055

DEFORMATION OF MT DUKONO FROM INTERFEROMETRIC SYNTHETIC APERTURE RADAR OBSERVATION FROM 2021-2024

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Abstract

Located in the Halmahera Arc Volcano, Mt Dukono is one of the most active volcanoes in the Maluku islands. There are reports of eruptions that had been occurred here in the past such as 1550, 1719, 1868, 1901, and 1933. Due to its location that is hard to be accessed, the report on monitoring about volcanic activity in this volcano, especially geodetic monitoring, becomes rare. This is where Interferometric Synthetic Aperture Radar (InSAR) can come to tackle this problem. In this observation, we were using 118 SAR images from Sentinel 1 satellite from January 2021 towards December 2024. Small baseline subset method was used in this observation to extract time series information of the deformation that was occurred in Mt Dukono. To mitigate the atmospheric artifacts that can affect the measurement, we were using GACOS model. From the time series analysis that we got, there was a down trend in the deformation on the edifice of the Mt Dukono with different rates in the north and southern part of the volcano in the period of 2021 to 2023. Since July 2023, we found some build-up phases that is occurred in the all side of the Mt Dukono edifice. We presume that the role of the influx of magma from the magma chamber played an important role in the deformation of the Mt

Dukono. In this case, there was an increase in the magma supply rate that is bigger than its discharge rate, making Mt. Dukono to be uplifted.

Paper ID: 056

INTEGRATING TERRESTRIAL AND AIRBORNE LIDAR FOR ESTIMATION OF POTENTIAL CARBON CREDITS FROM ABOVEGROUND BIOMASS

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Abstract

Accurate estimation of carbon credits requires precise mapping of biomass, in which parameters such as the diameter and height of trees play an important role. This study uses a combination of terrestrial and aerial LiDAR to enhance the estimation of aboveground biomass (AGB) in carbon credit calculations. Utilizing high-resolution LiDAR data, tree diameter at breast height (DBH) and tree height were extracted and validated against field measurements, achieving an RMSE of 1.38 cm for DBH and 0.79 cm for tree height. Correlation analysis revealed a strong relationship between DBH and AGB (r = 0.8599), a moderate relationship between DBH and tree height (r = 0.5643), and a weaker relationship between tree height and DBH (r = 0.3787). This suggests that stem size is not always directly proportional to tree height. This variability could be due to different tree species, growing environments or unique growth patterns. Furthermore, regression analysis confirmed the contribution of each variable to the AGB prediction model, with an R^2 value of 0.8059 indicating that 80.6% of the variation in AGB could be explained by DBH and tree height. These findings confirm the potential of combining multi-scale LiDAR data to improve AGB estimates and support more precise carbon credit calculations. This approach offers a scalable, efficient, high-accuracy solution for carbon stock assessment, contributing to sustainable forest management and climate change mitigation efforts.

Paper ID: 057

A COMPARISON BETWEEN LIDAR-UAV AND DJI ZENMUSE L2 IMAGE DENSE CLOUD FOR ELEVATION ACCURACY IN HARVESTER TERRAIN

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Abstract

Filtering LiDAR data in Unmanned Aerial Vehicles (UAVs) to achieve the best possible results presents a significant challenge. This study focuses on comparing elevation accuracy derived from two different sources: a low-cost LiDAR-UAV system and DJI Zenmuse L2 image-based data with Post Processing Kinematic (PPK) method, specifically for terrain measurements in a harvester environment. The research examines the accuracy of point clouds generated from both LiDAR and image-based methods across various land covers, including vegetation, roads, and open terrain. The processing of classification use the Multiscale Curvature Classification (MCC) in software. Ground truth measurements are obtained using RTK GNSS to generate cross-section profiles, ensuring a reliable comparison. The statistical metrics used to evaluate accuracy include Root Mean Square Error (RMSE), Mean Absolute Error (MAE), and Strip Adjustment. Furthermore, the Digital Terrain Model (DTM) generated from each dataset is analyzed to assess the distinct characteristics of terrain representation provided by both technologies. These results can serve as a valuable reference for designing an efficient water distribution system for palm oil plantation areas. By understanding terrain variations and elevation accuracy, plantation managers can optimize irrigation planning, ensuring equitable water distribution that supports sustainable palm oil cultivation. This study highlights the potential advantages and limitations of different remote sensing technologies in agricultural applications, helping improve decision-making in precision farming and land management.

Paper ID: 058

ANALYSIS OF ACCURACY POSITIONING PERFORMANCE OF LOW-COST AND GEODETIC GNSS USING PRECISE AND BROADCAST EPHEMERIS

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Abstract

The accuracy of GNSS-based positioning is significantly influenced by the type of satellite ephemeris data used. This includes broadcast ephemeris, which is available in real time, and precise ephemeris, which is post-processed and provided by organizations such as the International GNSS Service (IGS). This study evaluates the positioning performance of a low-cost GNSS receiver (u-blox F9P) and a geodetic-grade receiver (Trimble) under two ephemeris scenarios: broadcast and precise. The GNSS data were processed using RTKLib in post-processing mode with appropriate ephemeris configurations. Both receivers consistently tracked 8 to 11 satellites across all observation sessions, with negligible differences between the two ephemeris types. In terms of positioning accuracy, the low-cost GNSS receiver yielded Root Mean Square Error (RMSE) values of 0.383 m (North), 0.244 m (East), and 0.163 m

(Height) when using broadcast ephemeris. When using precise ephemeris, the RMSE slightly improved to 0.368 m (North), 0.244 m (East), and 0.162 m (Height). For the geodetic-grade receiver, RMSE values were 0.234 m (North), 1.026 m (East), and 0.148 m (Height) with broadcast ephemeris, and 0.246 m (North), 1.025 m (East), and 0.157 m (Height) with precise ephemeris. These findings suggest that precise ephemeris data provides minor improvements in positioning accuracy for low-cost receivers, while geodetic receivers demonstrate stable performance regardless of ephemeris type. Therefore, low-cost GNSS receivers present promising potential for precision applications where cost-effectiveness is essential.

Paper ID: 059

DIRECTIVITY OF COSEISMIC IONOSPHERIC DISTURBANCES PROPAGATION FOLLOWING THE 2024 HUALIEN-TAIWAN EARTHQUAKE USING GNSS-TEC

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Abstract

Earthquakes are natural disasters that have the potential to damage and cause casualties. The shifting of the Earth's crustal plates during an earthquake will generate acoustic waves that can cause disturbances in the ionospheric layer, known as Coseismic Ionospheric Disturbance (CID). This research studies the propagation and directivity of CID due to the Taiwan M 7.4 earthquake on April 2, 2024, 23:58:12 UTC triggered by a reverse fault mechanism near the boundary between the Eurasian plate and the Philippine Sea. Ionospheric disturbances were analyzed using TEC measurements with the regional GNSS network spread across Taiwan. The first CID was detected about 10 minutes after the earthquake occurred. The maximum measured TEC amplitude was about 0.3 TECU (TEC unit) and the horizontal propagation velocity was about 0.87 km/s, close to the acoustic wave velocity at ionospheric height. The directivity pattern shows that CID propagation is predominantly south-northward, influenced by the earthquake source mechanism and local ionospheric conditions. These findings can be applied to support the development of early detection systems for earthquake-related ionospheric disturbances and tsunami warning systems.

Paper ID: 060

TREE MORPHOLOGY AND STRUCTURE ANALYSIS BASED ON 3D POINT CLOUD DENSITY WITH BACKPACK AND DRONE LIDAR INTEGRATION

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Abstract

The utilization of LiDAR technology in tree inventory has rapidly advanced, including TLS, Backpack LiDAR, and Drone LiDAR. This technology enables three-dimensional object modeling with high accuracy, surpassing the spatial resolution limitations of satellite imagery. Since compact LiDAR products such as TLS are very expensive, a low-cost backpack technology integrated with drone LiDAR has been developed to address this issue. This study focuses on analyzing the 3D structure of trees using LiDAR based on the point cloud density analysis generated from the fusion of Backpack LiDAR and Drone LiDAR data. The research targets 3 tree species that have similar physical characteristics, aiming to identify tree species through analysis of point density differences in various parts of the tree, such as the trunk and crown. The methodology involves merging point cloud data from both devices to obtain a more complete 3D representation of the trees. Measurement and calculation of structural parameters, such as tree volume, diameter at breast height, and tree height, are the primary focus. The distribution of point density is used to examine the physical and morphological characteristics of trees in detail. Results show an RMSE of 0.083 meters from data merging, indicating a high level of spatial accuracy in integrating the two data sources. Point cloud density analysis effectively represents tree structure and calculates relevant physical parameters non-destructively. This approach can be applied for forest monitoring, natural resource management, and ecosystem change assessment based on geospatial data.

Paper ID: 061

BUILT-UP AREA IDENTIFICATION IN SUBURBAN REGION USING MODIFIED PRISI INDEX OF SENTINEL-1 DATA (CASE STUDY: SURABAYA-SIDOARJO, INDONESIA)

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Abstract

Rapid urbanization in Indonesia has led to the emergence of suburban areas and the phenomenon of urban sprawl—characterized by uncontrolled city expansion into previously non-urban regions. A prime example of suburban development is the Surabaya Metropolitan Area (SMA), especially Sidoarjo Regency, which has far higher rates of population growth than Surabaya City. Synthetic Aperture Radar (SAR) technology is capable of monitoring densely populated areas, as it overcomes the limitations of optical imagery, such as interference from adverse weather, cloud cover, and dependence on daylight. This study proposes the use of the Modified Piecewise Radar Impervious Surface Index (PRISI) to analyze the spatial distribution and characteristics of built-up land in suburban environments. PRISI integrates radar backscatter intensity and interferometric coherence to enhance the extraction of impervious surfaces. Experimental results indicate that the highest impervious surface extraction occurs in the Waru sub-district of Sidoarjo Regency, with overall accuracy of 88.46% and a kappa coefficient of 76.92%. Furthermore, analysis of the results reveals that the total built-up area along the Surabaya–Sidoarjo border spans approximately 2,847 hectares, with dense development found in suburban districts such as Waru, Taman, and Sedati. These findings affirm modified PRISI's effectiveness in supporting impervious surface extraction from Sentinel-1 SAR data in suburban regions.

Paper ID: 062

ENHANCING AERIAL IMAGE TEXTURE FOR BETTER 3D RECONSTRUCTION: A COMPARISON OF HISTOGRAM EQUALIZATION AND CONTRAST LIMITED ADAPTIVE HISTOGRAM EQUALIZATION TECHNIQUES

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Abstract

The quality of aerial imagery is often degraded due to factors such as adverse weather conditions, atmospheric interference, or camre limitation. These factors significantly impact the effectiveness of the three-dimensional reconstruction process, particularly during the feature extraction and point cloud formation stages. The problem becomes more pronounced when reconstructing relatively homogenous surfaces, where a lack of texture leads to poor feature matching, resulting in incomplete or inaccurate models in the Structure from Motion (SfM) workflow. This study aims to evaluate the effectiveness of two methods of improving image quality, Histogram Equalisation (HE) and Contrast Limited Adaptive Histogram Equalisation (CLAHE), in improving texture quality and consequently enhancing the accuracy and completeness of 3D reconstruction in homogeneous areas. The evaluation was conducted through visual analysis, point cloud density, and spatial comparison using a Cloud-to-Cloud (C2C) approach. The HE and CLAHE processed point clouds were compared against those derived from the original, unenhanced imagery. The results indicated that the CLAHE method

provides a more controlled contrast increase and produces point clouds with improved density and distribution compared to HE and the original image. Furthermore, the C2C analysis revealed lower spatial deviations in the reconstructions generated using CLAHE. These findings suggest that CLAHE is more effective in enhancing visual quality, especially in low-textured areas, to support the reconstruction of photogrammetry-based mapping.

Paper ID: 063

MAPPING GRASSFIRE BURN SEVERITY IN ZAMBALES, PHILIPPINES: A NORMALIZED BURN RATIO INDEX AND K-MEANS APPROACH WITH SENTINEL-2 AND BLACKSKY IMAGERY

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Abstract

Grassfires pose a significant threat to ecosystems, infrastructure, and human lives worldwide. In the Philippines—an archipelago marked by diverse topography and a tropical climate—grassfires are a recurring hazard, particularly during the dry Amihan season from January to March. Characterized by strong northeast monsoon winds and minimal rainfall, this period creates ideal conditions for rapid fire spread. During the first quarter of 2025, several grassfire incidents were reported across Luzon, with one of the most notable occurring in Barangay Pundaquit, San Antonio, Zambales in March. In response, the Philippine Space Agency conducted a remote sensing-based damage assessment using both open-source medium-resolution Sentinel-2 imagery, and a commercial, on-demand very-high-resolution (VHR) BlackSky satellite imagery. Sentinel-2 data enabled the generation of burn extent and severity maps due to its rich spectral information, while BlackSky imagery provided finer spatial detail for delineating affected areas. However, VHR data often lack the spectral depth necessary for vegetation index-based severity assessments. This study aims to evaluate the reliability of VHR satellite imagery in producing thematic maps under time-sensitive scenarios. Specifically, it compares the burn extent and severity outputs from BlackSky with those derived from Sentinel-2, highlighting the strengths and limitations of each data source. The results offer valuable insights into the potential use of VHR imagery for rapid disaster response and fire management planning, particularly in situations where immediate action is required, and cloud-free optical data availability is limited.

Paper ID: 064

THE EFFECT OF TECTONIC PLATES MOVEMENT ON THE ACCURACY OF DATUM TRANSFORMATION PARAMETERS FROM SRGI2013 EPOCH 2012.0 TO SRGI2013 EPOCH 2021.0 CALCULATION RESULT

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Abstract

Indonesian region is located at the convergence of several tectonic plates, causing all geospatial objects within it to experience positional changes due to crustal deformation. With recent epoch update in Indonesia's reference system SRGI2013 from epoch 2012.0 to epoch 2021.0, all data that were previously defined in SRGI2013 epoch 2012.0 must be integrated into the SRGI2013 epoch 2021.0 reference system. Datum transformation is required to achieve this purpose, either by using transformation parameters or deformation model. Given Indonesia's complex geography, where tectonic plate interactions create varying deformation directions across regions, this study calculated datum transformation parameters for each tectonic plates in Indonesia's area using the Helmert 3D model and validated the results with the transformation results generated by using the deformation model issued by the Geospatial Information Agency (BIG). Results of this study shows that calculating datum transformation parameters per tectonic plate improved the accuracy results approximately ±11 cm than datum transformation parameters being calculated without considering plate boundaries. When the plate-specific parameters were compared to the deformation model, the deformation model overall performance shown to be ±2 mm better. However, analysis at the individual plate results revealed that some plates achieved better accuracy with plate-specific parameters, while others performed better with the deformation model. Keywords: datum transformation, Helmert, deformation model, tectonic blocks

Paper ID: 065

FLOOD INUNDATION ANALYSIS OF GRESIK REGENCY, INDONESIA USING SENTINEL-1 INSAR COHERENCE RATIO AND BACKSCATTER

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Abstract

Indonesia is one of the most susceptible countries to natural disasters, with floods being the most significant threat. In 2024, floods contributed to 55% of the 1,478 disaster occurrences recorded by the National Disaster Management Agency. Gresik Regency is highly susceptible, particularly because of the Lamong River overflows. This study is aimed at determining the spatial extent of flood inundation in Gresik Regency on February 19th, 2024 using Sentinel-1 Synthetic Aperture Radar imagery. Sentinel-1 was selected due to the ability of obtaining data regardless of cloud cover or weather conditions. Two analytical methodologies have been employed: backscatter and InSAR coherence ratio. Backscatter method discovered that Benjeng, Ujungpangkah, and Manyar among the most affected sub-districts. Validation against historical flood data yielded an overall accuracy of 86% and a kappa accuracy of 81%, while comparison with the flood susceptibility map produced 86% overall accuracy and 80% kappa accuracy. InSAR Coherence method identified Benjeng, Dukun, and Balongpanggang as the sub-districts most affected by flooding. The severe flooding in Benjeng fits with its vulnerability to recurring inundation due to the excessive flow of the Lamong River, a major watercourse in southern Gresik. Validation using historical data produced an overall accuracy of 72% and a kappa accuracy of 64%, while comparison with the susceptibility map yielded 75% overall accuracy and 69% kappa accuracy. Based on the processing, it has been determined that the backscatter approach provides the highest accuracy in flood mapping in Gresik Regency, Indonesia.

Paper ID: 066

AN ASSESSMENT OF PROTECTED RICE FIELD POLICY (LSD) IN SEMARANG REGENCY ON RICE PRODUCTION TO SUPPORT THE FOOD ESTATE PROGRAM

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Abstract

Indonesia through the Regulation of the Minister of ATR/BPN Number 12 of 2020 stipulates protected rice fields (LSD) to secure productive rice fields. The determination of LSD aims, among others, for the food estate program and food security. In Semarang Regency, the determination of LSD has been strengthened by the regulations of the Semarang Regency spatial plan (RTRW). This study aims to assess the determination of LSD in Semarang Regency has been able to support rice production as one of the food estate programs. The methods used in this study are rice field production mapping, map overlay and calculation of rice availability needs. Rice field production mapping was carried out by interview surveys with agricultural extension workers. The results of the analysis show that in 2023 Semarang Regency experienced a surplus in rice production. However, in 2043 Semarang Regency was unable to maintain its rice self-sufficiency condition. There are 3 sub-districts that experienced a change in status from

surplus to deficit in 2023 to 2043. The 3 sub-districts include Tuntang, Banyubiru, and Bawen District. The results of this study can be used as a basis for agricultural and rice field management strategies.

Paper ID: 068

THE PREDICTION MODELLING ANALYSIS OF REGIONAL ECONOMIC ACTIVITY BASED ON NIGHTTIME LIGHTS IN CENTRA JAVA PROVINCE

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Abstract

Central Java Province has the second largest number of regencies/cities in Indonesia and has diverse economic characteristics. This diversity is a challenge in providing fast, spatial, and accurate economic development data. This study aims to utilize night satellite imagery (Nighttime-Light/NTL) to indicate economic activity to build a predictive model of regional economic growth. Linear regression analysis and machine learning, NTL VIIRS data for the period 2013–2023, are processed to project night brightness until 2043 in five-year intervals. The NTL prediction results are used to estimate the GRDP value, with an average error rate of 2% for GRDP and 8% for NTL. The projection shows that economic activity growth is concentrated in urban areas, national road corridors, and provincial borders. The level of conformity between the classification of nighttime brightness and the leading sectors of the regional economy reaches 89%, and 60% against the directions of the provincial Spatial Planning Plan (RTRW). This finding proves that regional economic activities can be identified spatially through the NTL approach and has the potential to support spatial planning policies and long-term planning.

Paper ID: 069

MACHINE LEARNING-BASED APPROACH FOR SPATIO-TEMPORAL GROUNDWATER STORAGE PREDICTION USING GLDAS TIME-SERIES DATA IN EAST JAVA PROVINCE, INDONESIA

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Abstract

The use of groundwater as a source of fresh water in Southeast Asian countries such as Indonesia is approximately 60% to 65%. Spatio-temporal prediction of groundwater storage (GWS) is urgently needed for sustainable water resources management. Therefore, in this study,

spatio-temporal prediction of GWS is performed using GLDAS time-series data and implementing a machine learning (ML) approach in East Java, Province. The ML algorithm used in this study is gradient boosting decision tree regression (GBDTR). GLDAS data was extracted from 2018 to 2024 monthly at each pixel. Afterward, the data was aggregated using the mean value of each epoch (t) and was modelled using the GBDTR. The mean GWS data at t as the independent variable and t-1 to t-5 as the dependent variable. This data is then split into training and testing data in a ratio of 80:20 sequentially. The training data is used for univariate time-series modelling using GBDTR. Meanwhile, the testing data was used for model evaluation using the mean absolute percentage error (MAPE), root mean square error (RMSE), and R2. The model was then implemented to each pixel and used to predict 12 epochs in future from the last epoch. The prediction model built has RMSE, MAPE, and R2 of 49.37 mm, 0.72, and 4.55%, respectively. With these results, it can be interpreted that the model performed well. The findings of this study contribute to the development of a groundwater availability evaluation system, which can support decision-making related to freshwater resources management.

Paper ID: 070

FLOOD HAZARD ASSESSMENT OF FLOOD WIDENING AREA DUE TO LAND SUBSIDENCE IN PEKALONGAN, CENTRAL JAVA, INDONESIA

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Abstract

Land subsidence (LS) is a gradual lowering of the ground surface, typically occurring in alluvial formations. In the Pekalongan area, LS has gained increasing attention over the past five years, with several studies attributing it to excessive groundwater extraction, particularly by the long-established Batik industry. While this industry has supported Pekalongan's economic growth for over a century, its environmental impacts—especially the expansion of flood-prone areas—are becoming more severe. In this study, the Sentinel-1 SAR data from 2017 to 2025 were used, and the Small Baseline Subset (SBAS) method was applied to estimate land subsidence rates in Pekalongan. Our results show that the maximum LS rate reaches 11 cm/year, affecting both Pekalongan City and parts of Pekalongan Regency. Using DEMNAS as the baseline topography, we simulated flood extent in 2017 (the year DEMNAS was acquired) and projected it for 2025, accounting for changes in elevation due to LS, using the HEC-RAS model. The results show that the flood-affected area increased by a factor of 1.2 in 2025 compared to 2017, particularly in coastal regions. The flood hazard also increases when the land subsidence

factor is included in the analysis. Additionally, the subsiding terrain has developed into a bowl-shaped depression, indicating that some zones may become permanently inundated.

Paper ID: 071

ESTIMATION OF MAGMA SUPPLY VOLUME AT MOUNT MERAPI DURING 2022-2024

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Abstract

Mount Merapi, located on the border of Central Java and the Special Region of Yogyakarta, is one of the most active stratovolcanoes globally. Its persistent activity suggests magma accumulation or movement within the volcanic system. This study monitors deformation through Electronic Distance Measurement (EDM), with episodic measurements yielding changes in Slope Distance (CSD) that indicate deformation. Seventeen EDM baselines were analyzed to estimate deformation parameters, including the pressure source characteristics—assumed spherical—such as chamber location, size, inflation pressure, magma volume, and supply rate from June 1, 2022, to December 31, 2024. The grid search method was used to minimize residuals between field and theoretical data. Results show asymmetric deformation due to the 1888 lava dome shifting 4.24 meters northwest. The estimated magma chamber measures approximately 207.31 meters and lies at 1 100–1 700 meters depth beneath the summit, aligning with the aseismic zone. Inflation pressures ranged from 0.9 to 35 MPa. Magma volume increased by 9.31 × 10^6 m^3, with a supply rate fluctuating between 0.8 and 115 × 10^3 m^3/day. Increases in supply rate correlate with heightened seismicity, indicated by Volcano-Tectonic A (VTA), Volcano-Tectonic B (VTB), and Multiphase (MP) events. Seismic data confirm that observed surface deformation reflects subsurface volcanic processes. These findings provide critical input for disaster risk mitigation and support informed decision-making for future hazard management

Paper ID: 072

HYDRODYNAMIC MODELLING AS A STUDY FOR BRANTAS RIVER WATERHSHED RECOVERY EFFORT (STUDY CASE: KALI SURABAYA AND KALI MAS)

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Abstract

Water plays a crucial role in sustaining life and supporting human activities yet increasing industrialization and residential expansion continue to threaten its quality, especially in river systems. Kali Surabaya and Kali Mas, as part of the main streams in the Brantas River watershed, serve vital ecological and socioeconomic functions for East Java. However, rapid development has led to significant water quality degradation. This study uses the MIKE21 hydrodynamic model to simulate flow characteristics in the Kali Surabaya and Kali Mass and integrates with MIKE ECOLab for water quality modeling to assess the distribution of BOD, DO, NH4, and NO3 across seasons. The model is validated using the error bias comparison method to verify its content resemblance to real life situations. The results show that water quality tends to decline downstream, particularly during the dry season, with BOD levels reaching 6.3 mg/L, NH4 concentrations exceeding 0.65 mg/L in the downstream, and DO dropping to 2.2 mg/L in the upstream, hence placing those areas in class 3 to class 4 under Indonesian standards PP No. 22/2021. Based on these findings, targeted restoration measures are proposed for each river segment, including aeration systems in the upstream areas, waste load reduction in midstream zones, and community-based cleanups and urban buffers in downstream urban areas.

Paper ID: 074

LAND SUITABILITY AND CARRYING CAPACITY ANALYSIS BASED ON LAND VULNERABILITY USING FL-AHP IN THE RELOCATION AREA OF THE BAGONG DAM PROJECT, TRENGGALEK

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Abstract

The relocation of residents due to the construction of the Bagong Dam in Trenggalek necessitates a land suitability assessment to ensure that new settlements are both safe and sustainable, particularly considering the area's high land vulnerability. This study evaluates the land suitability and carrying capacity of six designated relocation areas using the Fuzzy Logic–Analytical Hierarchy Process (FL-AHP) approach based on land vulnerability. Five key parameters—slope, geological formation, aspect, land use, and proximity to roads—were analyzed using spatial data processed through fuzzy membership, FL-AHP weighting, and weighted overlay to generate a vulnerability map. This map was then classified into land suitability zones (S1–N). The carrying capacity of S1 zones was calculated using the standard of 26 m² per person. The results identify geological formation (36.95%) and slope (30.61%) as the most influential factors. Relocation Areas 1, 2, and 3 were found to be the most suitable (predominantly S1–S2), while Area 5 requires further evaluation. The total area deemed suitable for habitation is approximately 299,253 m², which can accommodate up to 11,510 people—well above the actual relocation need of 1,127 individuals. The FL-AHP method provides a

systematic and adaptable framework for vulnerability-based suitability assessment, supporting more informed and sustainable spatial planning decisions.

Paper ID: 075

COMBINATION OF TERRESTRIAL AND AIRBORNE GRAVITY DATA TO GENERATE COMPLETE BOUGUER ANOMALY MAP OF NORTHEAST SULAWESI ISLAND, INDONESIA

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Abstract

The integration of terrestrial and airborne gravity data offers a valuable approach for regional-scale geophysical investigations, particularly in geologically complex areas. The Directorate for Geospatial Reference Systems, Geospatial Information Agency of Indonesia (Badan Informasi Geospasial; BIG), has conducted systematic gravity survey campaigns using both ground-based and airborne methods to support the development of the national geoid model, INAGEOID2020. This study explores the further application of these datasets to produce a high-resolution Complete Bouguer Anomaly (CBA) map of Northeast Sulawesi Island, Indonesia. A unified gravity dataset was compiled from terrestrial and airborne observations. Initial data quality assessment was performed by cross-referencing with a global geoid model, EGM2008 degree 360. Standard gravity corrections were applied, including latitude, free-air, and Bouguer corrections, resulting in the Simple Bouguer Anomaly (SBA). The SBA was subsequently refined through terrain correction using digital elevation models and regional geological parameters, yielding the final CBA map. The resulting CBA was validated through comparison with Bouguer anomaly data published by the Center for Geological Survey (Pusat Survei Geologi; PSG), Geological Agency of Indonesia. The comparative analysis indicates a spatial agreement exceeding 70% in key structural zones. Additionally, consistency was observed between the CBA derived from terrestrial-only, airborne-only, and combined datasets, confirming the reliability of the hybrid gravity approach. This study demonstrates the potential of integrating multi-platform gravity datasets to enhance subsurface structural interpretation and supports broader applications in regional geophysical mapping across the Indonesian archipelago.

Paper ID: 076

DEVELOPMENT OF "DETEKSI DINI TANAHKU" LAND INFORMATION SYSTEM TO ACCELERATING SPATIAL ANALYSIS AT LAND SERVICES COUNTER

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Abstract

In realizing the guarantee of land service time and product quality, it is necessary to conduct a spatial analysis prior to the acceptance of land service applications at the Land Office. Facts show that registered land parcels at the Samarinda City Land Office are still found 122 parcels located in Forest Areas and 5732 parcels that are incompatible with Spatial Planning. For this reason, it is necessary to build an information system that is used to analyze spatial land parcels at the beginning of the application as an early warning system step and simplify surveying and mapping services. This research aims to design an information system that can be an instrument for the community and all land partners to be able to actively participate in order to analyze the spatial data of land parcels independently before registering services at the land counter. The method used is research and development. Data collection techniques are carried out through: interviews and observations. Data analysis was conducted using qualitative methods with a descriptive approach. The results showed that the application design has several stages, namely: (1) Planning; (2) Design; (3) Construction; and (4) Testing. The application is designed by analyzing the current system, analyzing user needs and system requirements. The application is designed with unified modeling language modeling. Application construction is carried out by accommodating the entire series of application planning and design processes. Application testing is carried out using two stages, namely: black box testing method and application trials on studio work.

Paper ID: 077

MOBILE MAPPING SYSTEM (MMS) WITH LIDAR AU20 SENSOR-BASED APPROACH FOR COMPREHENSIVE URBAN ROAD INVENTORY EXTRACTIONS

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Abstract

Urban road inventory plays a crucial role in infrastructure management and transportation planning by enabling a detailed understanding of roadway elements and mobility patterns. Traditional methods such as manual surveys and aerial imagery are often constrained by labor intensity, safety risks, and insufficient resolution. This study introduces an advanced approach utilizing Mobile Mapping System (MMS) technology, centered on the CHCNAV AlphaUni 20 (AU20) LiDAR sensor, to support the high-resolution digitalization of urban road infrastructure. Conducted along Jalan Raya Muchtar in Depok City, Indonesia, the research focused on acquiring dense, accurate point cloud data under real traffic conditions using a vehicle-mounted MMS operating at speeds of 40–50 km/h. The AU20 sensor's high point density (up to 2,000,000 pts/sec) and centimeter-level accuracy facilitated detailed feature extraction of road elements, including curbs, lane markings, traffic signs, and vertical roadside objects. GNSS and

IMU integration ensured precise georeferencing, enhanced further through Post-Processed Kinematic (PPK) correction and SatLiDAR preprocessing. The proposed workflow incorporates novel segmentation and filtering techniques, utilizing tools such as CoPre and CoProcess, optimized for the AU20's capabilities. This study demonstrates improved processing efficiency and accuracy in complex urban settings, overcoming common challenges such as GNSS signal degradation and cluttered environments. The resulting data serves as a foundational resource for spatial analysis, infrastructure modeling, and smart city applications. Ultimately, the methodology contributes to the development of scalable and reliable urban mapping frameworks applicable to various city environments.

Paper ID: 078

CHARACTERISTICS OF EXTREME RAINFALL IN RELATION TO THE INDIAN OCEAN DIPOLE (IOD) AND EL NINO SOUTHERN OSCILLATION (ENSO) IN NORTH SUMATRA PROVINCE

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Abstract

This study investigates the characteristics of extreme rainfall in North Sumatra, Indonesia, and its relationship with the El Nino-Southern Oscillation (ENSO) and the Indian Ocean Dipole (IOD). Using a blended daily precipitation dataset from 1991 to 2024, which combines gauge data from 17 meteorological stations and CHIRPS satellite estimates, this research analyzes eight extreme rainfall indices recommended by the ETCCDI. A validation process confirmed the reliability of the CHIRPS data, showing a strong correlation ($r \approx 0.78$) with station observations. The analysis reveals a distinct bimodal rainfall pattern across the province, with primary and secondary peaks in November-December and April-May, respectively. The study demonstrates a significant influence of global climate phenomena on local rainfall extremes. La Nina and negative IOD phases are strongly correlated with increased rainfall intensity, volume, and duration, leading to wetter conditions (higher RX1day, PRCPTOT, CWD). Conversely, El Niño and positive IOD phases are associated with significantly drier conditions and an increased risk of meteorological drought (higher CDD). Spatial analysis using Inverse Distance Weighted (IDW) interpolation reveals a pronounced geographical disparity: the western coast, including the Nias Islands, is highly susceptible to intense rainfall and prolonged wet periods, whereas the eastern coast is more prone to extended droughts. These findings provide a comprehensive overview of rainfall dynamics in North Sumatra and underscore the region's vulnerability to climate-driven hydrological hazards.

Paper ID: 079

PERFORMANCE EVALUATION OF FOUR BIAS CORRECTION METHODS FOR CLIMATE HAZARDS GROUP INFRARED PRECIPITATION WITH STATION DATA (CHIRPS) IN SUMATRA ISLAND

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Abstract

*Accurate rainfall data is critical for climate monitoring and hydrometeorological disaster management. This study investigates the influence of seasonal monsoons on bias correction methodologies for CHIRPS (Climate Hazards Group InfraRed Precipitation with Station data) satellite rainfall estimates in Sumatra, Indonesia. Using 20 years (2003–2023) of ground observations from 42 BMKG stations and corresponding CHIRPS data (0.05° resolution), we evaluated four correction methods: Linear Model (LM), Quantile Mapping (QM), Generalized Additive Model (GAM), and Random Forest (RF). Results show monsoon seasons significantly impact bias: *wet season* (October–March) exhibits CHIRPS underestimation (up to 60% for >75 mm rainfall), corrected optimally by QM (MAE reduced by 31.5%); *dry season* (April–September) shows systematic overestimation (15–25% for <5 mm rainfall), best addressed by LM/GAM. Topographical variation explains 68% of bias variance, with RF outperforming in orographically complex western regions (*r* = 0.48) and LM/GAM proving optimal in eastern lowlands (ΔRMSE < 5%). Key limitations include CHIRPS' 5-km resolution (fails microclimate capture) and data inconsistencies (28.7% null values). We recommend season-zonal correction protocols for BMKG to enhance hydrometeorological decision-making and hybrid AI models for future research.*

Paper ID: 080

ANALYSIS OF LOW-LEVEL WIND SHEAR (LLWS) TRIGGERS USING RADAR AND LIDAR DATA AT SOEKARNO-HATTA INTERNATIONAL AIRPORT: CASE STUDIES OF JANUARY 30 AND FEBRUARY 20, 2023

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Abstract

Low-Level Wind Shear (LLWS) is an atmospheric phenomenon that poses a significant threat to flight safety, particularly during takeoff and landing phases. This study aims to analyze the

triggering factors of LLWS at Soekarno-Hatta International Airport based on two events detected by LIDAR on January 30 and February 20, 2023. The data utilized includes LIDAR alerts and weather radar products (CMAX and PPI), which were analyzed both spatially and temporally. The results indicate that both LLWS events occurred at night under dry atmospheric conditions, with no indication of convective clouds observed on radar imagery. Wind pattern analysis using LIDAR revealed the presence of atmospheric waves in the form of trapped lee waves, as well as a significant contribution from the Land Breeze Front (LBF) phenomenon. The January 30 event displayed a bidirectional zigzag structure consistent with a standing wave generated by wind-topography interaction. Meanwhile, the February 20 event exhibited a more complex and spatially extensive zigzag pattern, suggesting the involvement of multi-mode wave oscillations and turbulent microstructures associated with the LBF. These findings underscore the critical importance of LIDAR in the early detection of LLWS within complex tropical coastal environments.

Paper ID: 081

APPLICATION OF GEOGRAPHIC INFORMATION SYSTEM AND ANALYTICAL HIERARCHY PROCESS (AHP) IN ANALYZING DROUGHT-PRONE AREAS (CASE STUDY: GRESIK REGENCY)

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Abstract

Gresik Regency is a region vulnerable to drought due to uneven rainfall distribution and imbalanced hydrological conditions. This study aims to identify and map drought-prone areas in Gresik Regency using a Geographic Information System (GIS) approach and the Analytical Hierarchy Process (AHP) method. Parameters used in the analysis include rainfall, land surface temperature (LST), land cover (NDVI), soil type, and slope. The data used consists of Landsat 8 satellite imagery, DEM data, temperature and rainfall data from BMKG, and soil type and land cover data. The analysis process involved spatial data processing in ArcGIS and parameter weighting. The results indicate that the most influential parameter on drought-prone areas is NDVI. The interaction among parameters shows that Alluvial soil type (16.1%), low NDVI values (0.15–0.25) with a weight of 49.4%, very low vegetation density (28.93%), and high surface temperature (30–33°C) with a weight of 5.07% significantly affect drought risk. The drought risk distribution map shows that moderate classification dominates most areas, especially in Duduksampeyan, Manyar, Bungah, Sidayu, Ujungpangkah, and Gresik sub-districts. These findings can serve as a basis for disaster mitigation planning by relevant agencies.

Paper ID: 082

TREE STRUCTURAL PARAMETER EXTRACTION AND ABOVEGROUND BIOMASS ESTIMATION USING LOW-COST BACKPACK LIDAR

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Abstract

Accurate estimation of aboveground biomass (AGB) plays a critical role in assessing forest carbon stocks and understanding the impacts of climate change. Traditional methods based on destructive sampling and allometric equations are often limited by labor intensity, species-specific calibration, and structural variation across ecosystems. This study investigates the potential of a low-cost backpack LiDAR system to extract individual tree structural parameters, namely Diameter at Breast Height (DBH) and tree height. These parameters play an important role in estimating AGB in a tropical urban forest setting. Point cloud data were acquired using a mobile SLAM-based LiDAR system, followed by ground-level reference measurements for validation. Horizontal slicing and circle fitting techniques were employed for DBH extraction, while tree height was derived from point cloud segmentation. The 3D structural model of each tree was further reconstructed using the Adaptive Quantitative Structural Model (AdQSM), enabling direct calculation of tree volume. AGB was then estimated using wood density values, a biomass expansion factor (BEF), and a correction factor for tree morphology. The results indicate a high level of agreement between LiDAR-derived parameters and ground truth measurements, with RMSE values below 5 cm for DBH and 1,2 meters for tree height. This study demonstrates the feasibility of using affordable LiDAR systems for efficient, non-destructive, and scalable forest biomass assessment, particularly in areas where access to high-end sensors is limited.

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