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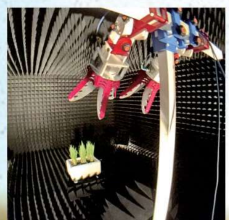
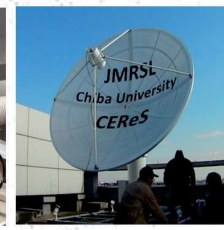
Proceedings of

The 7th Indonesia Japan Joint Scientific Symposium
The 24th CEReS International Symposium
The 4th Symposium on Microsatellite for Remote Sensing (SOMIRES 2016)
The 1st Symposium on Innovative Microwave Remote Sensing







November 21-24, 2016
Keyaki Convention Hall, Chiba University

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Center for Environment Remote Sensing, Chiba University, Japan
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IJJSS 2016
Indonesia Japan Joint Scientific Symposium

Preface

The 7th Indonesia Japan Joint Scientific Symposium (IJJSS 2016), the 24th CEReS International Symposium, the 4th Symposium on Microsatellite for Remote Sensing (SOMIRES), and the Symposium on Innovative Microwave Remote Sensing were held on the Nishi-Chiba campus of Chiba University, Japan, during 20-24 November 2016. These symposia focused on providing a forum to share and discuss recent issues and developments in various fields of science and technology.

IJJSS has been held since 2004 and now it has become one of the successful regional symposia co-organized by two countries – Indonesia and Japan. In IJJSS 2016, a total of 160 papers that have gone through review process are presented. In each of the 29 sessions, enthusiastic and stimulating discussions have led to the exchange of innovative ideas and advancement of the state of knowledge among students and researchers from universities in Japan, Indonesia, and other countries.

Generous supports for the conference were provided by Kabupaten Siak, Bank Riaukepri, Katoro, APPJ, Dental Support, Chiba Soy Sauce Union, and Kominato Railway. On behalf of the IJJSS local organizing team, I would like to express my sincere gratitude to their supports, which greatly contributed to the participation of young scientists.

Finally, I would like to thank all the proceedings team members who have dedicated their effort and time to bring the manuscripts into the form of a book. This book will serve as a long-lasting credit to the achievements of IJJSS 2016.

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The 4th Symposium on Microsatellites for Remote Sensing
The Symposium on Innovative Microwave Remote Sensing

November 21-24, 2016
Keyaki Convention Hall, Chiba University

Monday, November 21	
09:30-12:00	Opening Ceremony (Moderator : Dr Takenobu Aoki and Meidesta Pitria)
	Opening Remark : General Chairman Prof Hiroaki Kuze
	Opening Speech : Rector of Chiba University – Prof Takeshi Tokuhisa
	Opening Speech : Vice President of University of Indonesia – Prof Bambang Wibawarta
	Inauguration Ceremony of New Sister University : Universitas Islam Riau (UIR) – Chiba University
	Inauguration Ceremony of International Collaboration : Regency of Siak – Center for Environmental Remote Sensing
	Keynote Speech (1) – Prof Yoshifumi Yasuoka **Keynote Speech (2)** – Prof Eko Tjipto Rahardjo **Keynote Speech (3)** – Drs. H. Syamsuar, M.Si
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12:00-13:30	Lunch
13:30-17:00	Laboratory / Research center visiting Prof Hiroaki Kuze – Lidar Facility Prof Josaphat Tetuko Sri Sumantyo – Microwave Remote Sensing Facility Prof Hitoshi Irie – Atmospheric Research Facility Prof Atsushi Higuchi – Himawari-8 Facility (Dr Koichi Toyoshima) Prof Naoko Saito – GOSAT Facility Prof Katsumi Hattori – Geohazard Research Prof Shogo Shimazu – Chemistry Research Facility Prof Hiroshi Asanuma – Mechanical Engineering Prof Motoi Machida – Chemistry Research Facility (22 November 2016 08:00 to 15:30)
13:30-15:00	Alumni Meeting – 3F Reception Hall (Prof Ryoko Niikura) Opening speech – Rector of Chiba University : Prof Takeshi Tokuhisa

Monday, November 21	
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Tuesday, November 22	
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16:00-17:00	Poster session
17:00-19:00	Banquet – 3F Reception Hall Opening speech : Prof Motoi Machida – Kanpai (Opening toast) : Prof Kenichi Sakakibara Free talk for future exchange and collaboration – Prof Katsumi Hattori – Prof Kenichi Sakakibara – Prof Hiroshi Asanuma

Wednesday, November 23	
09:30-15:00	Parallel Oral Presentation Session
15:30	Closing and Awards Ceremony – Best Paper Awards – Best Presenter Awards – Best Poster Awards – Best Student Awards

Keynote Speech

Monday, November 21
10:15-11:45

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11:15-11:45 *KS003*		Drs. H. Syamsuar, M.Si Mayor/Regent of Regency of Siak, Riau Province, Indonesia *The success steps of Regency of Siak in tackling environmental issues; resolving the problem of forest fires in Siak District, Riau Province; Achievement of the National Environment Award 2015 and 2016*

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11:00 - 11:30 P123	Tri Widayati *The Ways Forward to Ecosystem-based Farming Management in Dieng Mountain, Central Java-Indonesia: A Proposed Model*	
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10:30 - 11:00 P124	Agus Indarjo *An Introducing the Tripatriate Model of University-Government-Communities in Managing Karimunjawa and Its National Park: Safe for Future Sustainable Development*	
11:00 - 11:30 P064	Junko NANAHOSHI (p:178-185) *A Consideration of Expectations in Nursing Education Regarding Relationships with Patients — Main Focus on Textbook Analysis of High School Nursing Departments —*	
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Geophysical Modelling Using Gravity Data Of Meteorite Impact Crater At Bukit Bunuh, Lenggong, Perak, Malaysia

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Abstract

A geophysical survey using gravity method was conducted at Bukit Bunuh, Lenggong, Perak, Malaysia, to determine the occurrence of a subsurface impact crater, based on the discovery of meteorite impact rock, suevite, in the study area. A standard correction was applied to all the gravity data to produce Bouguer gravity anomaly of the study area. The Bouguer gravity anomaly was used to produce several maps of gravity anomalies by filtering processes and relate them to the geological structure and tectonic history of the study area. Data processing and interpretation were conducted using geophysical software, Oasis Montaj. This software was used in a number of gravity data filtering processes, such as Low Pass Filter (LPF) and the Total Horizontal Derivative (THD). Bouguer gravity anomaly map shows a circular structure in Bukit Bunuh area which is interpreted as a remnant of meteorite impact crater. The gravity anomaly appears to decrease from the edge of the crater and increases at the center. This feature indicates a complex crater structure which has central uplift. The Total Horizontal Derivative map of residual gravity anomaly shows structural trend such as lineaments and faults that dominant to the northwest-southeast direction. A model was produced using GM-SYS 3D software to determine the geometry of the impact crater. The interpreted 3-D model shows a diameter of the impact crater was approximately 2368 m and depth of about 400 m. The model of the crater appears to tilt toward southeast, which illustrates the ancient meteorite that hit this area about 1.83 million years ago possibility came from northwest direction.

Keywords
Keywords: Geophysics; Gravity; Bukit Bunuh; Impact Crater; Model

1. Introduction

Gravity survey is a measurement of the gravitational potential field in a series of different locations for a particular purpose. The objective of this survey is to relate the density differences to anomaly gravity changes (Parasnis, 1986). The anomaly gravity changes shows horizontal density differences of subsurface rocks or materials and could be used to determine the subsurface structure (Samsudin, 1990).

A gravity survey was conducted in Bukit Bunuh, Perak, Malaysia. The study was initiated by a discovery of meteorite impact rock, called, suevite (Fig. 1), around Bukit

Bunuh area. The presence of suevite provides an evidence of possible ancient meteorite impact that had taken place in the study area.

Figure 1: Meteorite impact rock, suevite discovered in Bukit Bunuh area

Bukit Bunuh area (Fig. 2) was initially a rubber plantation until it had been replanted with palm oil plantation in 2001. During the replanting period, some suevite boulders and artifacts of archaeological significant were exposed, which was then confirmed by a palaeo-environmental mapping of Lenggong Valley. Since then the area has been set as a centre for archaeological and meteorite impact research lead by Universiti Sains Malaysia. Bukit Bunuh area is believed to be impacted by a meteorite around 1.83 million years ago, which developed an impact crater. However due to tropical weather and erosion, the geomorphology condition of the crater has been destroyed and the crater structure buried by a relatively new sediments.

Figure 2: Location map of Bukit Bunuh area

Based on Lenggong topographic map, sheet number 3464, series L7030, scale 1:50 000, issued by Department of Survey and Mapping Malaysia, 1986, Bukit Bunuh is situated at longitude $100^0 58.5'$ East and latitude $5^0 4.5'$ North. The study area is a hilly region that could be seen in the topographic map (Fig. 3), indicated by closed contour lines on the eastern and the western part. On the southern part, Bukit Bunuh is border with Raban Lake and Perak River flows on the eastern area.

Geophysical gravity survey can contribute a supporting evidence for meteorite impact structure in Bukit Bunuh. The fulfillment of all criteria would help the study area to be recognized as a World Heritage Site by UNESCO.

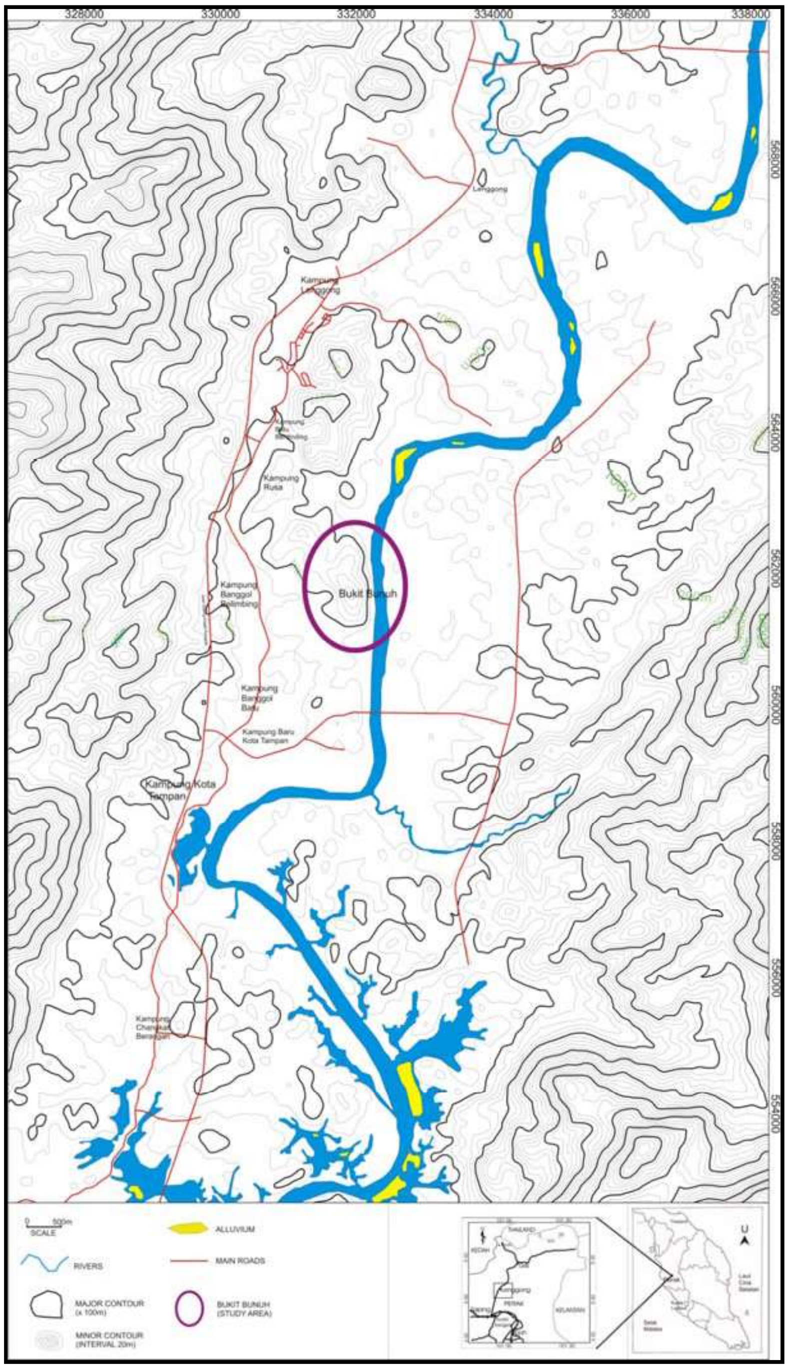

Figure 3: Topographic map of study area

Based on Geological Map of Lenggong valley issued by Mineral and Geoscience Department Malaysia in 2007, scale 1:200 000 (Fig. 4), the study area consists of

Quaternary sediment and small lithology unit of Tertiary tephra ash and metasediments. While, it basement were dominated by Mesozoic granitic rocks as a concurrence of regional granitic intrusion in Peninsular Malaysia during Triassic (Alexander, 1962). Suevite breccias in form of variable size boulders were found well scattered in the southern area of the Bukit Bunuh (Fig. 5).

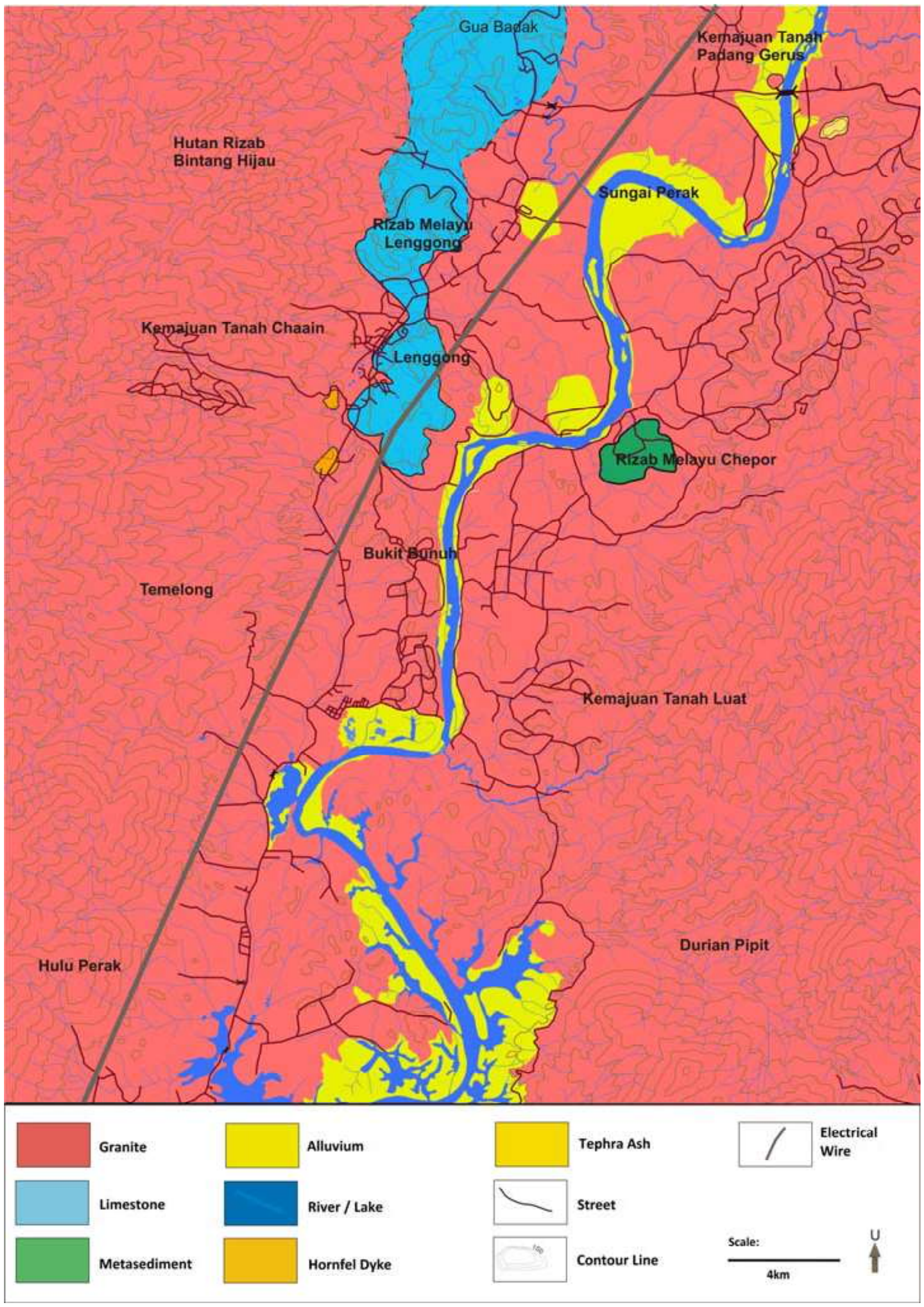

Figure 4: Geological map of Lenggong valley

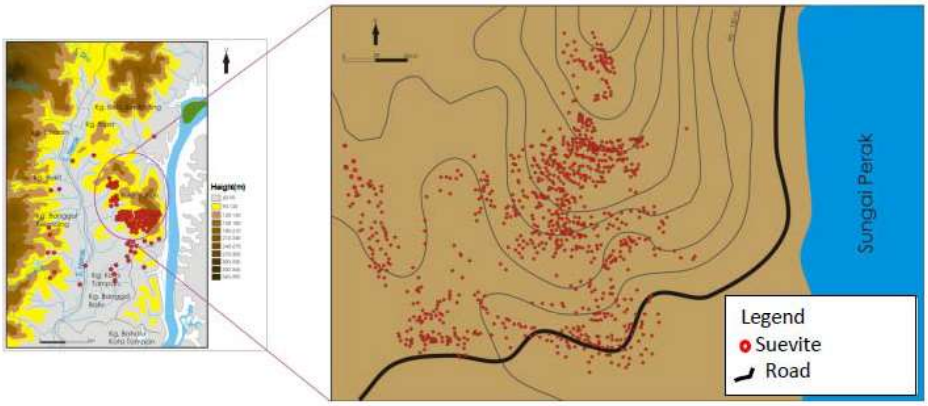

Figure 5: Map of suevite boulders

2. Methodology

The gravity survey was conducted using CG5 Scintrex Micro-Gravitimeter. A total of 544 gravity stations had been established with approximately 500 m spacing in surrounding area and 50 m spacing in Bukit Bunuh (Fig. 6). The observed gravity data has been tied with an established gravity station (Loke, et al 1983). Wallcae and Ternian altimeters had been used to measure the elevation of gravity stations and the station coordinates determined by using global positioning system (GPS) instrument.

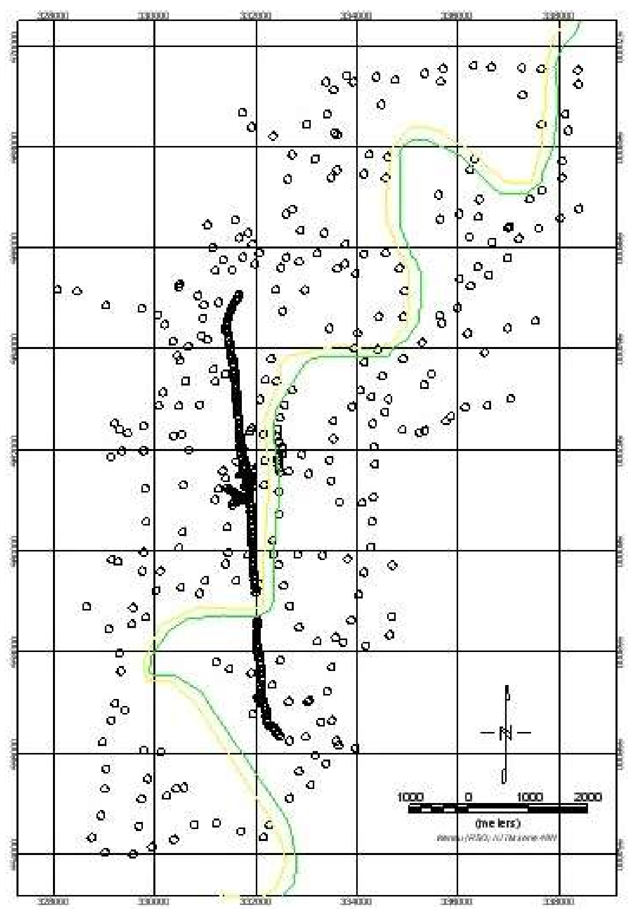

Figure 6: Map of observed gravity stations

The gravity data were corrected for drift, free air, bouguer, latitude and terrain in order to produce corrected bouguer anomaly data of the study area. The gravity data were then processed and analysed using Geosoft Oasis Montaj software to produce several gravity anomaly maps such as, bouguer, regional, residual, THD residual and THD regional anomaly maps, for qualitative and quantitative interpretation. Since about one fifth of known impact craters on Earth are covered with sediments, gravity is the major tool for investigation of theses craters (Grieve and Pesonan, 1992). The gravity signature of impact craters is relatively distinctive and the relationship between impact effects and density is somewhat straightforward (Pilkington and Grieve, 1992).

3. Result and Discussion

Several anomaly gravity maps had been produced and interpreted by qualitative and quantitative analysis.

3.1. Qualitative Analysis

The bouguer gravity anomaly map (Fig. 7) shows a negative low anomaly and some circular shaped in the study area.

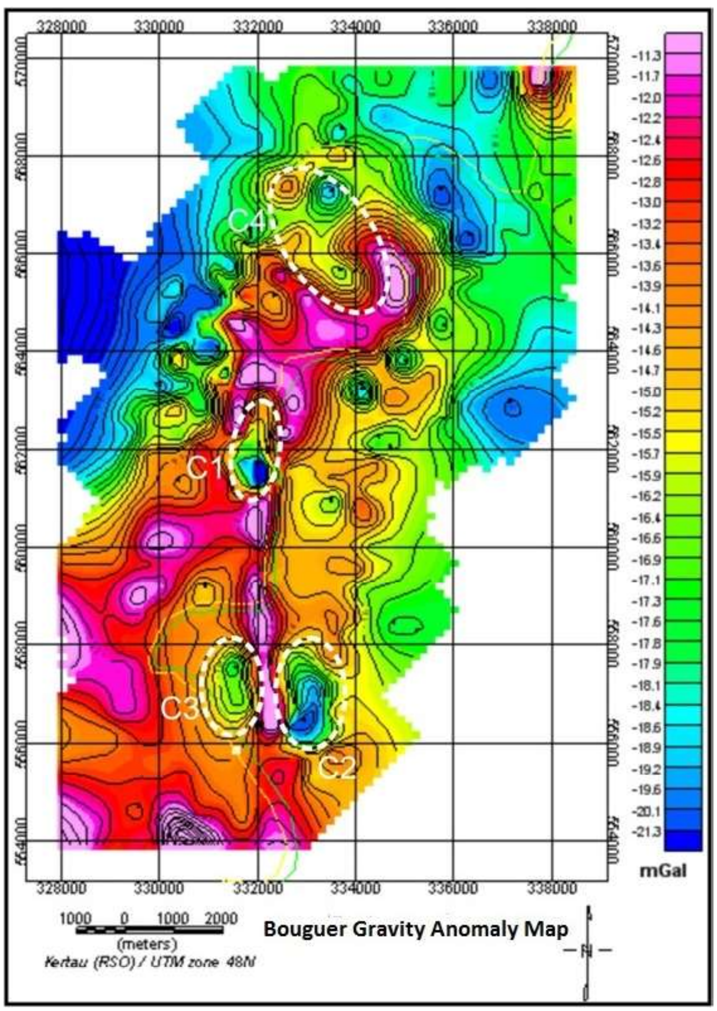

Figure 7: Bouguer gravity anomaly map of the study area

The map shows the occurrence of circular shaped in Bukit Bunuh area (C1). It surrounded by high anomaly with a diameter around 2.5km and interpreted as a remnant of meteorite impact crater. The low gravity anomaly is interpreted to be associated with low-density sedimentary fill, ejecta, and brecciated Suevite. Information from borehole data indicates that the subsurface geology at Bukit Bunuh area comprises of remnant of impact brecciated rocks (suevite) and weathered metasediments which are underlain by granitic rock basement. The bouguer anomaly map also shows the possible occurrences of three others impact craters (C2, C3, C4) located not very far to the northeast and southeast of the Bukit Bunuh impact crater. However, these structures need further detail investigation for confirmation.

Regional and residual gravity anomaly map had been produced to analysed subsurface structures. These maps were derivation of bouguer gravity anomaly map. Regional gravity anomaly map (Fig. 8a) shows the condition of basement. The anomaly tends to decreased in southwest-northeast direction. This indicated either the basement was shallower or alluvium sediment was thinner. Based on the surface geological condition, granite had been found in the southwest part of study area, therefore the first possibility is likely to be acceptable.

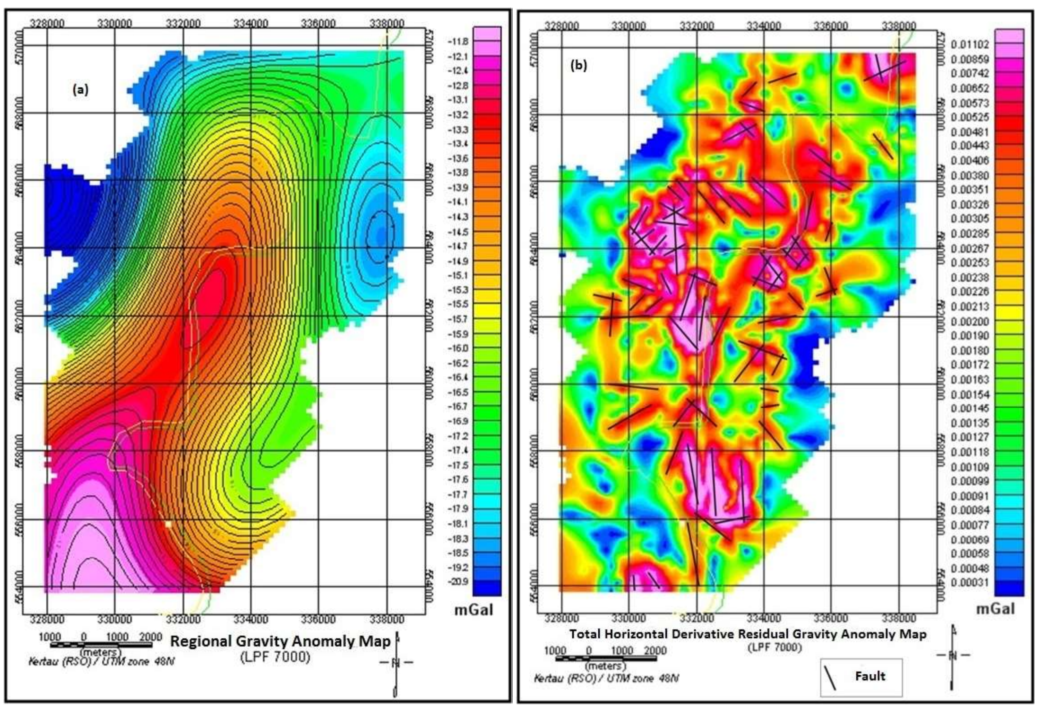

Figure 8: (a) Regional gravity anomaly map shows the condition of basement; (b) THD residual gravity anomaly maps shows the structure of shallower subsurface layer

Residual gravity anomaly map had been derived to produce Total Horizontal Derivative (THD) gravity anomaly map (Fig. 8b) that shows the structural condition of shallower subsurface layer. THD map shows the occurrence of lineaments and fault structures that concentrated in Bukit Bunuh and the direction is dominant to northwest-southeast. This data were supported by the result of rose diagram (Fig. 9) analysis that indicated the same dominant direction of the structures.

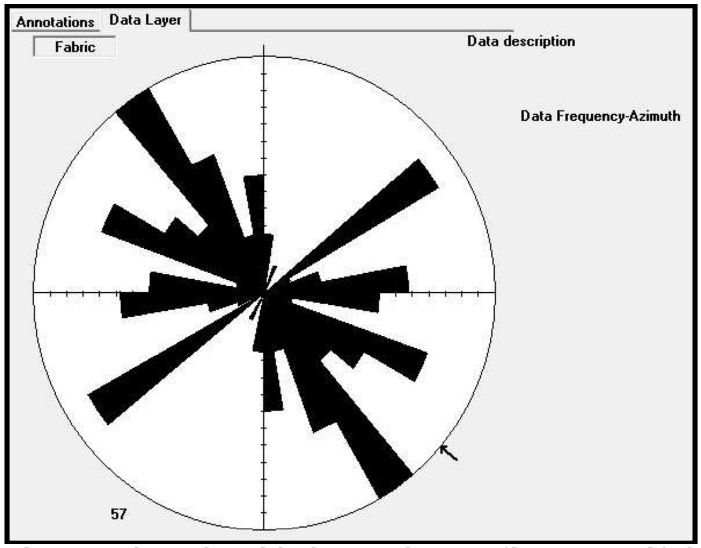

Figure 9: Rose diagram analysis indicated the dominant direction of lineaments and fault structures is northwest-southeast

3.2. Quantitative Analysis

An interpreted gravity model had been generated using GM-Sys 3D software. The model constructed based on several borehole data and bouguer gravity anomaly map of the study area. The 3D model (Fig. 10) shows the structure of impact crater is complex because of the occurrence of central uplifts.

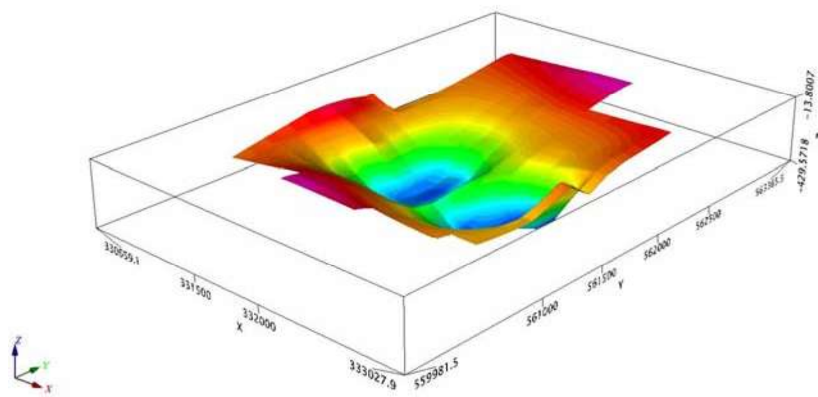

Figure 10: A 3D gravity models shows a complex crater structure with central uplifts

Based on this model, the diameter of impact crater approximately 2368 m and low density material including alluvium sediment, impact breccias (suevite) and metasediment with thickness about 400 m. The thickness of impact crater also could be determined from power spectrum analysis (Fig. 11) and the result had been displayed in a graphic that indicated the estimated layer and depth of impact crater. The graphic shows the subsurface structure divided into four section, 100 m, 130 m, 380 m and 400 m. The basement or the deepest part of impact crater had been interpreted belong to the last section. The 3D model of impact crater appears to tilt toward southeast direction (Fig. 12) suggesting the ancient meteorite that hit Bukit Bunuh area about 1.83 million years ago came from northwest direction.

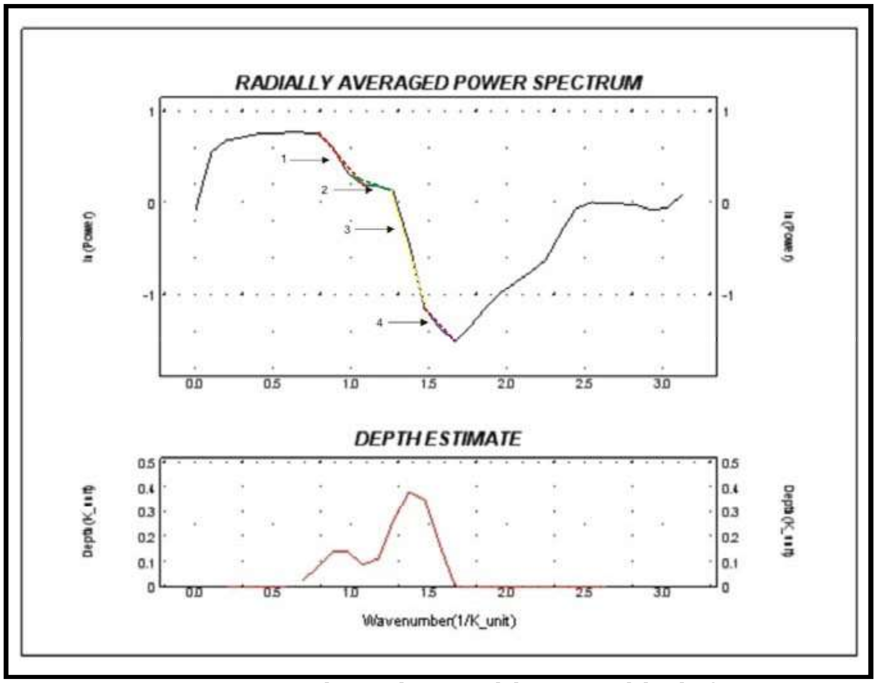

Figure 11: Power spectrum analysis to determined the estimated depth of impact srater

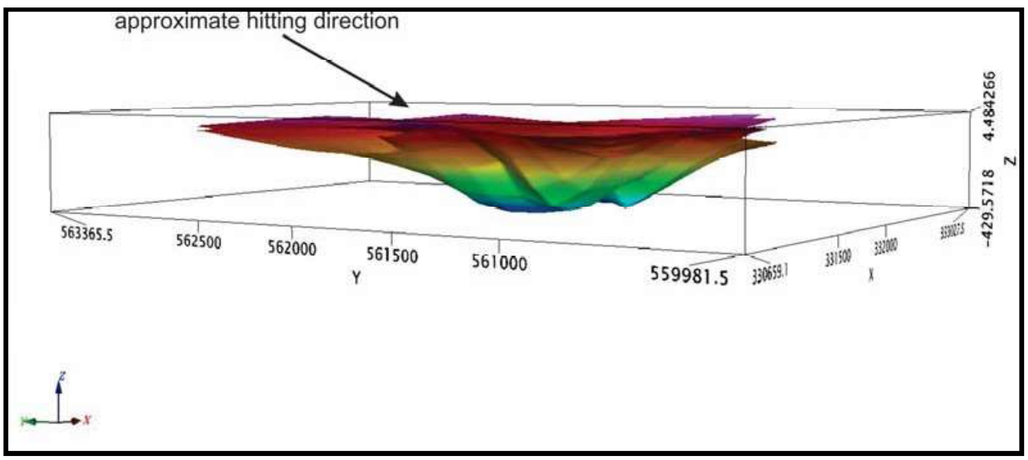

Figure 12: The direction of ancient meteorite that hit Bukit Bunuh 1.83 million years ago approximately came from northwest resulting the impact crater appears to tilt towards southeast direction

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Topic : Remote Sensing

Velocity and Time Series Landslide Deformation Monitoring in Slope Area using PSI SAR: Case Study in Kelok 9 West Sumatra

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Abstract

This Research investigates landslide deformation velocity and time series is using PSI Technique at Kelok 9 area west Sumatra, Indonesia. PSI is an advanced InSAR technique overcoming the problems of temporal and geometrical decorrelation and great precision measurement ground displacement in millimeter. Along Kelok 9 area many times landslide has occurred. In this research 10 ascending Advanced Land Observation Satellite, Phased Array L-band Synthetic Aperture Radar (ALOS PALSAR) images from March 2007 until November 2010 was employed. The processing result was confirmed by doing a ground survey, small drone survey and geological information data on the investigated area. The focus area of the survey was divided into eight areas around the Kelok 9 bridge. The result shows there is significant land movement (land deformation) in eastern and western of Kelok 9 bridge. The average velocity of each area is 59.8-94.3 mm/year and cumulative deformation maximum is 424.8 mm.

Keywords

Landslide deformation, Velocity, Time series, PSI, Kelok 9, Synthetic aperture radar.

1. Introduction

Kelok 9 area is a highway that connection between of two provinces, west Sumatra and Riau. The connection has history of landslide for long time. Almost every year landslide occurred in the area due to the complex topography and soil structure. The area is mountainous that part of “Bukit Barisan” that spread from Aceh in the North to

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Lampung in the South with about 1.650 km. the mountainous is growing up due to the subduction of Indo-Australia plate beneath to Sumatra Island in Eurasia plate.

Along the highway connection between both province west Sumatra and Riau has high slope in left and right side. Moreover, the structure of soil is composed of marlstone with andesite and slate varied with quartz. Beside that several local fault exist in the area then causing the area is prone to landslides and soil movement. The number of landslide from 2014-2016 around the area recorded 69 times landslide occurred. Six times in 2014, 20 times in 20 May 2015 and 35 times in 12 December 2015 and 4 times in 2016.

Monitoring potential landslide on the area is carried out by extracted synthetic aperture radar (SAR) satellite data that provided by Japan Aerospace Exploration agency (JAXA). In processing the SAR data, persistent scatterer interferometric (PSI) technique applied. The technique more advanced than last technique of Differential Interferometric synthetic aperture radar (D-InSAR) and InSAR [1],[2]. PSI technique can overcome the problem related to the geometric and temporal decorrelation and atmospheric disturbance[3],[4] .

The aim of the research is for monitoring the velocity of land movement on the kelok Sembilan area in time series. The result is important as scientific information for mitigation the potential land deformation.

2. Satellite Dataset and Study Area.

The satellite dataset for monitoring velocity of land movement in kelok 9 area is using L-band SAR data that provided by Japan Aerospace Exploration agency (JAXA, Japan). The dataset has frequency 1.27 GHz with 23 cm and 10 meter resolution[5]. The dataset is listed in Table 1.

Table 1. Dataset of ALOS PALSAR with

No	Acquisition date	Normal Baseline (Bn), (m)	Temporal Baseline (Bt)
1	20070703	74	-460
2	20070818	-24	-414
3	20071003	211	-368
4	20080820	626	-46
5	20081005	0	0
6	20091008	-134	368
7	20100711	272	644

8	20100826	82	690
9	20101011	120	736
10	20101126	351	782

The study area located in kelok Sembilan Bridge at Lima puluh kota district, west Sumatra Indonesia. The area is part of mountainous area with called as 'Bukit barisan' that has steep slope, 110- 2.261 meters above sea level. There are some volcano around the area such as Gunung Sago (2.261 meters), Gunung Bungsu(1.253 meters), and Gunung Sanggul(1.495 meters) above sea level. Also, 13 main river and its branch flow around the area.

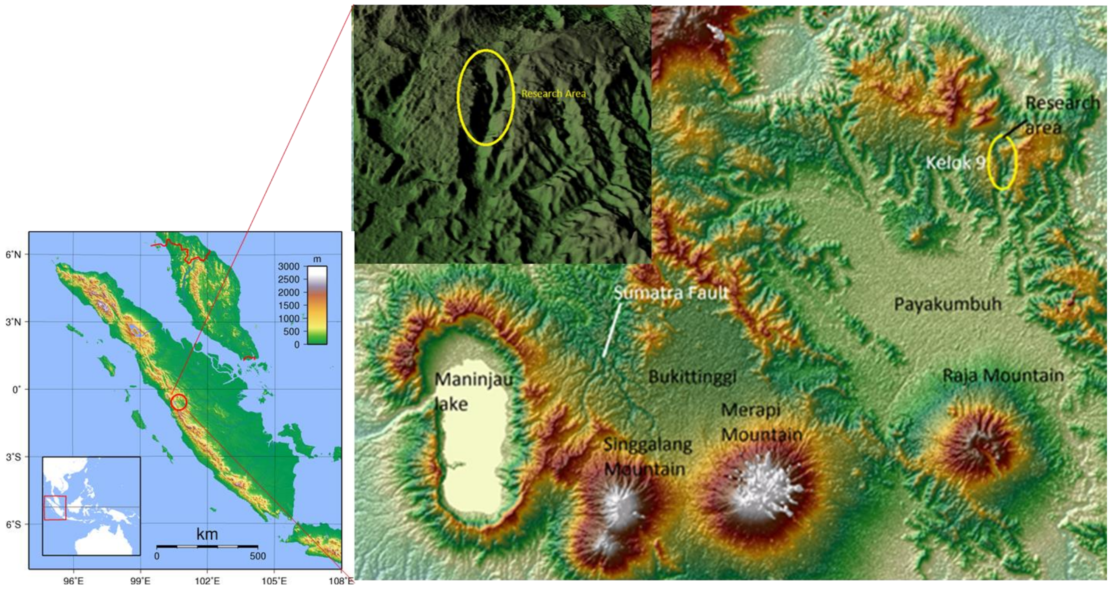

Figure 2. topography of Lima puluh kota district, West Sumatra, Indonesia

3. Method

Monitoring velocity of land movement in the study area is using Persistent scatterer interferometry (PSI) technique. The technique qualified to observe the earth changing in millimeter unit accuracy [6],[7]. It is can be done by stacking several satellite dataset that capture in time series that called as co-registration processing.

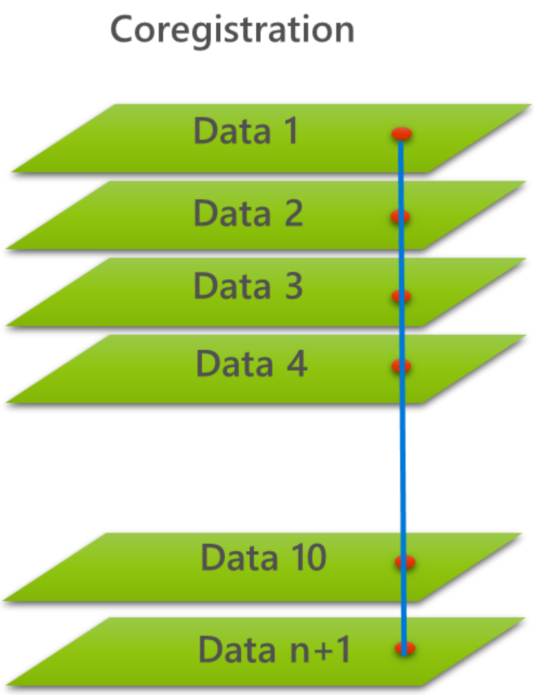

Figure 3. Co-registration SAR image

Fig. 3 illustrate the stacking of SAR data in different time observation. In the proses pixel in equal position (range and azimuth) connected each other that can be done by amplitude cross-correlation and based on the orbital dataset.

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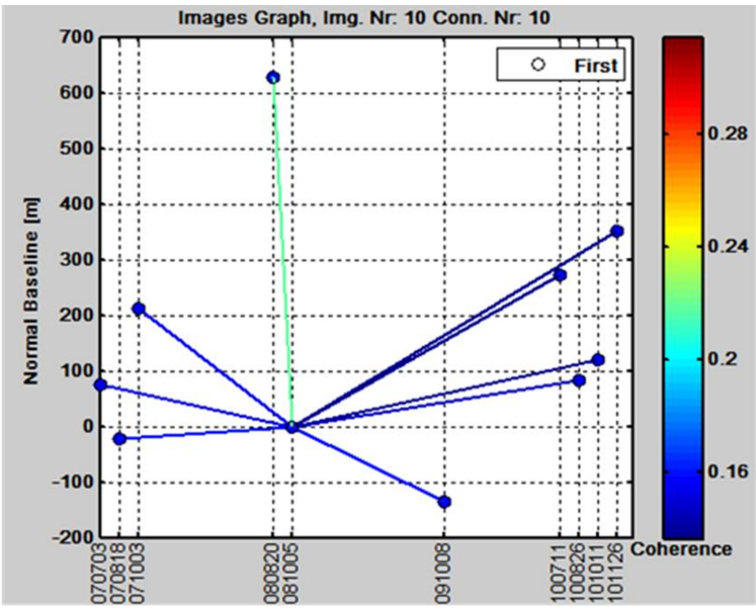

Figure 4. Normal baseline and temporal connection of ALOS PALSAR dataset in study area

Fig. 4 shown, based on the amplitude cross correlation, 10 scene of SAR data that successfully co-registration. The maximum and minimum normal baseline for the connection is 620 meters and 30 meters, respectively. The temporal time the combination is 1198 days

4. Result and Discussion

PSI technique was applied for processing 10 scene SAR of ALOS PALSAR data that provided by JAXA, Japan. After primary processing for co-registration the group of SAR data, filtering and multilinking, interferogram of the combination that refer to master image is shown in Figure 5.

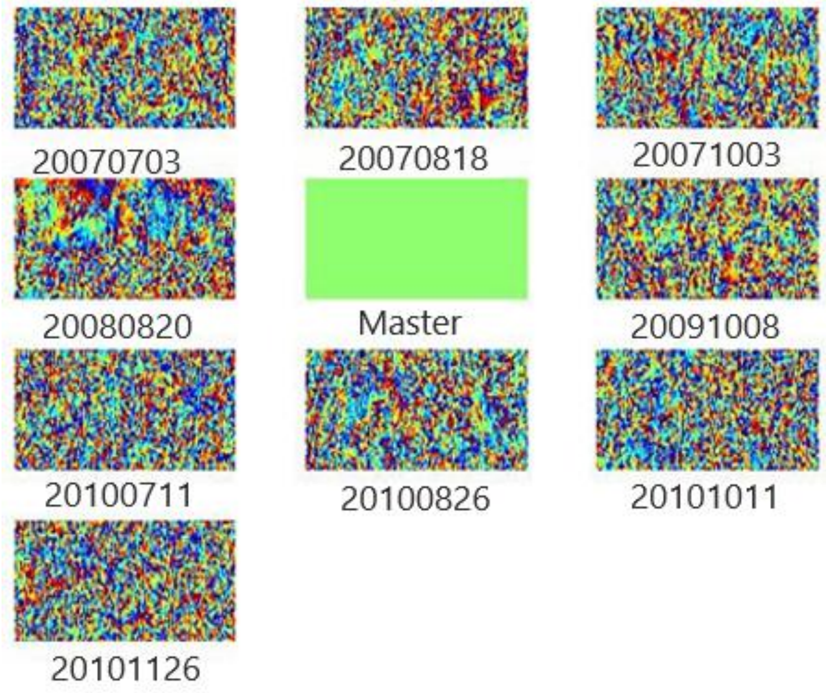

Figure 5. Interferogram of 10 scene ALOS PALSAR that refer to master scene.

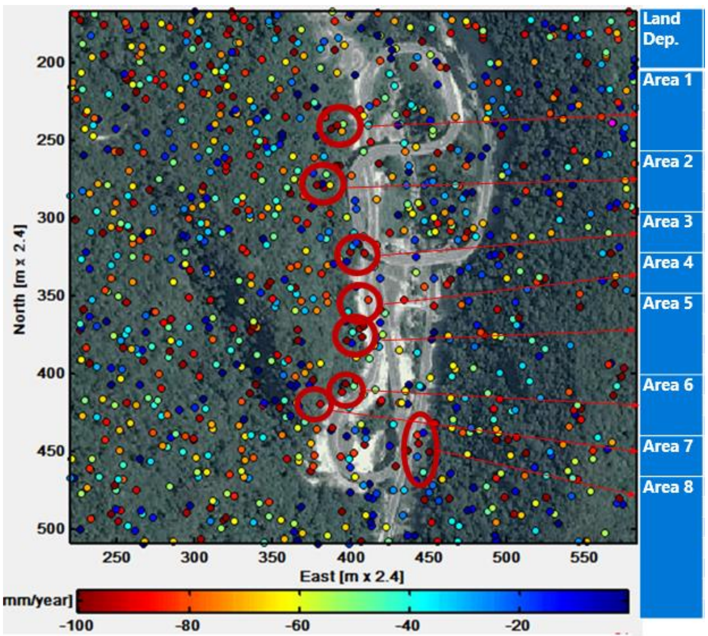

Figure 6. Persisternt scatterer distribution on the study area.

Land Dep.	ID	Velocity	Cum. Displacement	Status
Area 1	1861	-70.9	-167.381	Landslide
	1878	-99.3	-392.384	
	1889	-51.6	-260.404	
	1890	-95.6	-409.864	
Area 2	1690	-97.7	-372.246	Landslide
	1671	-16.9	-48.5508	
	1679	-64.9	-277.67	
Area 3	1460	-95.5	-292.485	Landslide
	1446	-93.1	-286.704	
Area 4	1292	-85.1	-247.921	Landslide
Area 5	1191	-78.6	-352.037	Landslide
	1192	-97.3	-356.221	
	1213	-94	-389.374	
	1221	-100	-337.705	
Area 6	1049	-93.1	-239.063	Landslide
	1067	-100	-355.241	
	1068	-91.3	-395.285	
Area 7	1024	-91.5	-395.959	Deformation
Area 8	800	-20.5	-117.025	Landslide
	806	-100	-424.847	
	822	-100	-255.261	
	831	-95.7	-409.028	
	860	-82.5	-365.514	
	871	-11.8	-124.875	
	892	-91.6	-314.378	

5. Conclusions

We have successful employed PSI SAR technique for measuring velocity in time series of landslide in kelok 9 areas. The velocity of landslide in each area is varied from 59.8 to 94.3 mm/year and cumulative displacement maximum is 424.8 mm. based on the observation most the area is landslide.

Acknowledgment

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