Faculty of Mathematics and Science Education
Universitas Pendidikan Indonesia

Book of Program

msceis 2019

7th International Seminar on Mathematics, Science, and Computer Science Education

October 12, 2019

"Mathematics, Science, and Computer Science Education
for Addressing Challenges and Implementations of Revolution-Industry 4.0".

Book of Program

2019 7th Mathematics, Science, and Computer Science Education International Seminar (MSCEIS)

"Mathematics, Science, and Computer Science Education for Addressing Challenges and Implementations of Revolution-Industry 4.0"

October 12, 2019
Bandung, Indonesia

Foreword from Chairman of MSCEIS 2019

On behalf of the organizing committee, I am honored and delighted to welcome all distinguished guests, keynotes and invited speakers, and participants to the Mathematics, Science, and Computer Science Education International Seminar (MSCEIS) 2019. This seminar has been held annually since 2013, organized by the Faculty of Mathematics and Science Education of Universitas Pendidikan Indonesia (UPI). In this year we collaborate with 12 Universities associated in the Asosiasi MIPA LPTK Indonesia (AMLI), consisting of Universitas Negeri Semarang (UNNES), Universitas Pendidikan Indonesia (UPI), Universitas Negeri Yogyakarta (UNY), Universitas Negeri Malang (UM), Universitas Negeri Jakarta (UNJ), Universitas Negeri Medan (UNIMED), Universitas Negeri Padang (UNP), Universitas Negeri Manado (UNIMA), Universitas Negeri Makassar (UNM), Universitas Pendidikan Ganesha (UNDHIKSA), Universitas Negeri Gorontalo (UNG), and Universitas Negeri Surabaya (UNESA).

In this year, the theme of MSCEIS is Mathematics, Science, and Computer Science Education for Addressing Challenges and Implementations of Revolution-Industry 4.0. We are pleased to inform that around 241 presenters are attending this seminar. There are 143 papers presented orally and 98 papers presented by poster covering a variety of subjects around mathematics, science, computer science, and science education. Moreover, there are four keynote speakers and 13 invited speakers for plenary and parallel sessions, respectively.

MSCEIS 2019 could not be realized without great assistance and support from many parties. To close, we wish to express our gratitude to all keynotes and invited speakers who have come to share their knowledge in this event. Also, we gratefully thank all participants for your contribution to MSCEIS 2019. In advance, we would like to extend our appreciation and sincerely give our thanks to the rector and vice rectors of Universitas Pendidikan Indonesia for their continuing support for this seminar. Also, I would like to thank the organizing committee members for making this event realized. We wish all participants a very fruitful and pleasant scientific program in this seminar. Finally, we do hope this event can facilitate all participants to interact with each other intensively for extending scientific network in the future.

Thank you very much and kind regards,

Chairman of MSCEIS 2019

Dr. Lala Septem Riza, M.T.

Welcome Message from the Dean of FPMIPA
Universitas Pendidikan Indonesia

I am honored and delighted to welcome all distinguished guests, keynote speakers, and participants to the Mathematics, Science, and Computer Science Education International Seminar (MSCEIS) 2019. The Faculty of Mathematics and Science Education (FPMIPA) of Universitas Pendidikan Indonesia (UPI) has been the organizer of MSCEIS since the first seminar in 2013. This seminar has been organized alternately by each department of FPMIPA every year. This year, the Department of Computer Science Education is in charge in organizing MSCEIS. And their commitment to make this event successful has been proved today. Congratulations!

As the dean of FPMIPA, I am pleased that our institution has been networking with other partner institutions incorporated in the Asosiasi MIPA LPTK Indonesia (AMLI), consisting of Universitas Negeri Semarang (UNNES), Universitas Pendidikan Indonesia (UPI), Universitas Negeri Yogyakarta (UNY), Universitas Negeri Malang (UM), Universitas Negeri Jakarta (UNJ), Universitas Negeri Medan (UNIMED), Universitas Negeri Padang (UNP), Universitas Negeri Manado (UNIMA), Universitas Negeri Makassar (UNM), Universitas Pendidikan Ganesha (UNDHIKSA), Universitas Negeri Gorontalo (UNG), and Universitas Negeri Surabaya (UNESA).

Together we have learned and worked to organize a high-quality conference which can build a relationship between researchers and may create opportunities for joint research or other collaborations. This conference has united us from various institutions to disseminate our research and have valuable discussions. We wish for you a delightful event and networking here.

We are very grateful that MSCEIS 2019 is attended by keynote speakers who have expertise related to our conference's theme. I would like to give my sincere thanks and appreciation to all of you. We believe that the talks today will inspire us and give insights or new ideas for doing your next research. Moreover, I also would like to express my gratitude to our partner institutions for their cooperation and contribution to MSCEIS 2019.

Thank you and kind regards,

Dean of FPMIPA Universitas Pendidikan Indonesia

Siti Fatimah, M.Si., Ph.D.

Welcome Message from the Rector of Universitas Pendidikan Indonesia

I am extremely proud and happy to welcome you to the Mathematics, Science, and Computer Science Education International Seminar (MSCEIS) 2019, organized by the Faculty of Mathematics and Science Education (FPMIPA) of Universitas Pendidikan Indonesia (UPI).

This conference was held to provide an event for experts of mathematics, science, and computer science education to disseminate their knowledge on each of their areas of expertise and expand the network connection on research activities. Furthermore, we intend to make the existence of this conference a motivation for researchers to publish their ideas about theory and application of numerous fields in mathematics, natural science, computer science, and science education. The vision of UPI to become a leading and outstanding university in education and producing, developing, and disseminating science and technology to improve people's welfare has become one of our goal along with collaborating in research activities with other universities. Therefore, we are looking forward to collaborating in various research areas.

I am finally proud to welcome all MSCEIS 2019 participants who delegated their institutions to UPI. Hopefully the distinguished participants can engage actively in this conference and enjoy the services we provide.

Thank you very much and best regards,

Rector of Universitas Pendidikan Indonesia

Prof. Dr. H.R. Asep Kadarohman, M.Si.

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Dr. Wahyudin, M.T.
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Dr. Mimin Iryanti, M.Si.
Dr. Ahmad Aminudin, M.Si.
Marthalina Iriany, M.T.

2019 7th MSCEIS Schedule

Saturday, October 12, 2019

Time	Activity	Venue
07.00 – 07.55	Registration	Ballroom Lobby
Opening Ceremony		Ballroom 2nd Floor
07.55 – 07.58	Audience Conditioning for Preparing the Opening Ceremony	
07:58 – 08.00	Opening Video	
08.00 – 08.05	Singing Indonesia National Anthem by **UPI's Orchestra**	
08.05 – 08.08	Conference report by Chairman of MSCEIS 2019: **Dr. Lala Septem Riza, M.T.**	
08.08 – 08.11	Speech of FPMIPA Dean: **Siti Fatimah, Ph.D.**	
08.11 – 08.15	Speech of Vice Rector: **Prof. Dr. Didi Sukyadi, MA**	
08.15 – 08.25	Speech of Rector & Open the Conference Officially: **Prof. Dr. Asep Kadarohman**	
08.25 – 08.40	Souvenirs Conferment & Photo Session	
08.40 – 09.00	Coffee Break	
09.00 – 09.05	Audience Conditioning for Preparing the Plenary Session (Performance by UPI's Orchestra)	
1st Plenary Session		Ballroom 2nd Floor
09.05 – 09.40	*Moderator:Al Jupri, Ph.D.*	
	Keynote Speaker I: **Prof. Goutam Chakraborty, Ph.D.**	
09.40 – 10.15	Keynote Speaker II: **Prof. Janchai Yingprayoon**	
10.15 – 10.40	Discussion	
10.40 – 11.00	Poster Session @Ballroom Lobby & Preparation for Invited Speakers' Session	
Invited Speakers' Session		
	Moderator: Suhendra, M.Ed., Ph.D. Invited Speakers for Mathematics & Mathematics Education Topic	Room: Ballroom 1 2nd Floor
11.00 – 11.15	**Prof. Dr. Sarson W. Pomalato, M.Pd.**	
11.15 – 11.30	**Dr. Al Azhari Masta, M.Si.**	
11.30 – 11.45	**Prof. Dr. Hamzah Upu, M.Ed.**	
11.45 – 12.00	Discussion	
	Moderator: Rosa Ariani Sukamto, M.T. Invited Speakers for Computer Science & Computer Science Education Topic	Room: Ballroom 2 2nd Floor
11.00 – 11.20	**Prof. Dr. Wawan Setiawan, M.Kom.**	
11.20 – 11.40	**Dr. Muhammad Nursalman, M.T.**	
11.40 – 12.00	Discussion	
	Moderator: Agus Fany Chandra Wijaya, M.Pd. Invited Speakers for Physics & Physics Education Topic	Room: Mandalayang 3rd Floor
11.00 – 11.20	**Dr. Eng. Pakhrur Razi, M.Si.**	
11.20 – 11.40	**Dra. Dwi Yulianti, M.Si.**	
11.40 – 12.00	Discussion	
	Moderator: Dr. Eka Cahya Prima, M.T. Invited Speakers for Biology Education and Science Education Topic	Room: Wastukencana 3rd Floor
11.00 – 11.20	**Prof. Dr. I Made Putrawan**	
11.20 – 11.40	**Dr. Dadan Rosana**	

Time	Activity	Venue
11.40 – 12.00	Discussion	
	Moderator: Tuszie Widhiyanti, Ph.D. Invited Speakers for Chemistry and Chemistry Education Topic	Room: Mandalagiri 3rd Floor
11.00 – 11.20	**Prof. Dr. Manihar Situmorang, M.Sc., Ph.D.**	
11.20 – 11.40	**Dr. Sukarmin, M.Pd.**	
11.40 – 12.00	Discussion	
	Moderator: Yayan Sanjaya, Ph.D. Invited Speakers for Biology & Chemistry Topic	Room: Agrabinta 3rd Floor
11.00 – 11.20	**Prof. Dr. Orbanus Naharia, M.Si.**	
11.20 – 11.40	**Dr. Sumari, M.Si.**	
11.40 – 12.00	Discussion	
12.00 – 13.00	Lunch Break @Restaurant & Poster Session @Ballroom Lobby	
13.00 – 13.05	Audience Conditioning for Preparing the Plenary Session (Performance by UPI's Orchestra)	
2nd Plenary Session		
13.05 – 13.40	*Moderator:Ikmanda Nugraha, M.Pd.*	Ballroom 2nd Floor
	Keynote Speaker III: **Dr. I Gusti Darmawan**	
13:40 – 14:15	Keynote Speaker IV: **Arif Hidayat, Ph.D.**	
14:15 – 14:40	Discussion	
14:40 – 14:50	Coffee Break and Audience Conditioning for Preparing the Parallel Session (Performance by UPI's Orchestra)	Ballroom 2nd Floor and Each Room for Parallel Session
Parallel Session		
14.50 – 17.00	Parallel Session	Room: Follow the Instruction

Ref. No : 111/MSCEIS7/2019 Bandung, June 24, 2019
Subject : Invitation Letter

To: **Dr. Eng. Pakhrur Razi, M. Si.**
Universitas Negeri Padang

Dear Dr. Eng. Pakhrur Razi, M. Si.

Mathematics, Science, and Computer Science Education International Seminar (MSCEIS) 2019 is an annual conference which held by many domestic and overseas universities. It is held by the Faculty of Mathematics and Natural Science Education, Universitas Pendidikan Indonesia (UPI) and the collaboration with 12 University associated in Asosiasi MIPA LPTK Indonesia (AMLI) consisting of UNNES, UPI, UNY, UM, UNJ, UNIMED, UNP, UNIMA, UNM, UNDHIKSA, UNG, and UNESA. All accepted and presented in the conference will be will be published in American Institute of Physics (AIP) and international reputational journals.

In this year, MSCEIS 2019 takes the following theme: "Mathematics, Science, and Computer Science education for Addressing challenges and implementations of Revolution-Industry 4.0". It will be held on October 12, 2019 in Bandung, West Java, Indonesia. Further information can be found at http://msceis.org (*under construction*).

Finally, this letter is an invitation for you to participate as INVITED SPEAKER for MSCEIS 2019, Bandung, Indonesia. The success of the conference and the strength of the technical program are therefore dependent on you contributing your knowledge and time. Thank you very much for your contributions. I look forward to hearing from you soon.

Kind regards,

Dr. Lala Septem Riza, M.Si.
Chairman of Organizing Committe
lala.s.riza@upi.edu

CERTIFICATE

This is to certify that

Dr. Eng. Pakhrur Razi, M.Si.

has participated as

Invited Speaker

in the

msceis 2019

7th International Seminar on Mathematics, Science, and Computer Science Education

October 12, 2019

Siti Fatimah, S.Pd., M.Si., Ph.D.
Dean

Faculty of Mathematics and
Science Education
Universitas Pendidikan Indonesia

Disaster Area Detection and Monitoring using Synthetic Aperture Radar (SAR)

MSCEIS 2019

Pakhrur Razi, M.Si, Ph.D

Center of Disaster Monitoring and Earth Observation (DMEO)
Physics Department
Univeristas Negeri Padang

OUTLINE

01 INTRODUCTION

02 AREA OBSERVATION AND SATELITE DATA SET

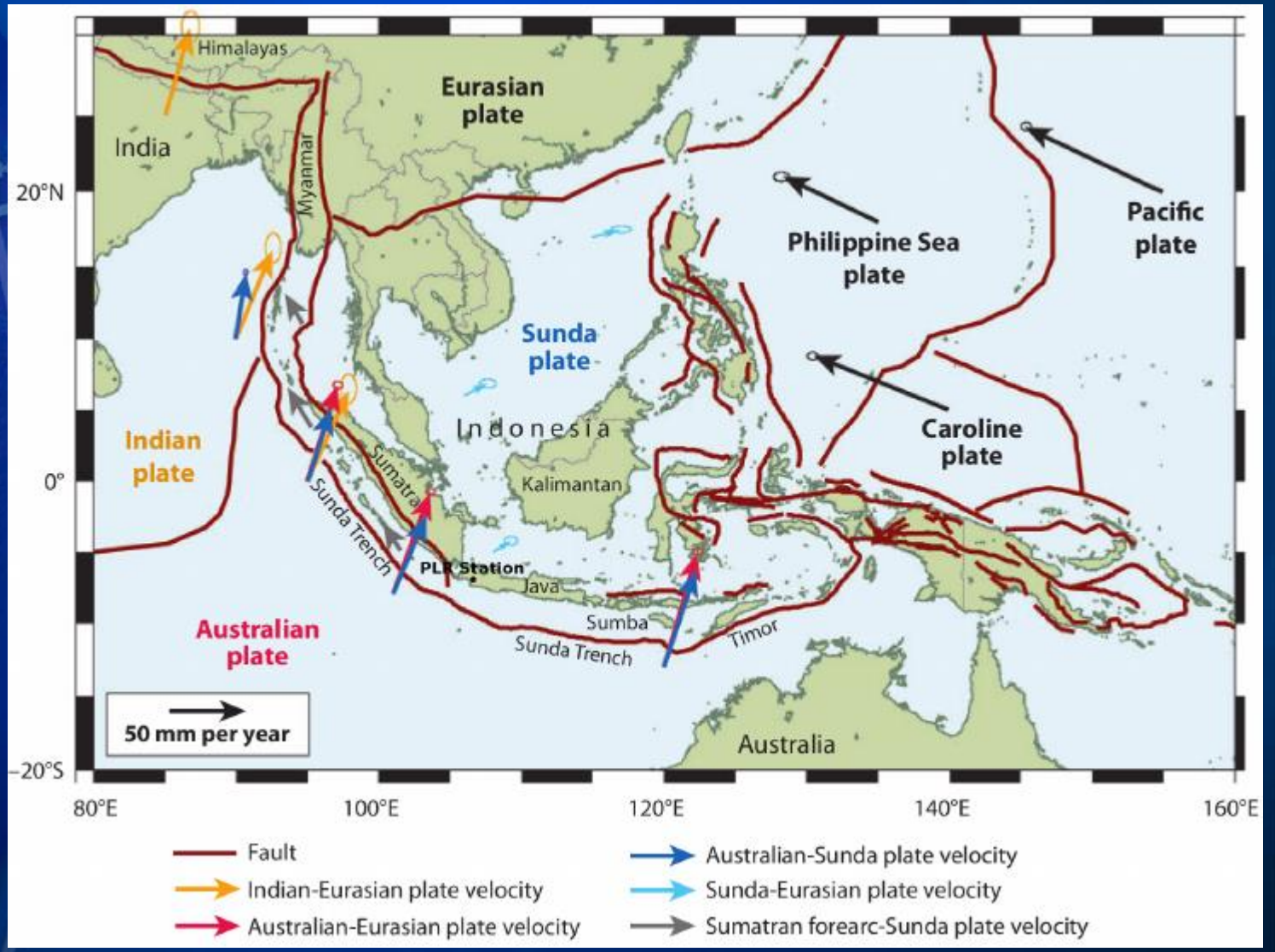
03 METHODOLOGY

04 RESULT

05 CONCLUSIONS

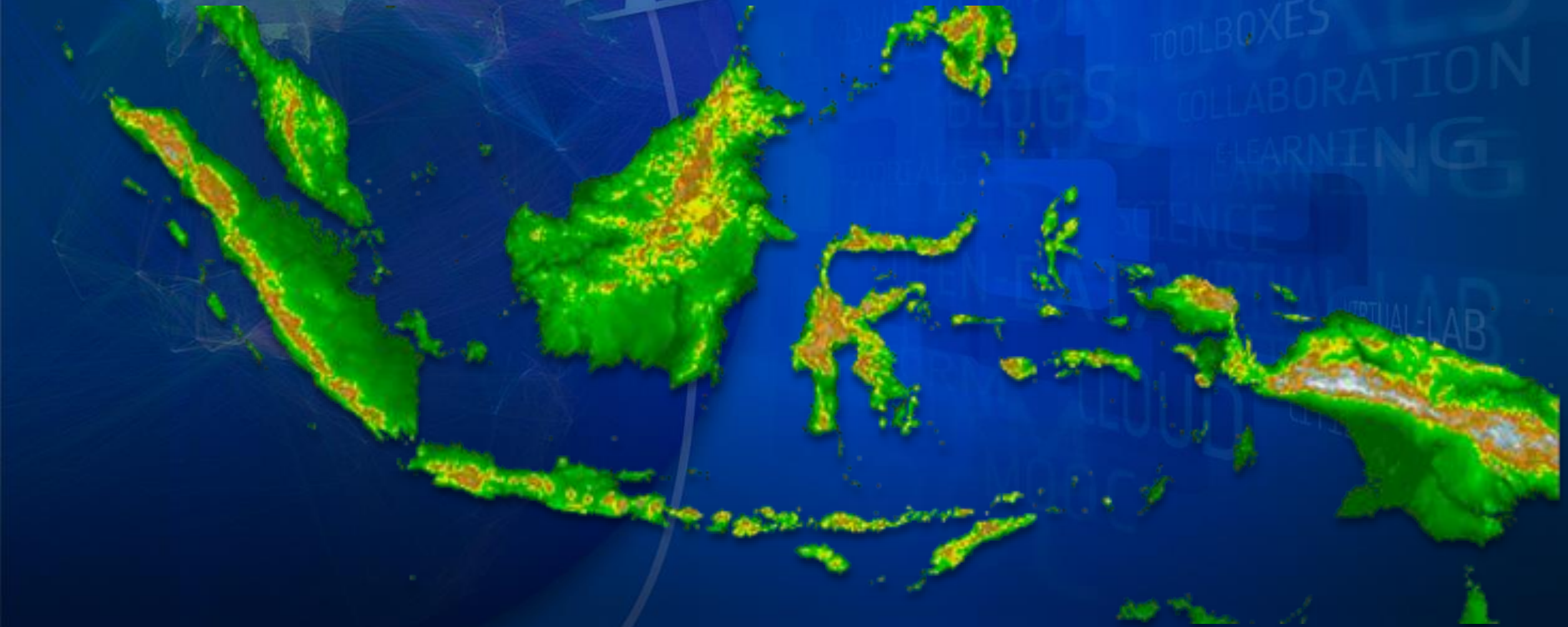
INTRODUCTION

01 Indonesia located in intersection of three tectonic plate (Eurasia, Indo-Australia and Pacific)



INTRODUCTION

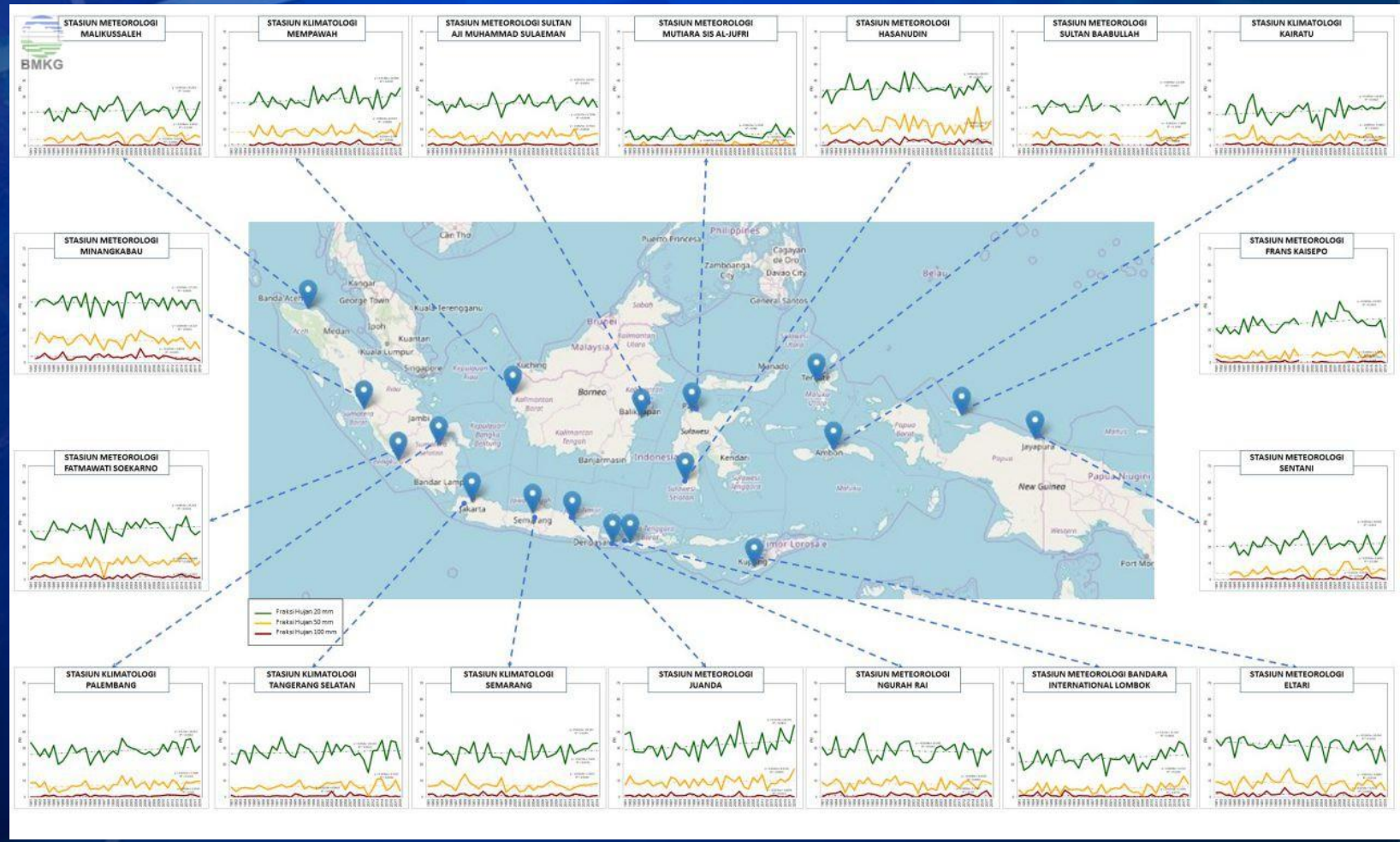
02 Complex topography and geology formation



INTRODUCTION

03 High rainfall intensity

Rain Fall trend of Indonesia from 1981-2018,



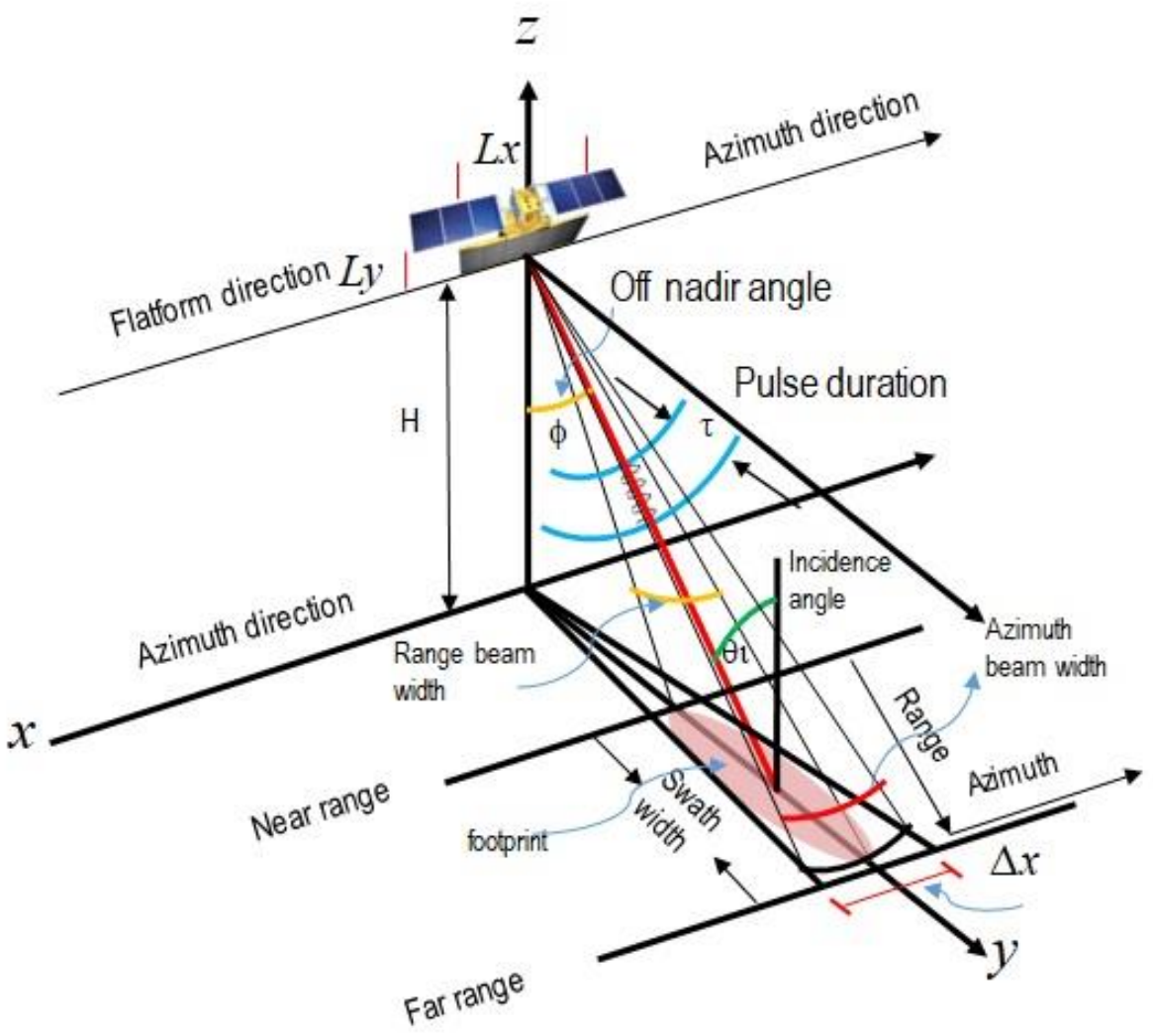
BMKG,2019

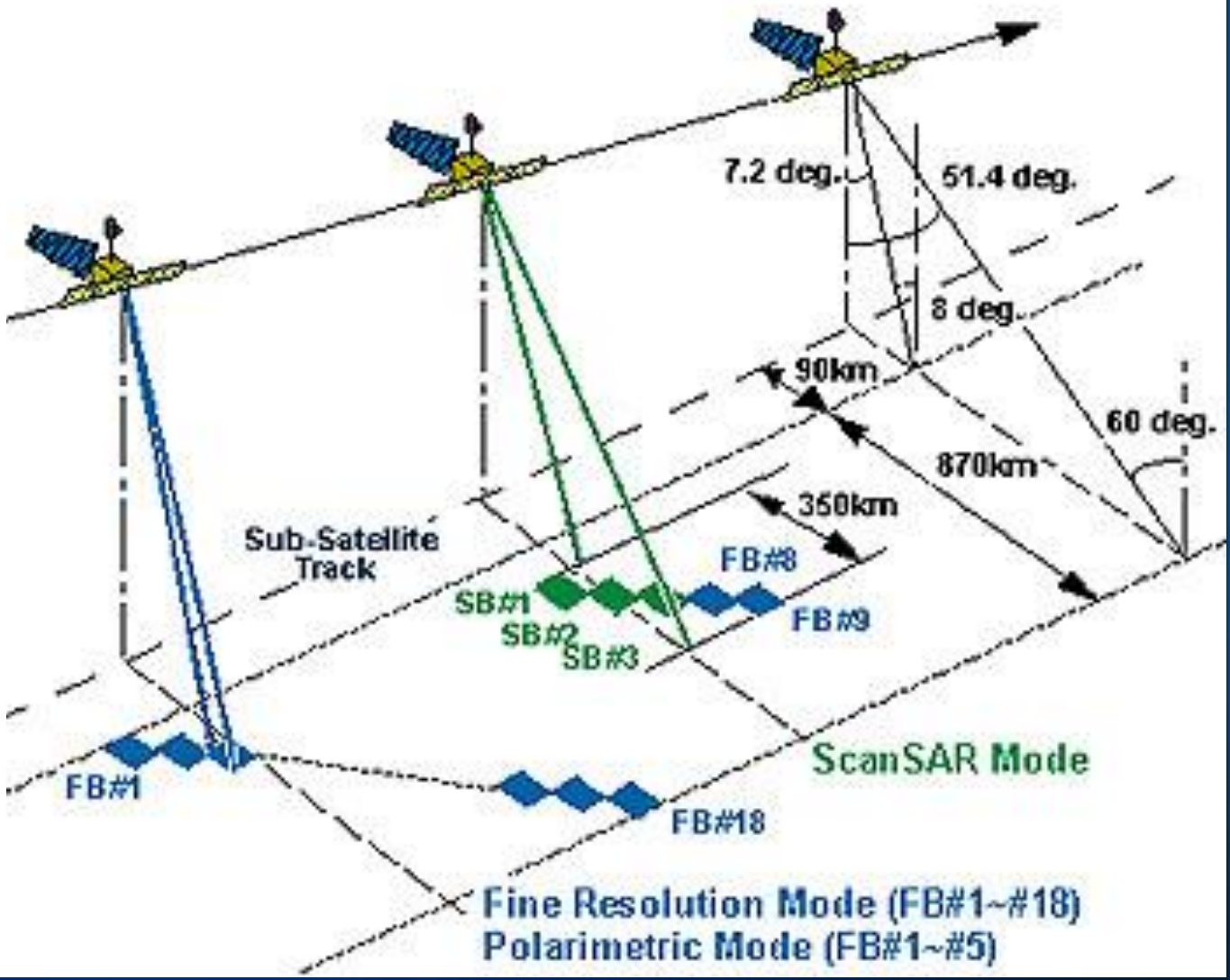
JAXA

ALOS-2

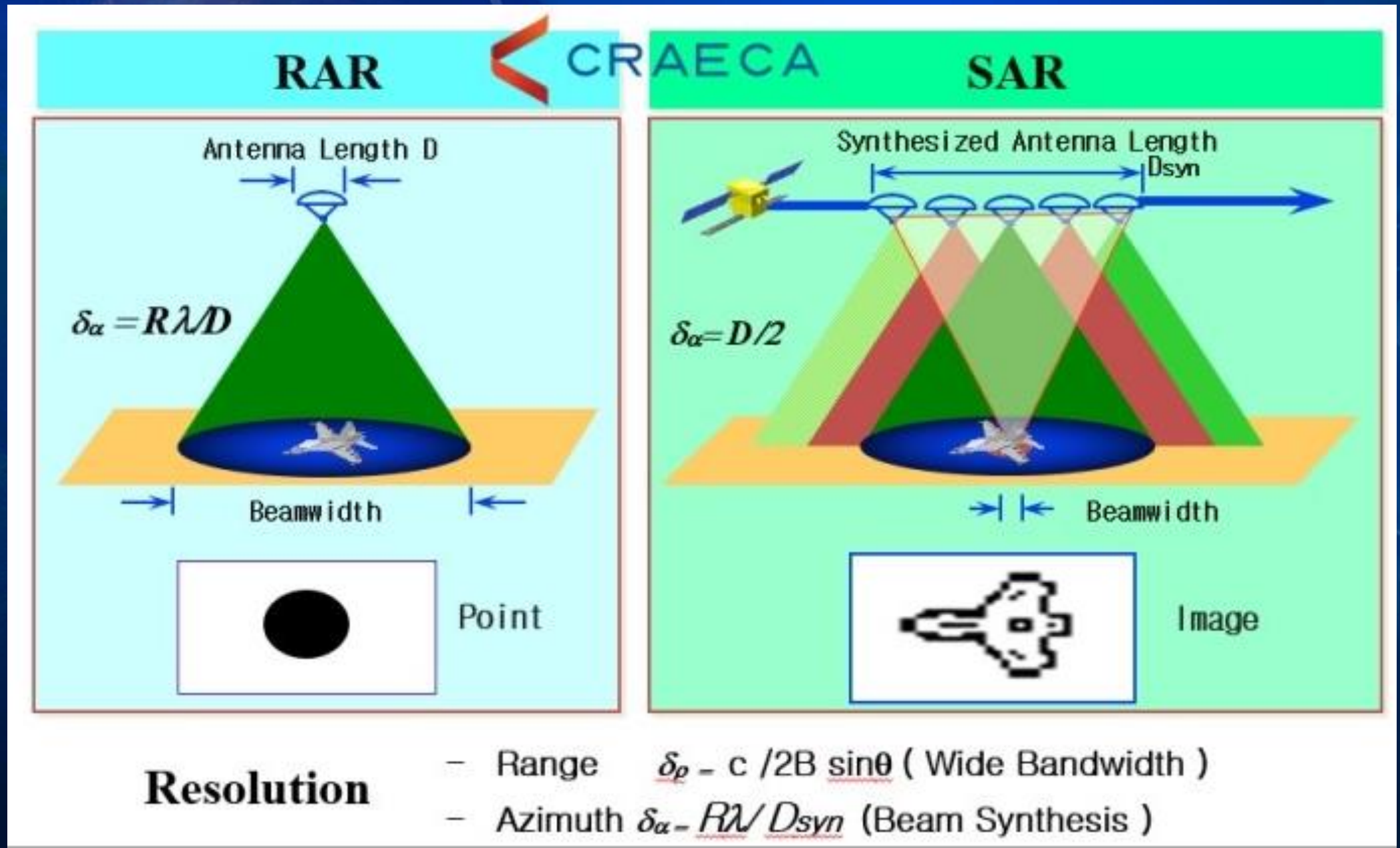
Sp

Satellite Geometry of ALOS PALSAR

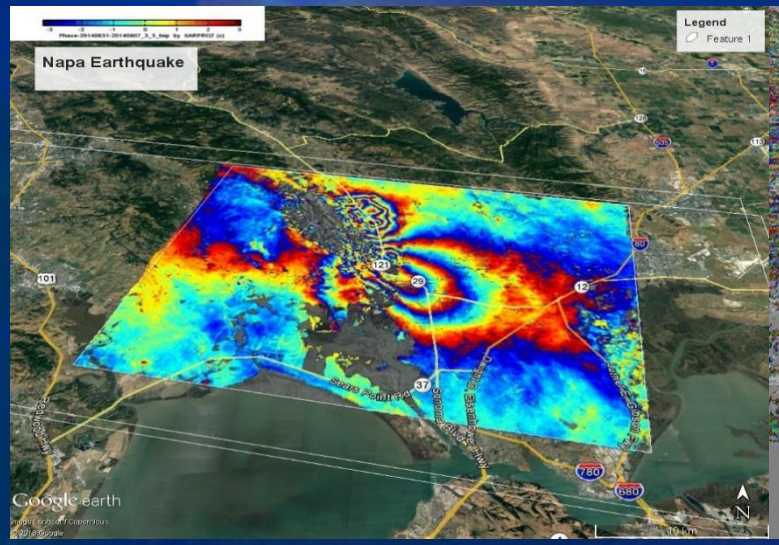


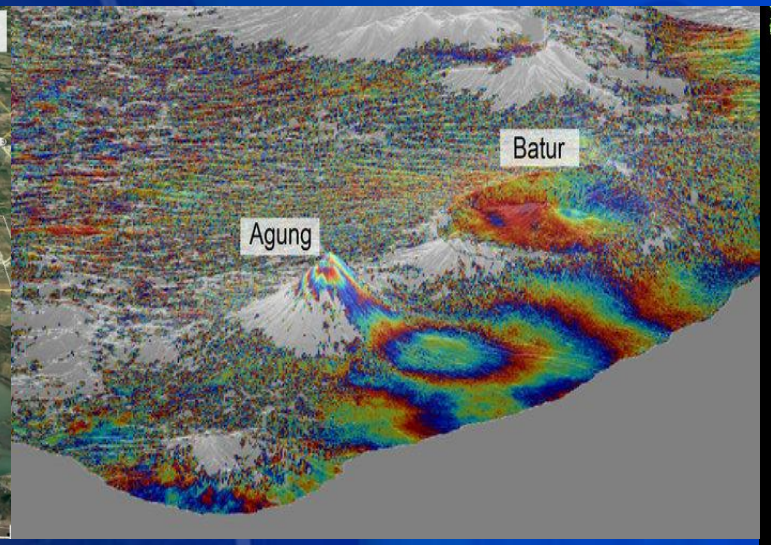


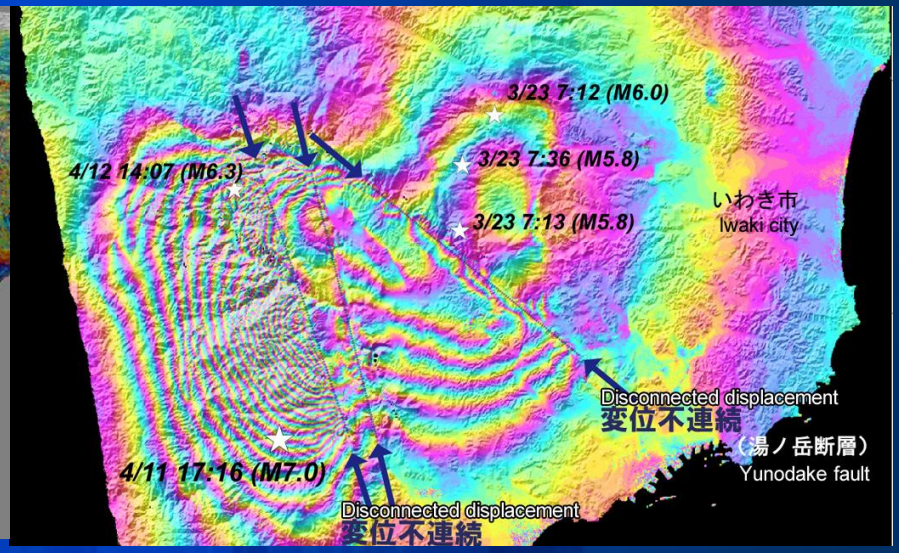
SAR vs RAR

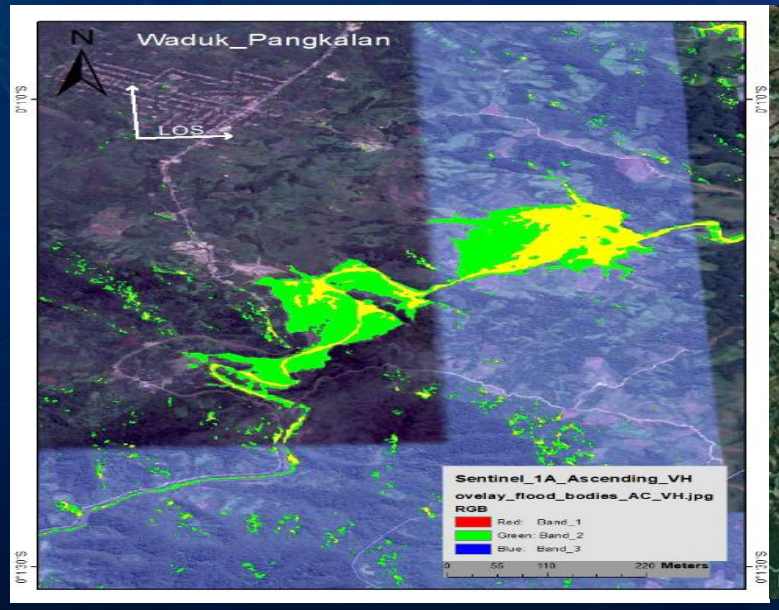

RAR
CRAECA
SAR
Antenna Length D
$\delta_\alpha = R\lambda/D$
Beamwidth
Point
Synthesized Antenna Length
Dsyn
$\delta_\alpha = D/2$
Beamwidth
Image
Resolution
– Range δ_ρ – c /2B sinθ (Wide Bandwidth)
– Azimuth δ_α – $R\lambda/Dsyn$ (Beam Synthesis)

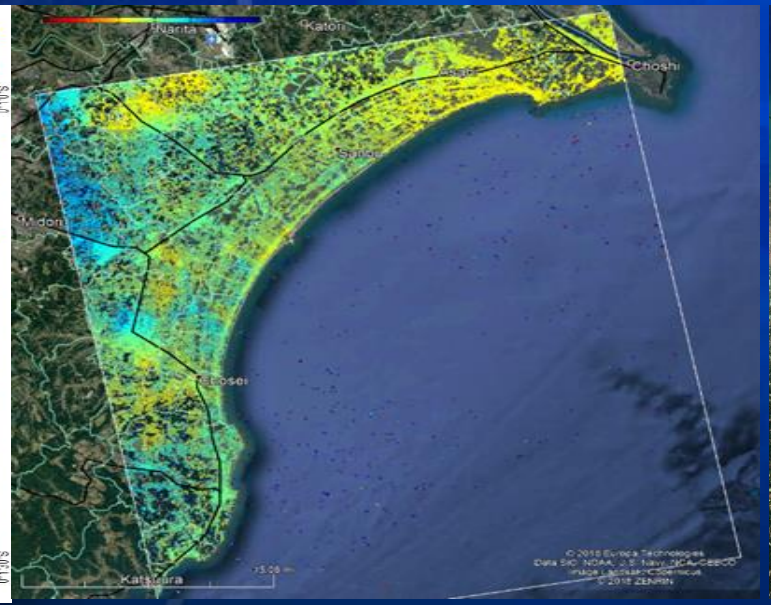
Applications of SAR satellite

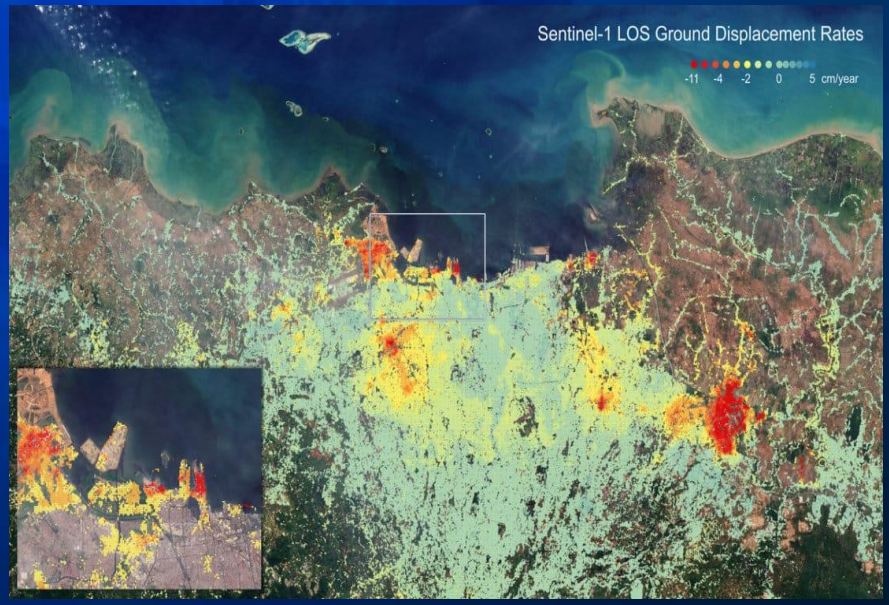




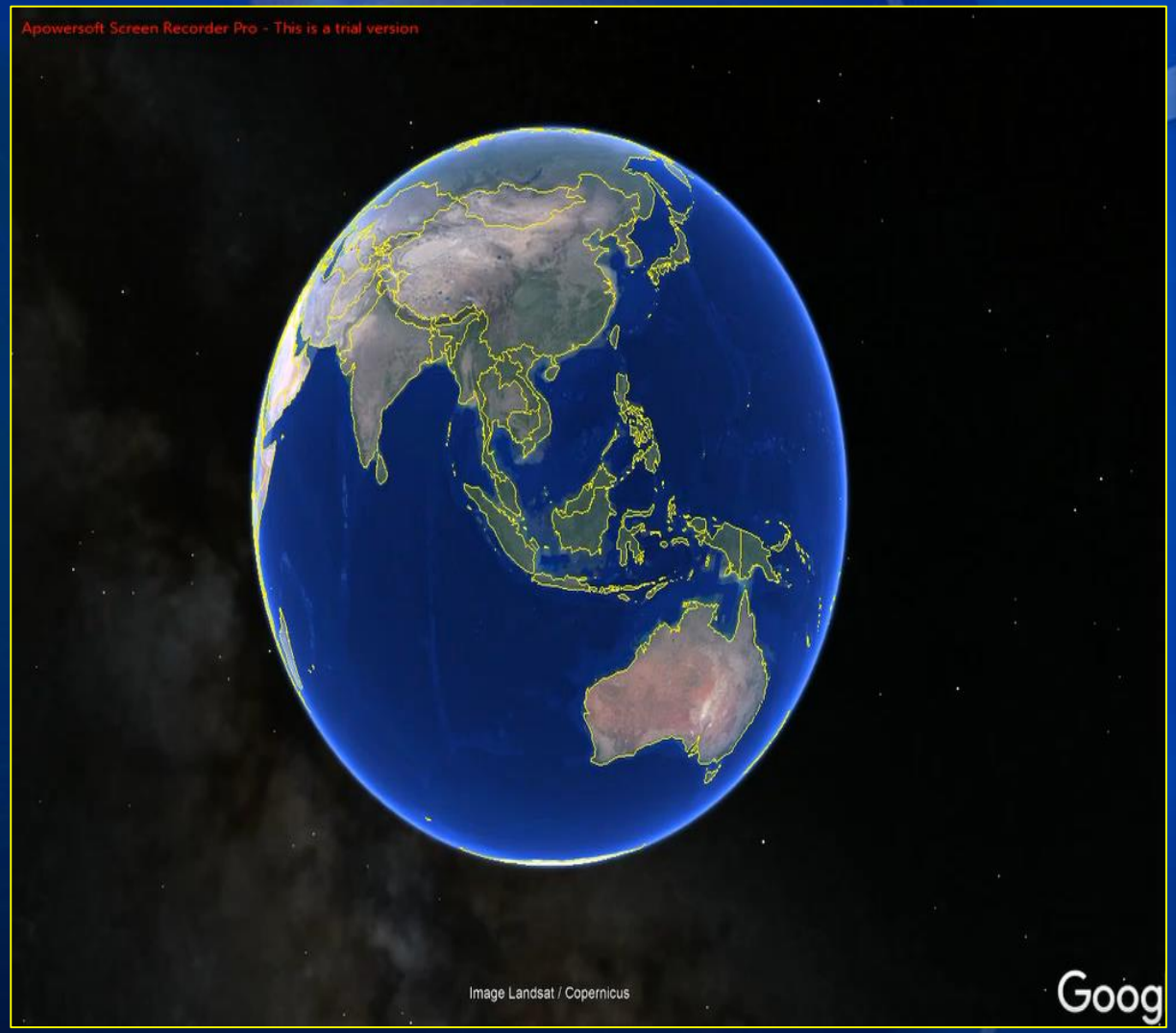




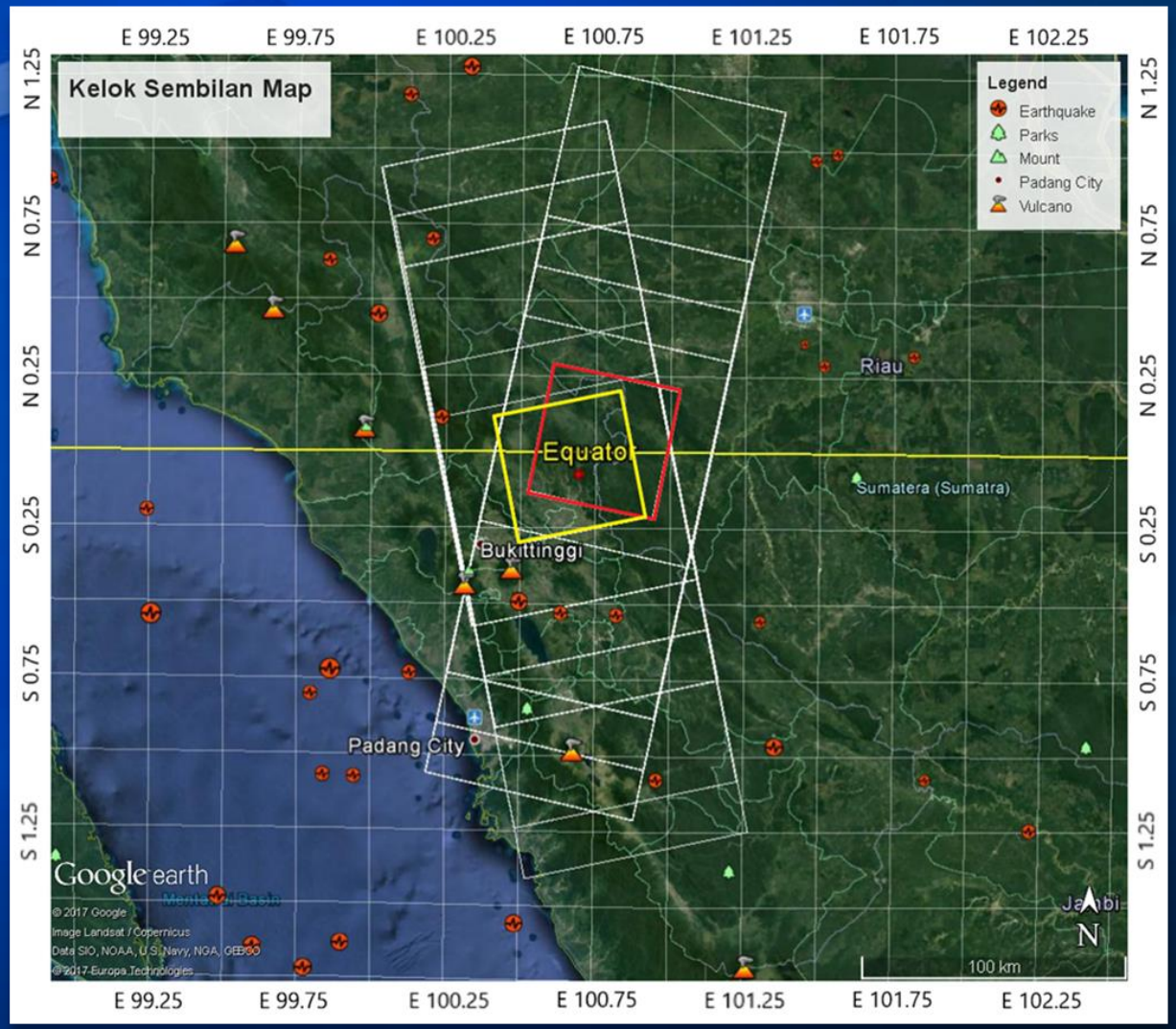




Area Observation and Satellite data set

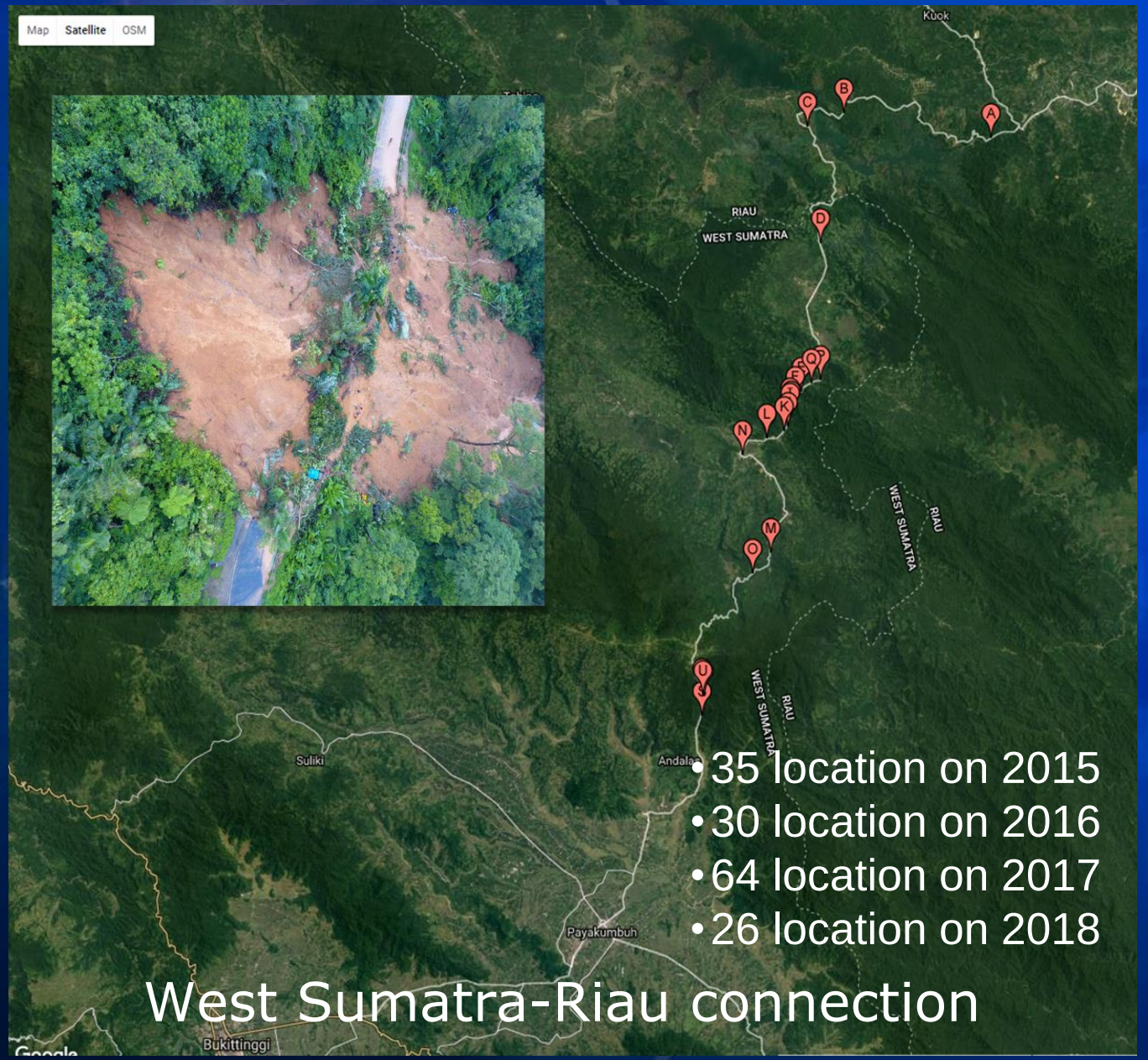


West Sumatra-Riau connection



Footprint of Satellite

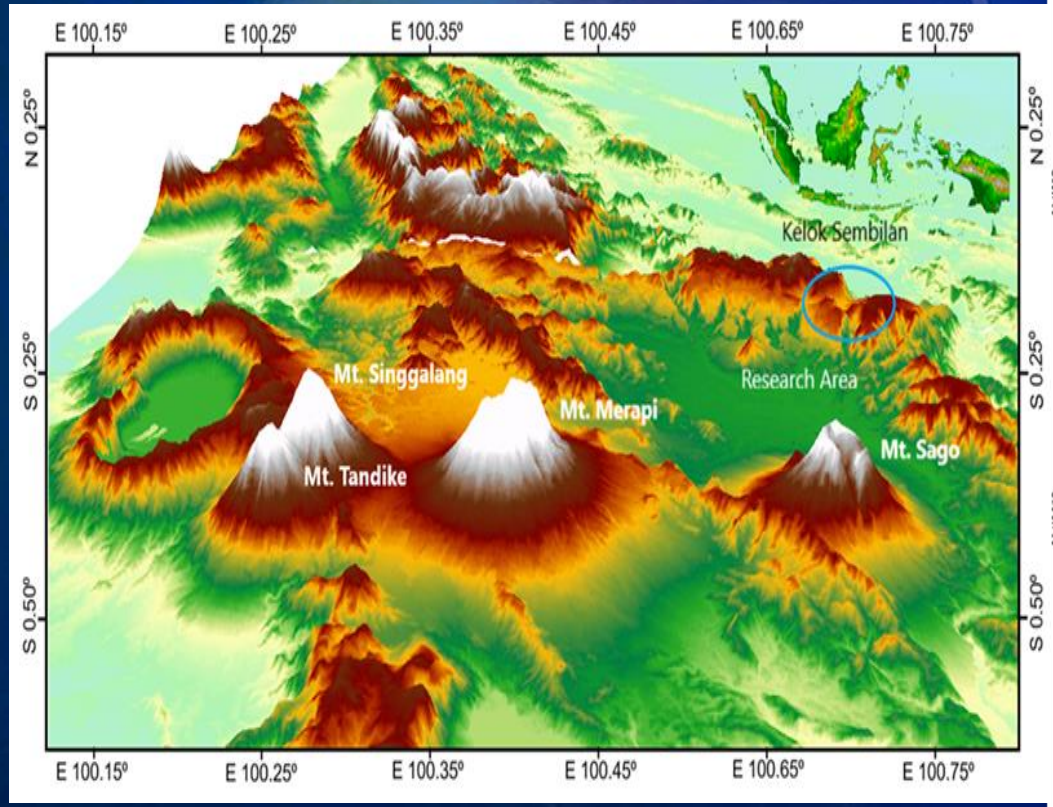
History landslide in Sumbar-Riau connection

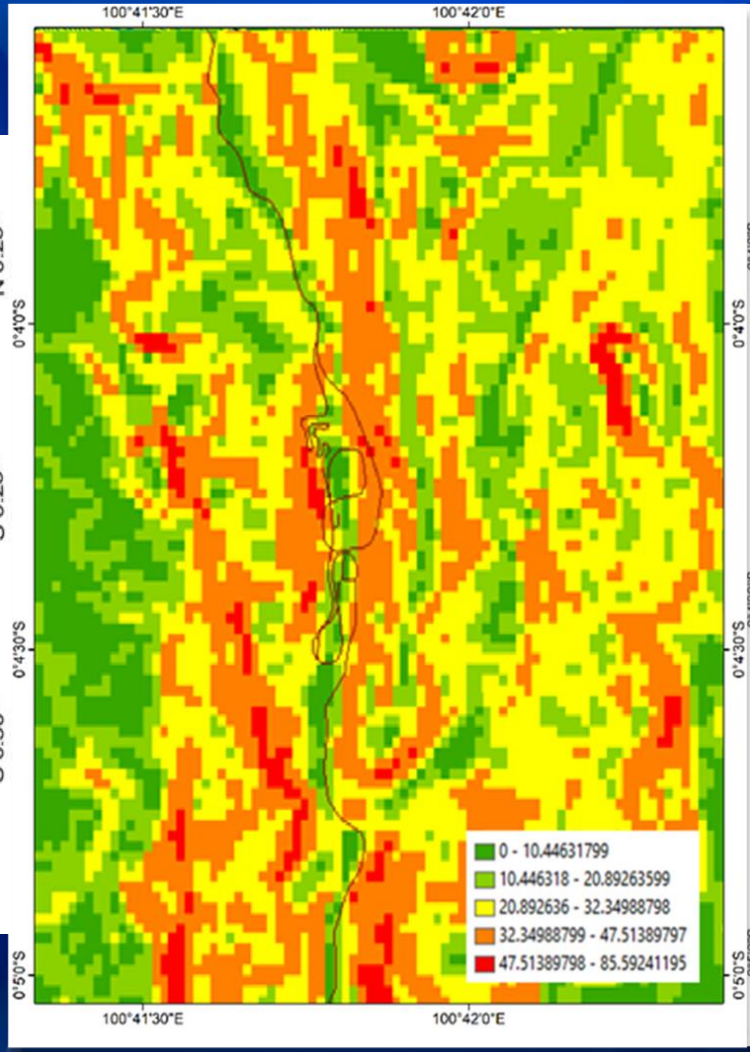


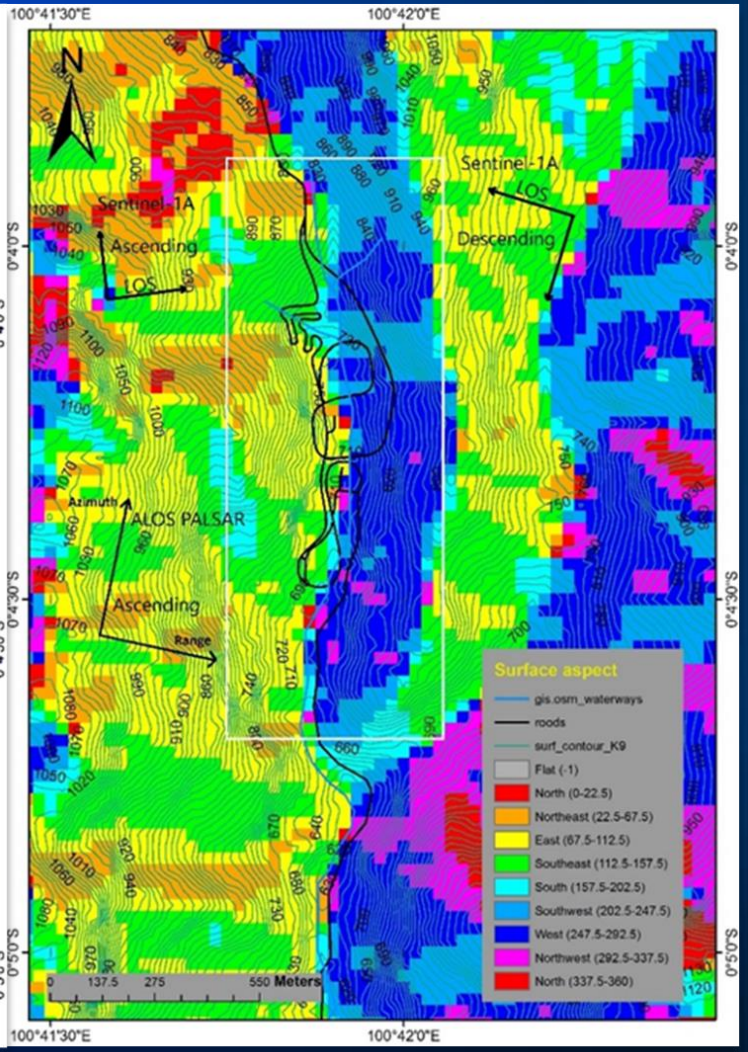
- 35 location on 2015
- 30 location on 2016
- 64 location on 2017
- 26 location on 2018

West Sumatra-Riau connection

Topography of West Sumatra







Satellite data set of ALOS

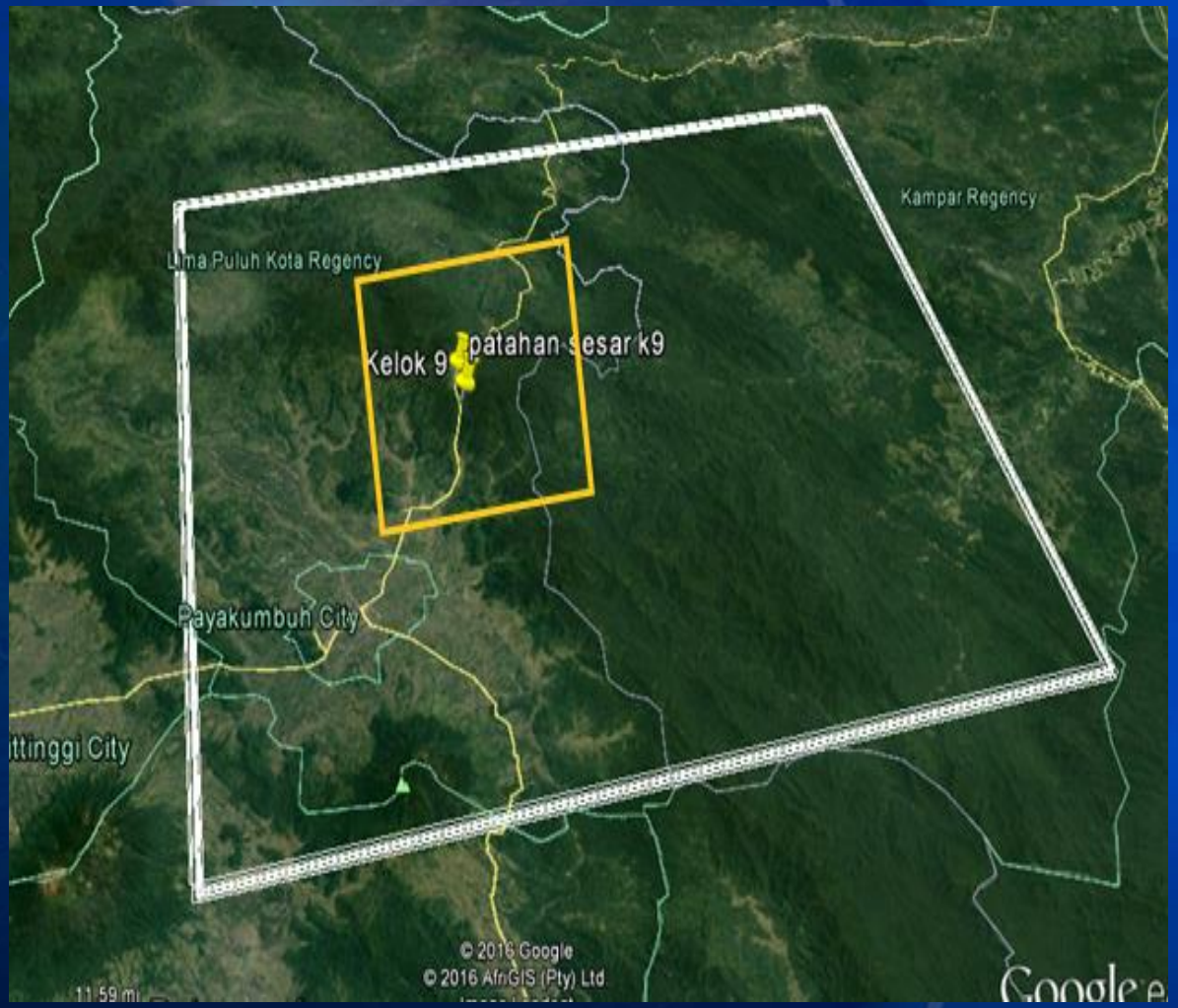
No	Acquisition Date (DD/MM/YYYY)	Mode	Normal Baseline B_n (m)	Temporal baseline B_t,(Days)	Off Nadir Angle
1	03072007	FBD	74	-460	34.3^0
2	18082007	FBD	-24	-414	34.3^0
3	03102007	FBD	211	-368	34.3^0
4	20052008	FBD	259	-138	34.3^0
5	05072008	FBD	155	-92	34.3^0
6	20082008	FBD	626	-46	34.3^0
7	05102008	FBD	0	0	34.3^0
8	08072009	FBD	758	276	34.3^0
9	08102009	FBD	-134	368	34.3^0
10	11072010	FBD	272	644	34.3^0
11	26082010	FBD	82	690	34.3^0
12	11102010	FBD	120	736	34.3^0
13	26112010	FBD	351	782	34.3^0

No	Orbit	The number of Scenes	Beam swath mode	Acquisition Time	Polarization	Off-Nadir angle
1	Ascending	36	IW 1	10/2014-03/2017	VV+VH	26.00^0-32.48^0
2	Descending	54	IW 3	10/2014-11/2017	VV+VH	35.35^0-40.40^0

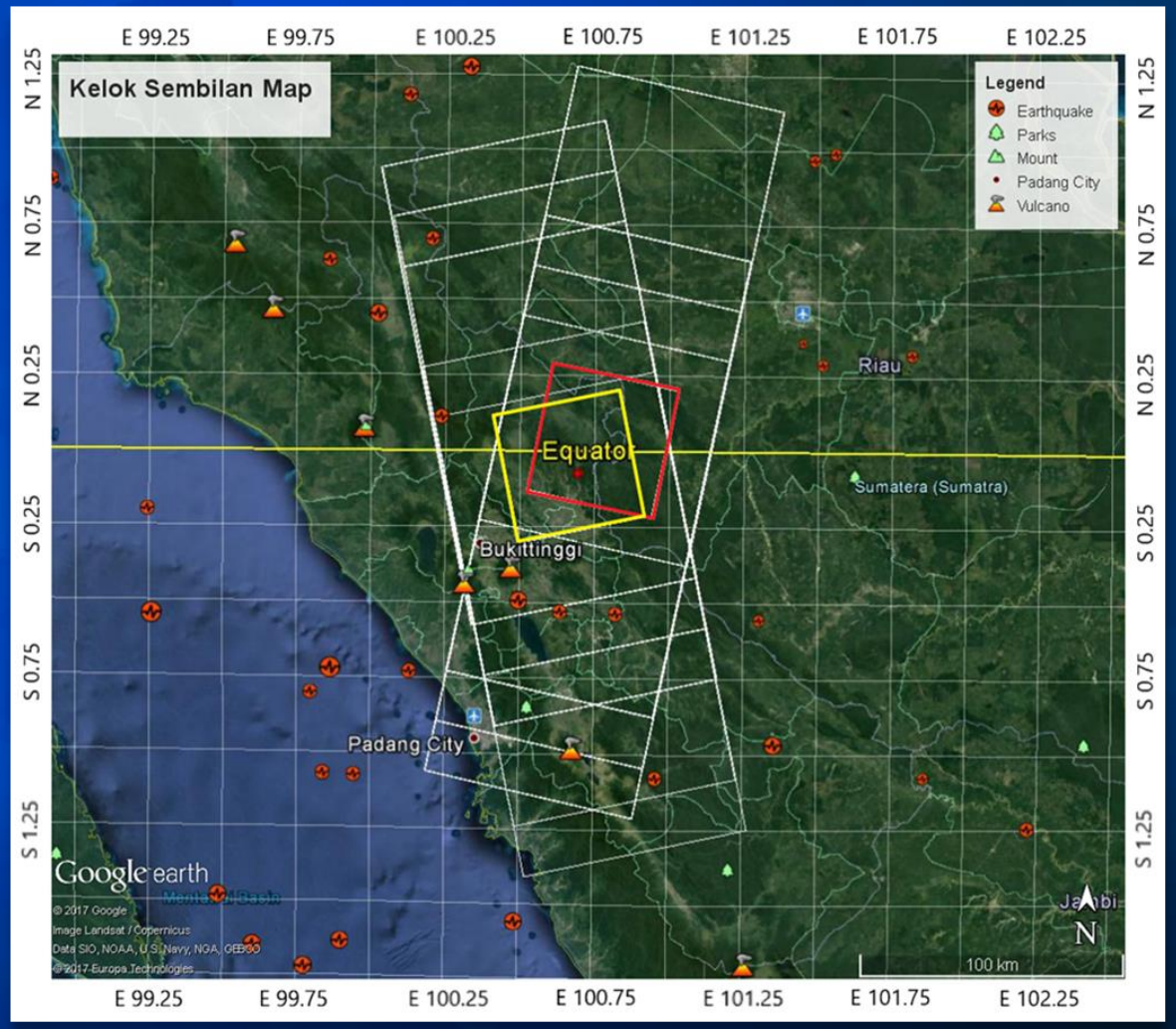
SENTINEL-1A

ALOS PALSAR

Footprint Satellite data set



ALOS PALSAR



SENTINEL

METHODOLOGY

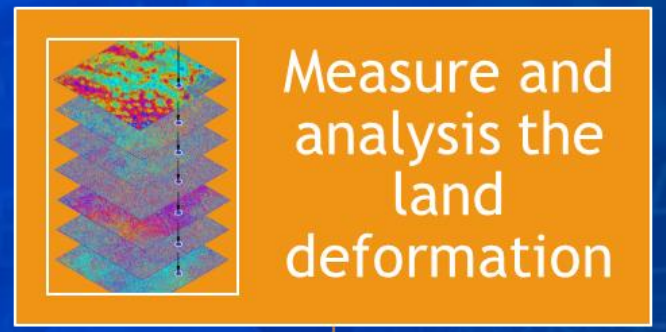
1. SARSatellite processing Technique

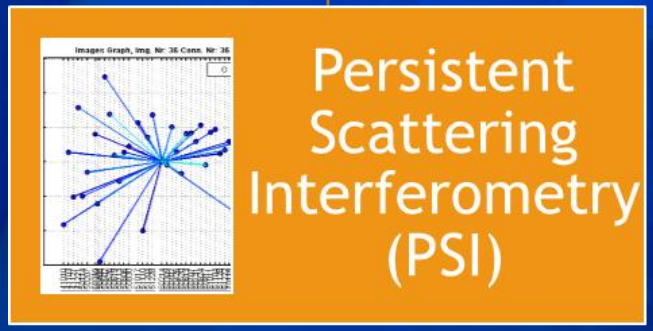
PSI → 13 scenes of ALOS PALSAR data from July 2007 to November 2010

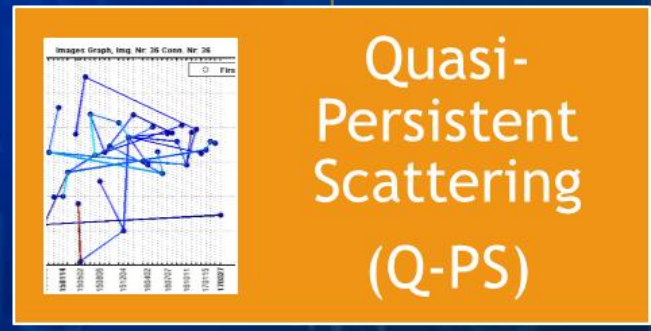
Q-PS → 36 scenes ascending and 54 descending orbit of Sentinel-1A SAR data from October 2014-November 2017

3. Validation

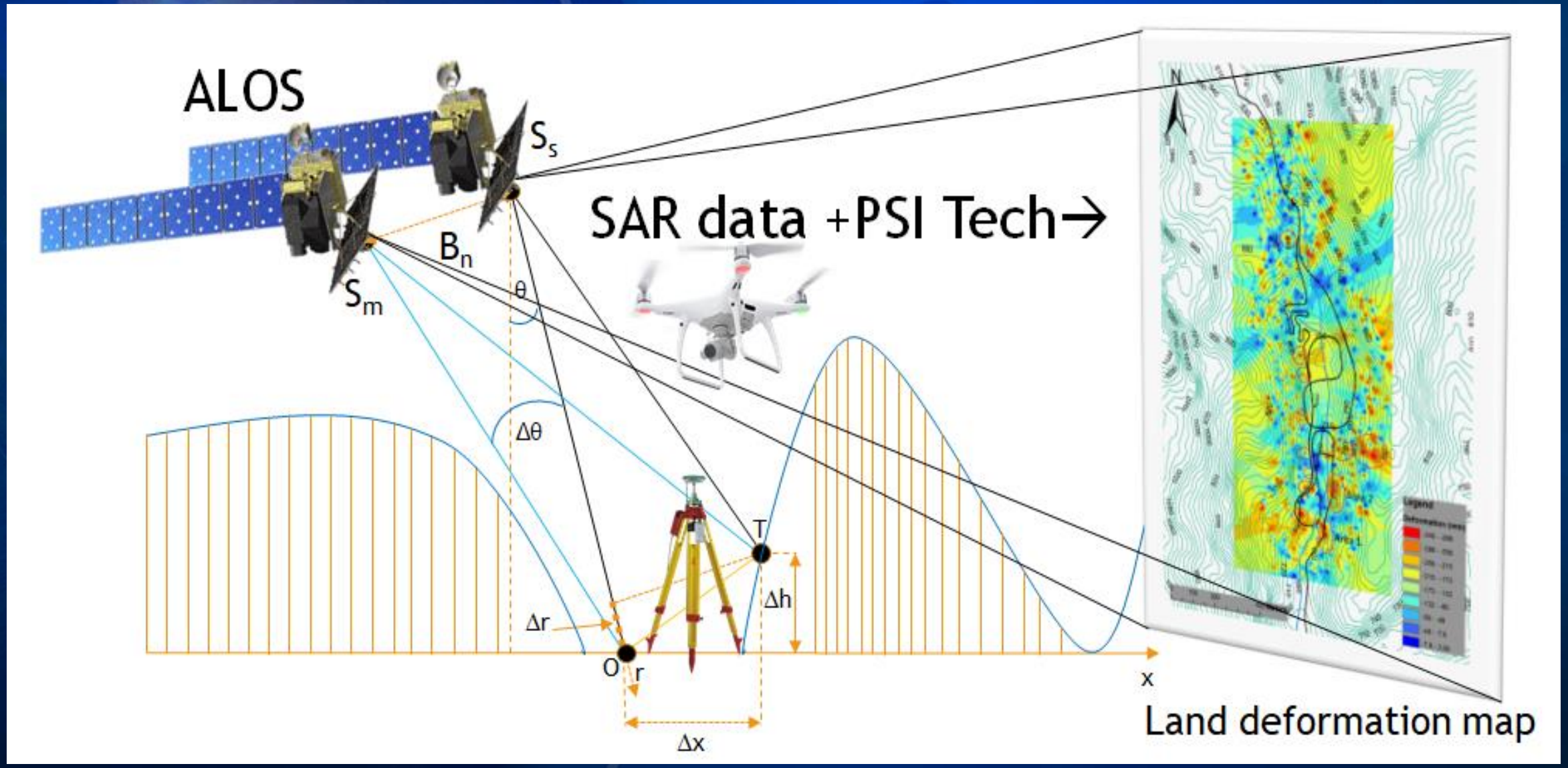
- Geodetic GPS
- 3D Photogrammetry
- UAV observation→ Sfm
- Clinometer
- Measuring tape







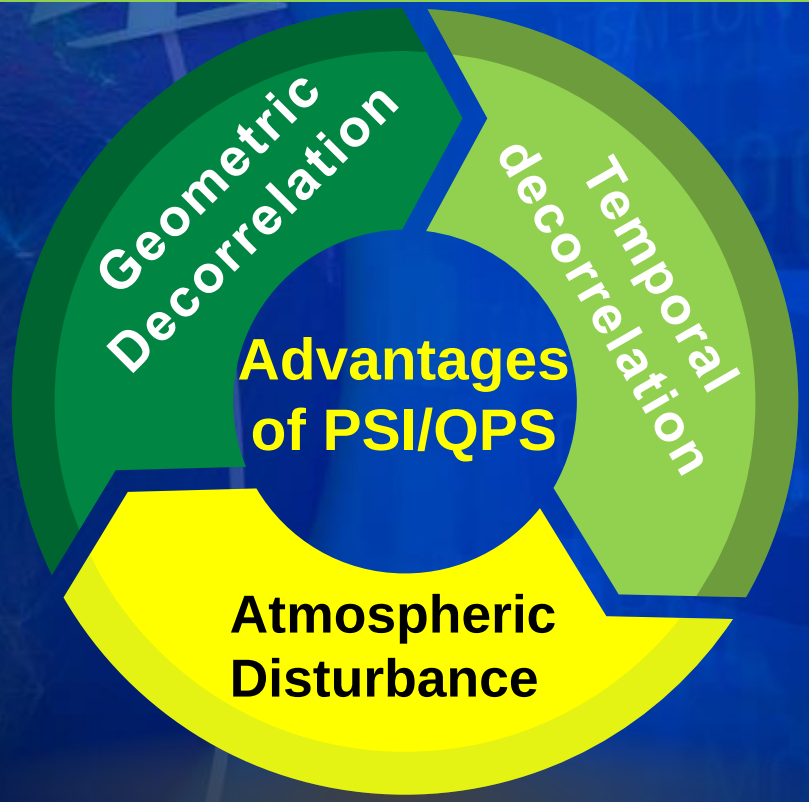
METHODOLOGY



METHODOLOGY: Advantages of the PS Technique

Monitoring land deformation in previous technique is using InSAR/DInSAR. In both technique, there are two major noise sources affecting the SAR Interferogram

1. Different time observation slightly different look angle
2. Topography area is not know with enough precision



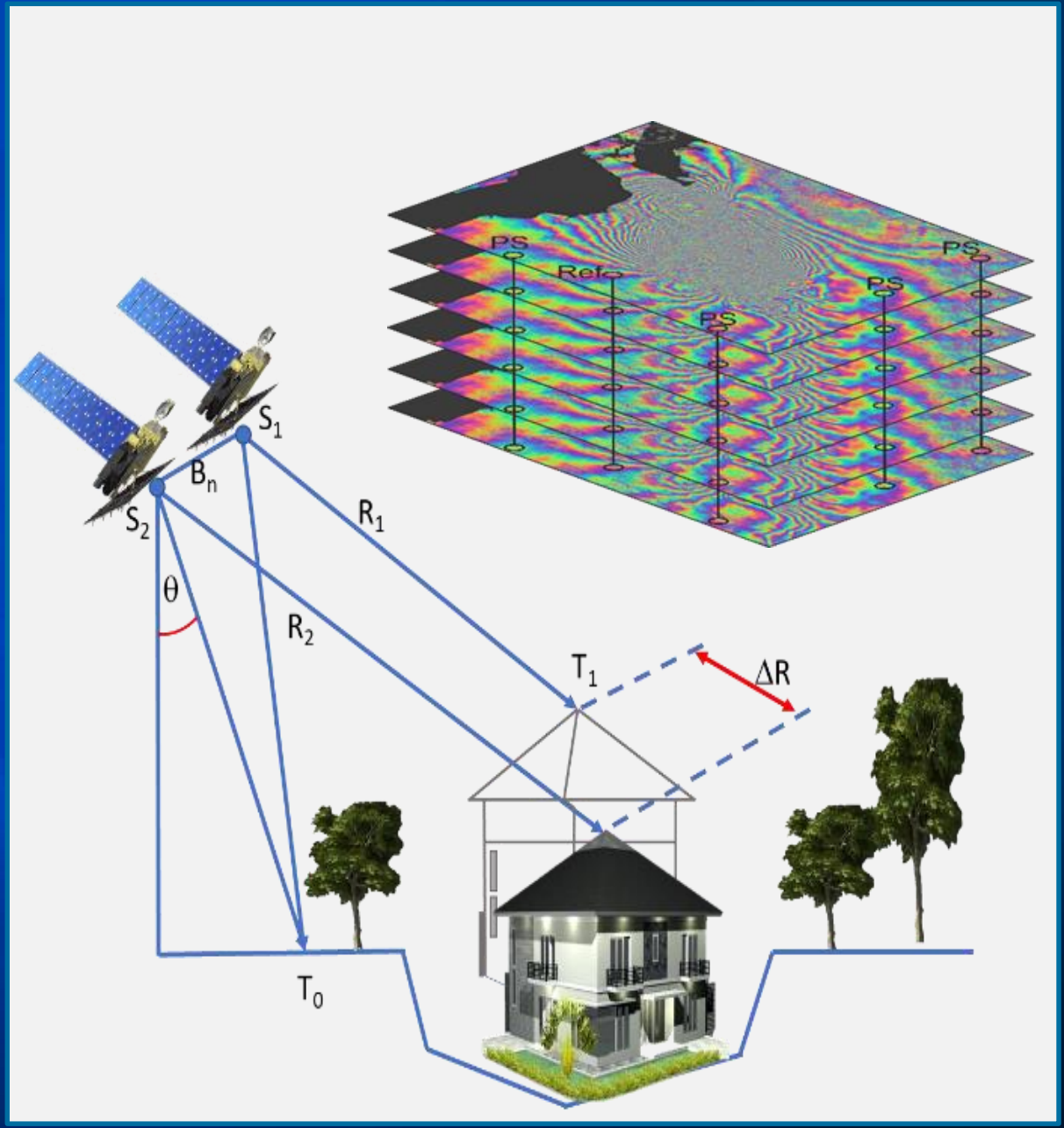
Individual scattering element different

Delay the radar signal

METHODOLOGY: PSI Technique

1. Persistent Scatterer Interferometry (PSI)

- The main idea is detected the high coherence point-like target of PS using Amplitude stability index as indicator of phase stability in time series.
- The SAR image that produces from each satellite observation is stacked with referring to one unique master image and then identify its PS based on the coherent radar target for all satellite data set



METHODOLOGY: The components that contribute to produced interferometric phase

$$\Delta\phi_{m,s}(T) = \Delta\phi_{m,s}^{flat}(T) + \Delta\phi_{m,s}^{height}(T) + \Delta\phi_{m,s}^{disp}(T) + \Delta\phi_{m,s}^{atm}(T) + \Delta\phi_{m,s}^{nois}(T)$$

$\Delta\phi_{m,s}^{flat}(T)$ is flat terrain component that can be estimated from orbital data and then removed

$\Delta\varphi_{m,s}^{height}(T)$ is topography component due to in accuracy of reference DEM, which is liner with normal baseline and height of the target *T*

$\Delta\phi_{m,s}^{disp}(T)$ is related to the displacement on the earth surface, because of the signal travel part length satellite to the target is changes between two acquisition time

$\Delta\phi_{m,s}^{atm}(T)$ is caused by different atmospheric condition in difference acquisition time

$\Delta\phi_{m,s}^{nois}(T)$ the noise caused by thermal noise during acquisition time and processing noise that produced during the processing radar image to obtain the interferogram

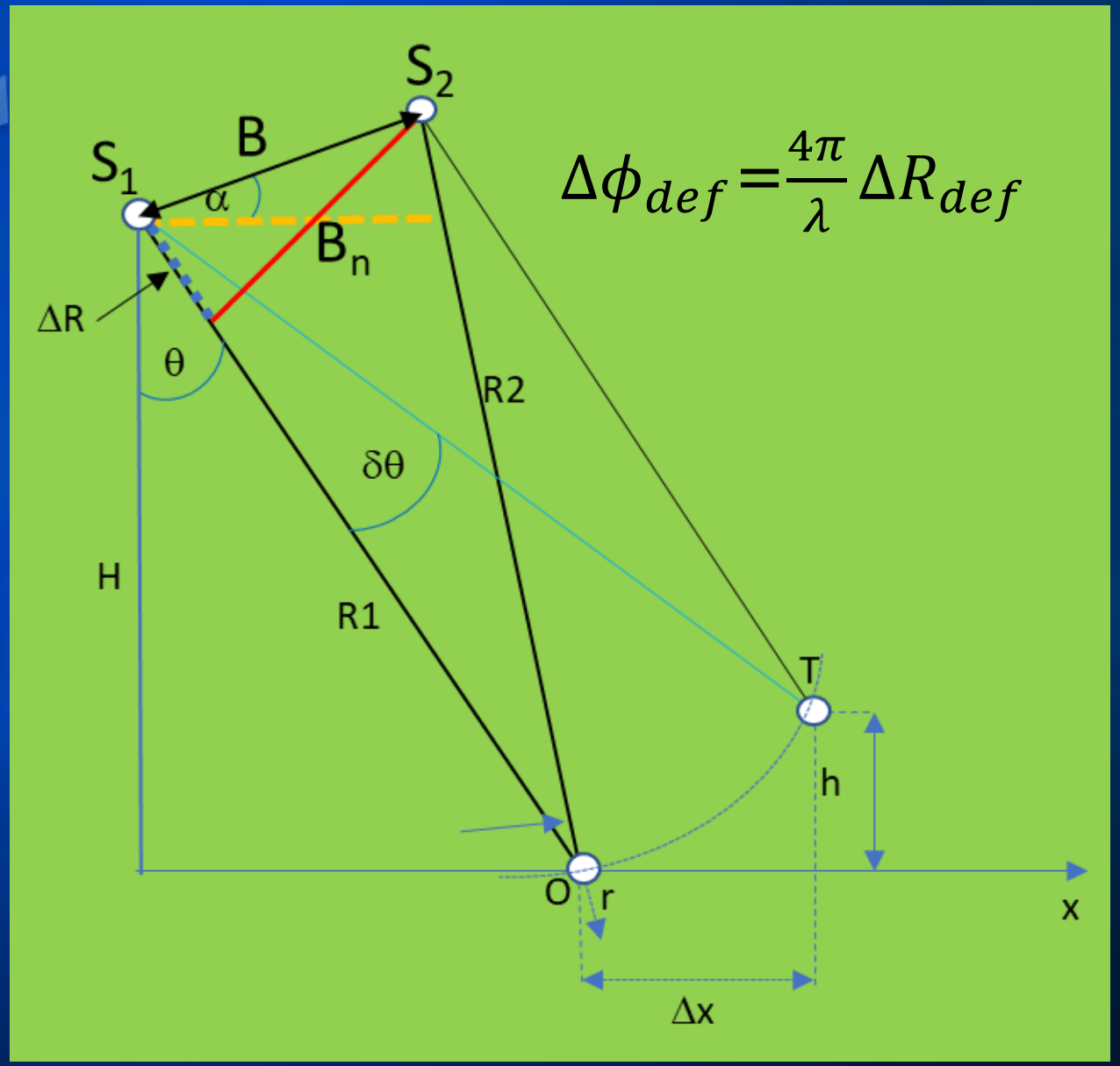
METHODOLOGY: The components that contribute to produced interferometric phase

Phase component remained

$$\Delta\phi_{m,s}(T) = \Delta\phi_{m,s}^{height}(T) + \Delta\phi_{m,s}^{disp}(T)$$

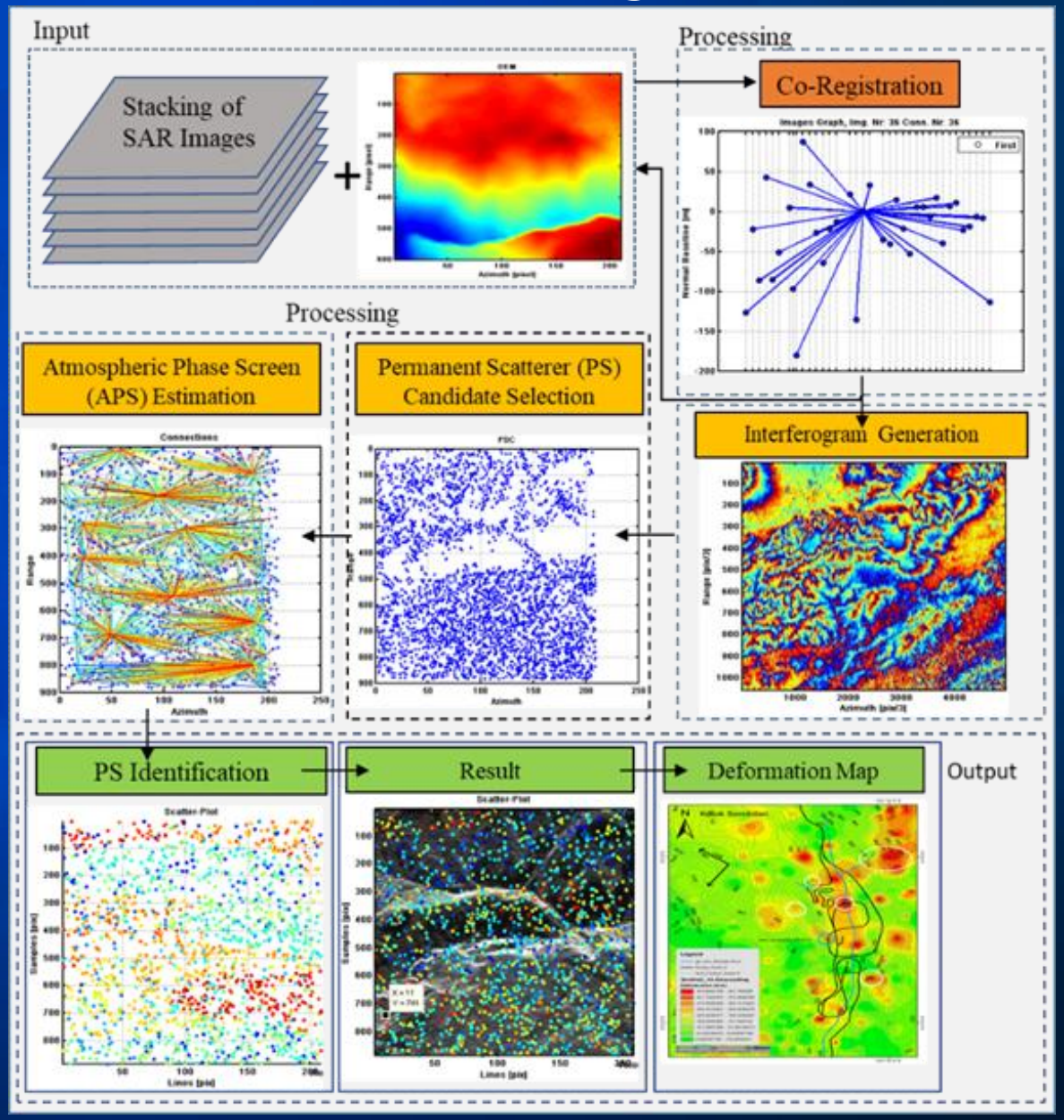
$$\Delta\phi_{m,s}(T) = \frac{4\pi}{\lambda}\frac{B_n}{R_m}\frac{\Delta h(T)}{sin\theta} + \frac{4\pi}{\lambda}B_t\Delta v(T)$$

- The first term of the equation means, the profile of image on the ground is function of the height of the point T and linear with normal baseline
- The second term means, the phase movement is function of relative velocity of point T with respect to reference point (linear model)

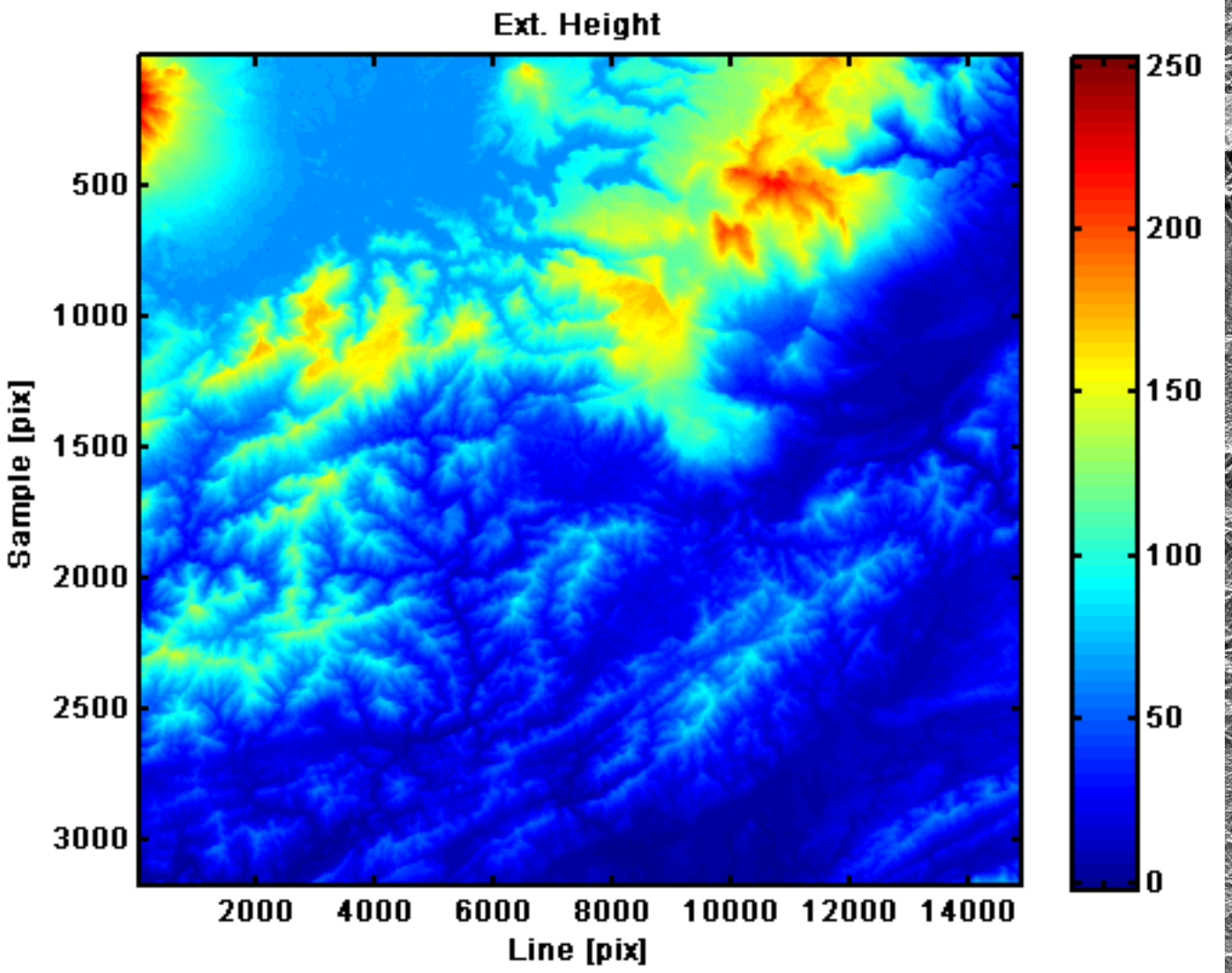


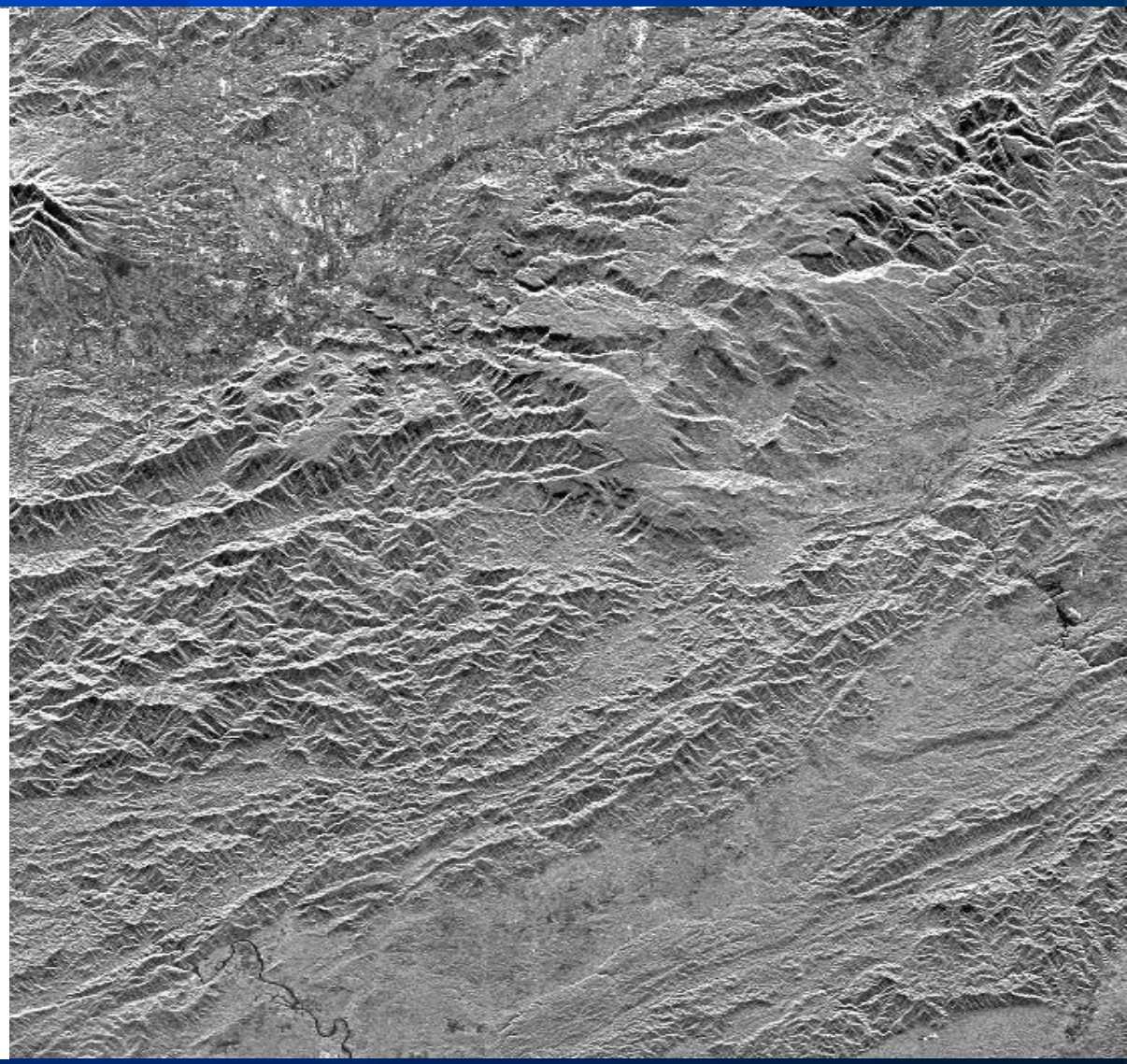
METHODOLOGY: General Flow of PSI & Q-PS Processing

- Input SAR data and DEM
- Co-registration
- Interferogram Generation
- PS candidate selection
- Atmospheric Phase Screen (APS)
- PS identification
- Geocoding (Reflectivity Map/Google earth)
- Deformation MAP using IDW



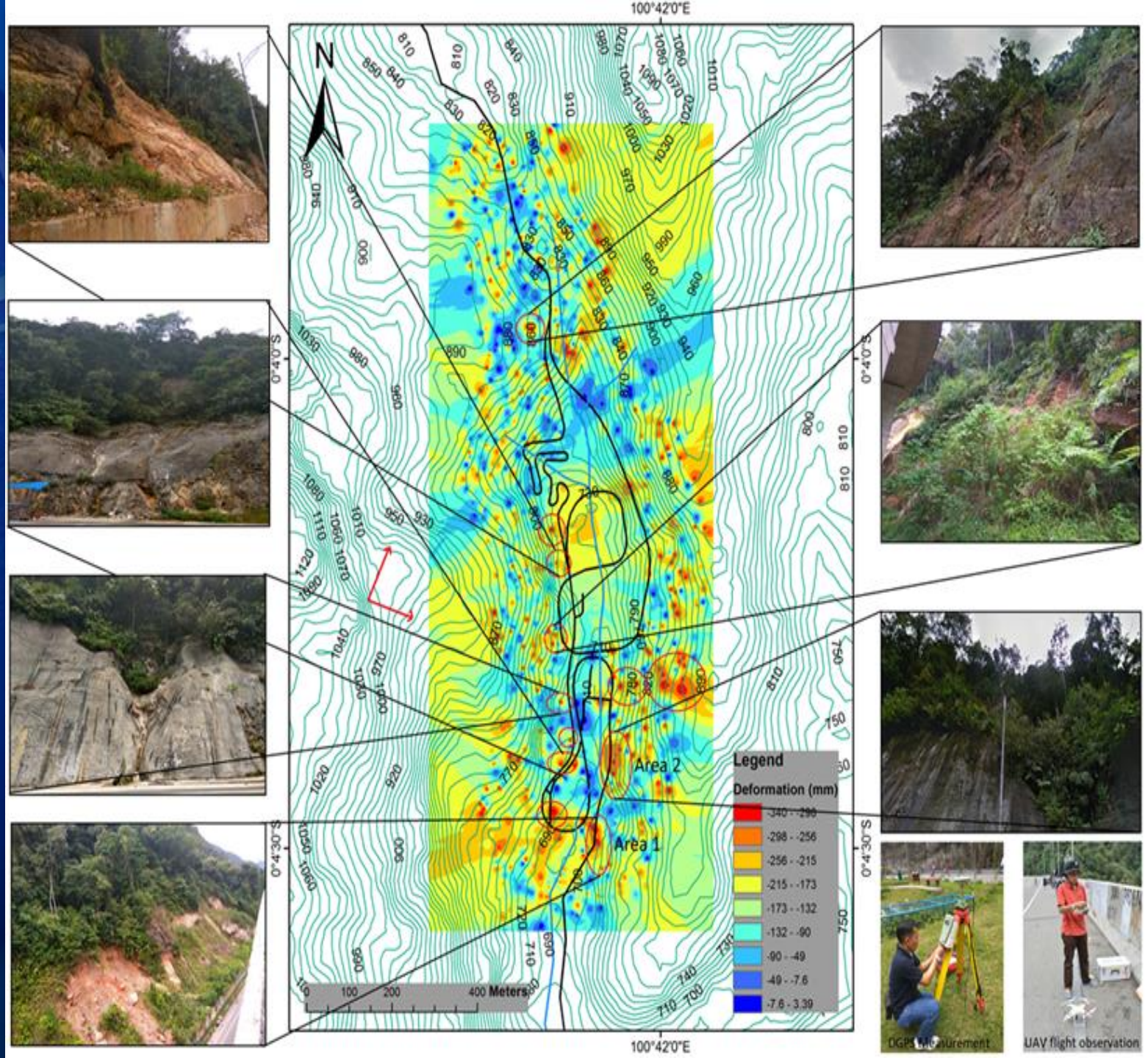
Result : DEM extracted From SAR data





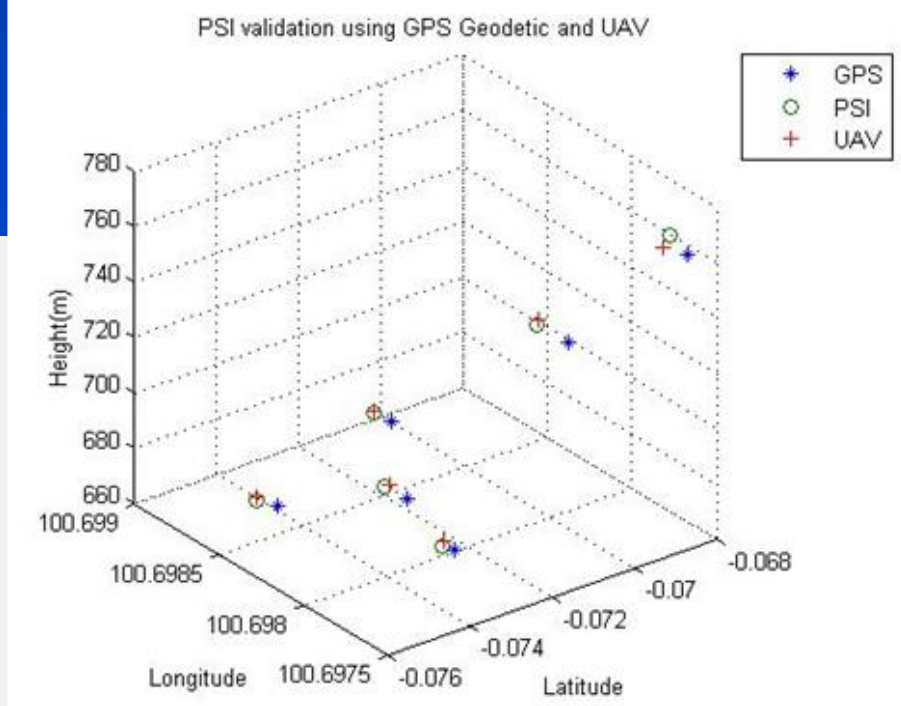
Result : PSI

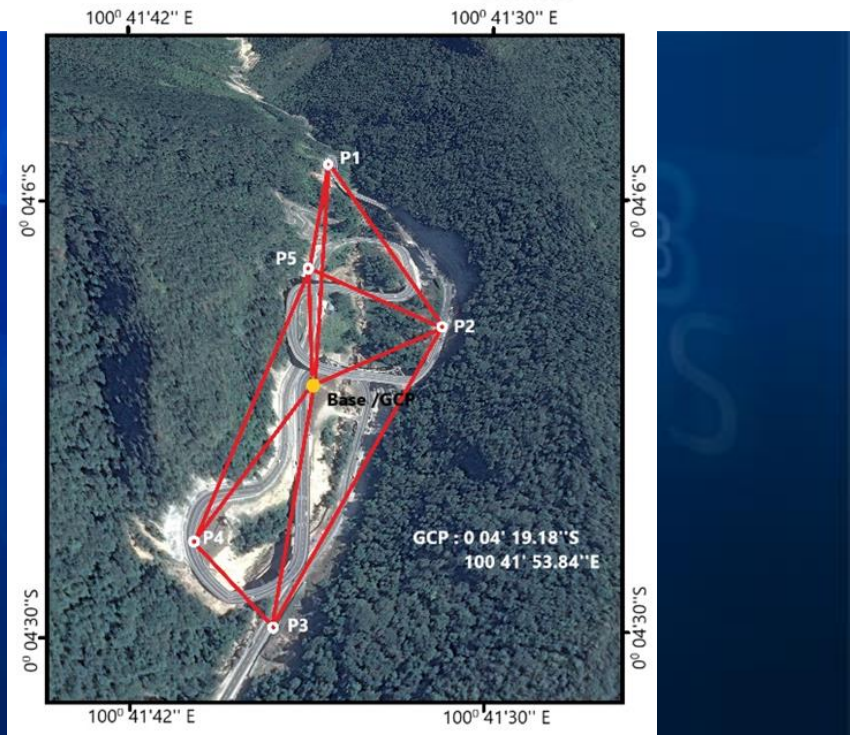
- Two area has significant land deformation area 1 and 2
- The maximum land deformation is -340 millimeter



Result : Validation of PSI

PS	PSI Technique			GPS Geodetic			UAV			Height Error	
ID	LAT	LON	Height (m)	LAT	LON	Height (m)	LAT	LON	Height (m)	% GPS	%UAV
826	-0.074281	100.69759	687.61	-0.074278	100.697520	688.30	-0.074269	100.697588	689.15	0.10	0.22
1040	-0.073636	100.69809	686.92	-0.073632	100.697960	687.62	-0.073631	100.698068	688.85	0.10	0.28
2547	-0.070005	100.69808	726.72	-0.070009	100.697890	727.71	-0.069984	100.698070	728.89	0.14	0.30
3321	-0.068322	100.69770	758.12	-0.068237	100.697610	760.01	-0.068311	100.697737	758.61	0.25	0.06
757	-0.074240	100.69870	662.41	-0.074060	100.698630	662.72	-0.074240	100.698709	663.93	0.05	0.23
1677 (GCP)	-0.071926	100.69858	687.13	-0.071921	100.698470	687.51	-0.071927	100.698572	688.06	0.06	0.14
									Average Height Error	0.12	0.21

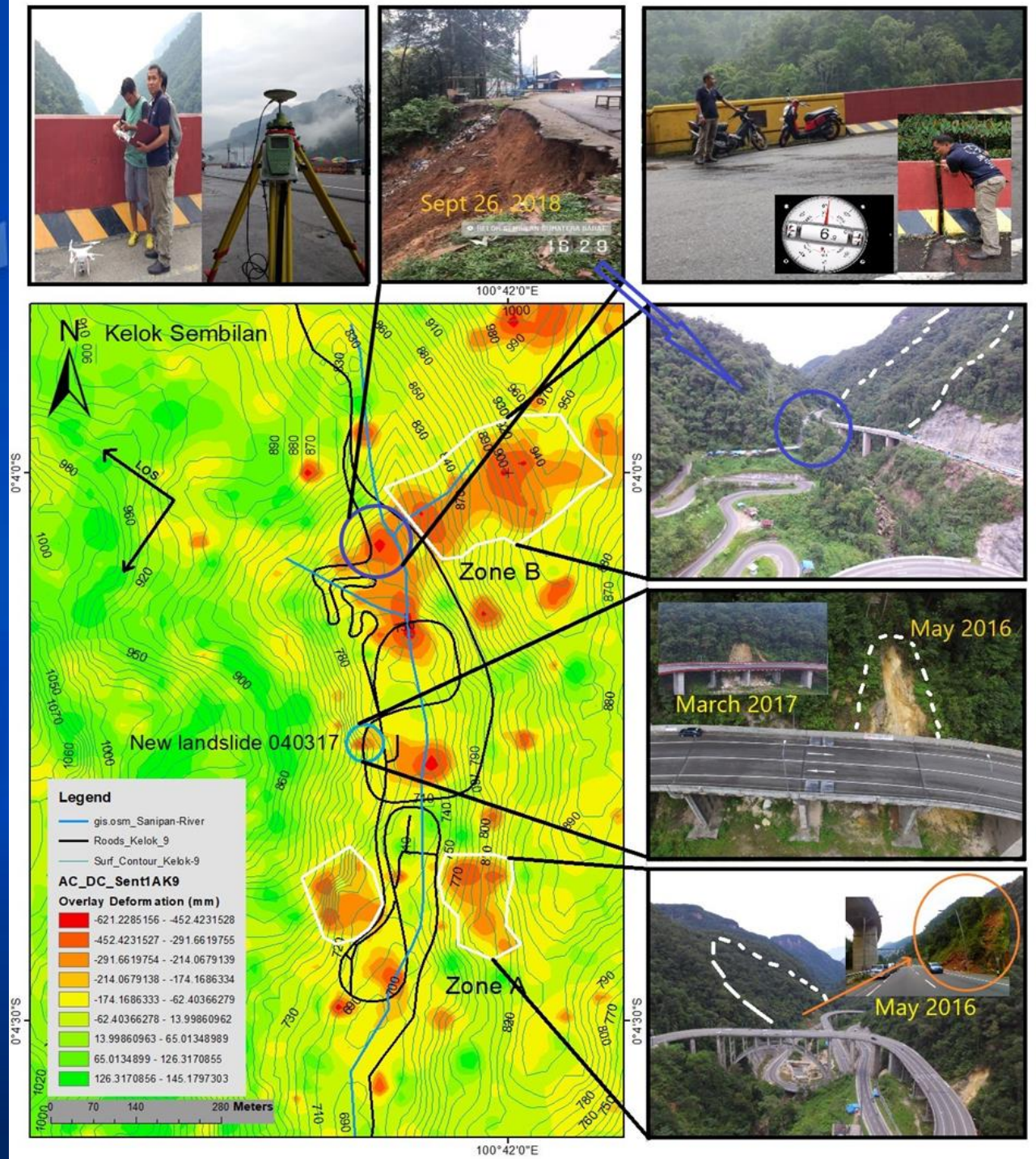




- Ground truth data were collected using both geodetic GPS instrument Leica GPS 1200 plus and UAV Phantom 3 professional for some selected high coherence value of PS points
- Elevation level difference between the techniques is less than 0.3%, with its RMSE of PSI-GPS and PSI-UAV are 0.97 m and 1.5 m, respectively

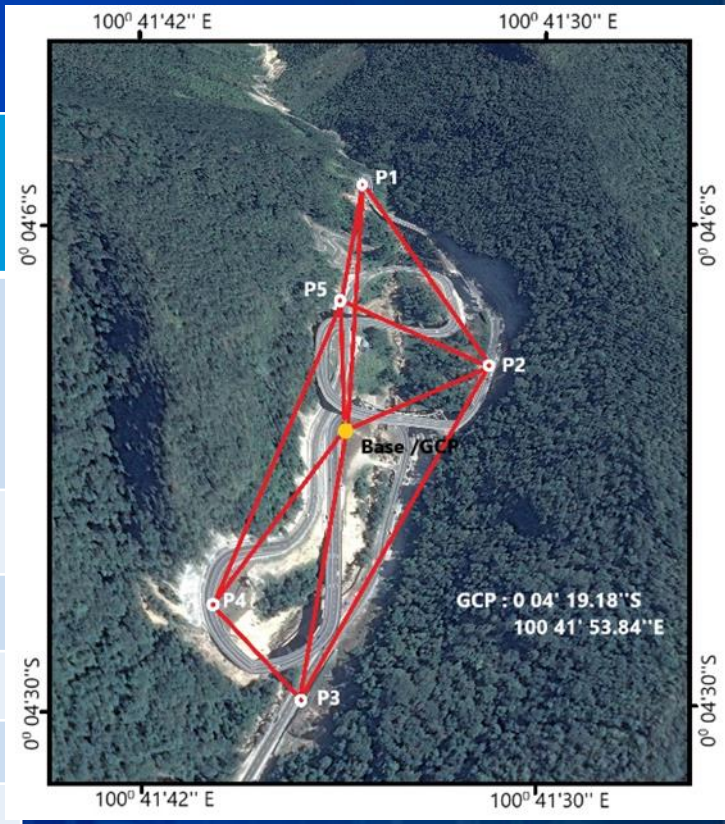
Result : Q-PS

- To obtain the land deformation Map, PS obtained from Q-PS technique in both ascending and descending orbit overlay using Inverse distance weight (IDW) interpolation and projected into DEM.
  - Zone A : landslide on May 2016
  - Left of the Flyover : landslide May 2016 and March 2017
  - Zone B: landslide on Sept 26, 2018 and bridge connection tilted with range 6-9 degrees and bridge wall side move around 2-4 cm.
  - The cumulative displacement zone A and B more than 500 millimeter with velocity 120 mm/year



Result : Validation of Q-PS

PS ID	Q-PS Technique			GPS Geodetic					Height Error
	LAT	LON	Δ Height (mm)	LAT	LON	1st Survey Height (m)	2nd Survey Height (m)	Δ Height (mm)	%
P1	-0.06616	100.6975	252.5	-0.06427	100.6975	768.30	768.13	170.2	0.82
P2	-0.07034	100.6997	83.1	-0.07363	100.6979	765.36	765.21	150.1	0.67
P5	-0.07000	100.6980	118.3	-0.07000	100.6978	727.71	727.65	60.3	0.58
P4	-0.07432	100.6977	80.3	-0.07423	100.6976	688.01	687.82	19.4	0.61
P3	-0.07424	100.6987	62.4	-0.07406	100.6986	662.72	662.57	14.3	0.48
P6 (GCP)	-0.07192	100.6985	17.7	-0.07192	100.6984	687.51	687.37	13.3	0.04
								Average Height Error	0.53



The network configuration of DGPS

1st Survey : Sept 16-18 2016, 2nd Survey: Sept 3,-16 2018

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