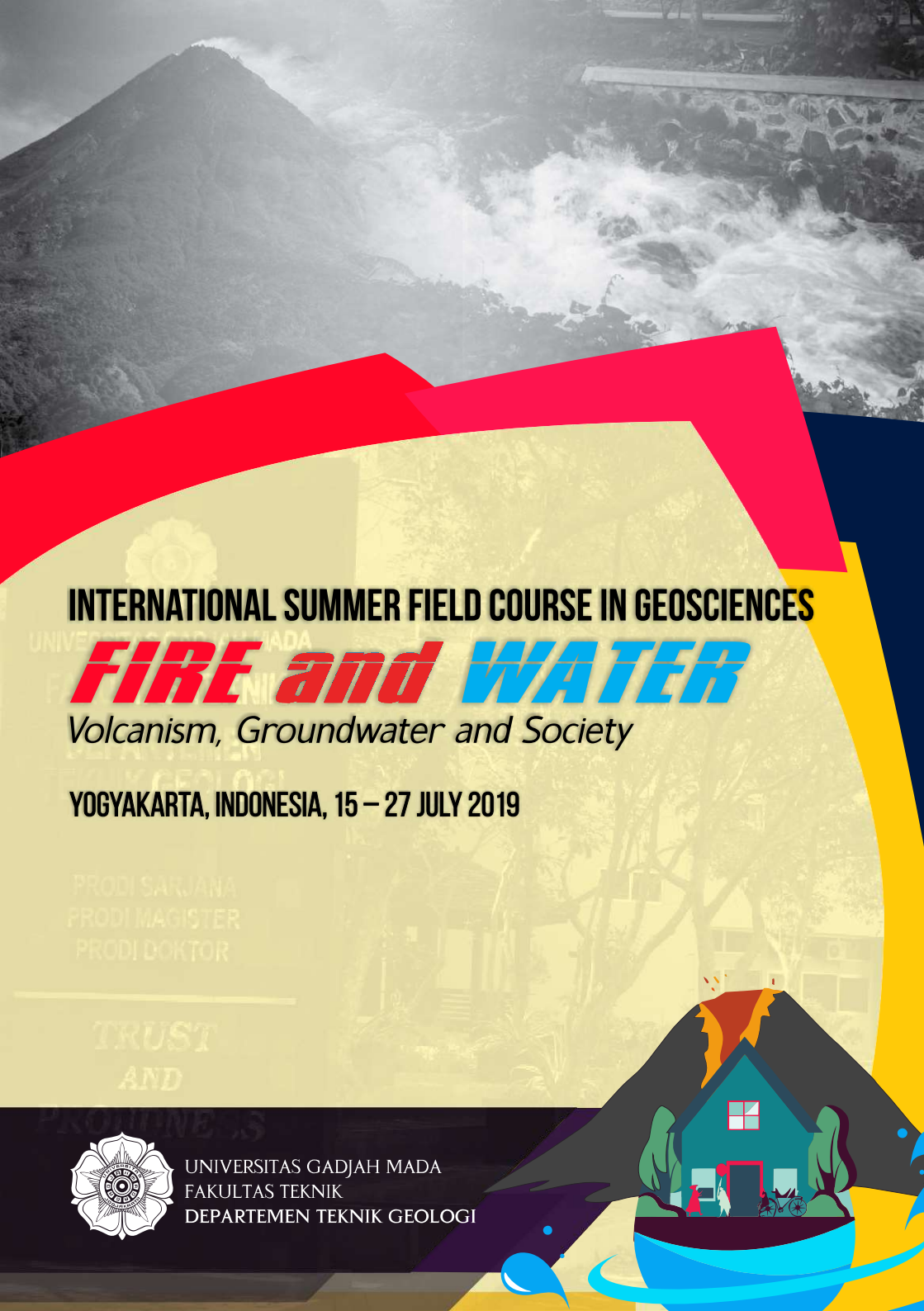




INTERNATIONAL SUMMER FIELD COURSE IN GEOSCIENCES

FIRE and WATER

Volcanism, Groundwater and Society

YOGYAKARTA, INDONESIA, 15 – 27 JULY 2019

PRODI SARJANA
PRODI MAGISTER
PRODI DOKTOR

TRUST
AND



UNIVERSITAS GADJAH MADA
FAKULTAS TEKNIK
DEPARTEMEN TEKNIK GEOLOGI



International Summer Field Course in Geosciences 2019

FIRE and WATER

Volcanism, Groundwater and Society

Yogyakarta, Indonesia, 15 – 27 July 2019

Hosted by

Department of Geological Engineering, UGM

In collaboration with

RWTH Aachen University, Germany

Master of Disaster Management, Interdisciplinary Graduate School, UGM

Department of Physics, Faculty of Science, UGM

Department of Geological Engineering, UNDIP

Department of Civil and Environmental Engineering, UGM

Networks:

AUN/SEED-Net Universities

Hokkaido University, Japan

Kyushu, University, Japan

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Welcoming Remarks

Dear distinguished Lecturers and Students,



This year, Department of Geological Engineering, Faculty of Engineering in collaboration with Interdisciplinary Graduate School, and Department of Physics, Faculty of Mathematics and Natural Science, Universitas Gadjah Mada has chosen to be the host of International Summer Field Course in Geoscience with theme "FIRE AND WATER: Volcanism, Groundwater and Society". For Department of Geological Engineering, Faculty of Engineering UGM, this activity

become the second time to be hosted the International Field-Summer Course in collaboration with RWTH Aachen University.

On previous field-summer course, I am impressed by the great determination of students from different nations, by working together for revealing the objectives of activities. During this occasion, they are not only sharing their knowledge but also understand the culture and society around them. Such kind of education has proved to be an important driver of global change. We recognize the future of earth will be facing problems of energy, climate change, geo-disaster and water supplies to which we are seeking answers. In the concordance to the theme of this Field Summer Course, we already preparing course activities for the students not only in the relation to volcanism and groundwater but also other knowledge in geoscience and geological engineering.

I would like to express my sincere thanks to all International Networking especially GetIn-CICERO RWTH Aachen University who initiated this activity, Japanese Supporting Universities of AUN-SEEDNet (Hokkaido and Kyushu University) and ASEAN University Network (Chulalongkorn University – Thailand, University Sains Malaysia – Malaysia, University Technology Malaysia – Malaysia,

Hanoi University of Mining and Geology – Vietnam, National University of Lao – Laos and University of Yangon – Myanmar) and also Universitas Diponegoro – Indonesia which support this Field Summer Course by sending their lecturer and/or students to join this activity.

Finally, I also would like to thank International Cooperation Office of Universitas Gadjah Mada, which supports this event and special thanks to the organizing committee, whose effort and hard work reflecting their commitment to this activity. Last but not least, I wish all of you enjoy, obtaining a lot of knowledge, having chances to know your new networks and colleagues, with surely loving the beauty of Indonesia during and after this field summer course.

Respectfully Yours,

Dr. rer.nat. Doni Prakasa Eka Putra

Chairman of International Summer Field Course in Geoscience 2019

Dear Colleagues, Dear Students, Dear distinguished Reader,

With the GetIn-CICERO project between Universitas Gadjah Mada and RWTH Aachen University we have started a process of learning from each other through joint research and contributing to the solution of scientific questions and societal tasks by gaining knowledge. We do not understand this virtual campus in the sense of the Latin root "campus" as a wide, empty field. Nor in the sense of the original American term for a closed



agglomeration of university buildings in front of a town. This research network builds on the secure foundation of the partners' expertise and academic traditions and brings us together on specific research issues. The joint researchers form the campus.

I am delighted that colleagues and students from so many countries have accepted the invitation to this Summer Field Course, giving many faces to the idea of the researchers' network. It is an expression of the lively AUN-SEEDNet to come together on a common theme in Indonesia despite the many different university cycles and we Europeans look forward to participating in it.

Academic traditions include university teaching derived from the object of research and developing further with it, which differs fundamentally from externally determined school teaching in this respect. The common struggle for new data and their best possible interpretation unites lecturers and students and makes us to the academia. I am looking forward to the new knowledge that will emerge from the excursion points and the joint fieldwork groups in this highly exciting piece of Indonesian geology.

Prof. Putra spoke about the spirit of the first joint Field Course four years ago. Prof. Putranto from Universitas Diponegoro played a decisive role in its preparation and implementation. Every day it was

to be seen how the joint working groups gave life to the often tried vocabulary of internationalization in respectful abolition of cultural distance. This year's Field Course will bring together even more people from different cultures and will be another challenge to understand each other correctly and to make new friendship.

The participation of the German group is made possible by the support of the Federal Ministry of Education and Research, the German Academic Exchange Service, the Aachen Geoscientists Association, the RWTH Aachen University and last but not least the Universitas Gadjah Mada. We would like to acknowledge everyone for this support.

I would like to thank Department of Geological Engineering, Faculty of Engineering, the Interdisciplinary Graduate School and the Department of Physics, Faculty of Mathematics and Natural Sciences, of Universitas Gadjah Mada for the comprehensive preparation of the Summer Field School and the renewed invitation to this shared experience.

I wish all of us inspiring, accident-free days, always with a smile on our faces.

Glückauf

Prof. Dr. Thomas R. Rüde
GetIn-CICERO Campus Dean

Organizing Committee

Advisor	: Heru Hendrayana
Chairman of the Program	: Doni Prakasa Eka Putra
Vice Chairman	: Teuku Faisal Fathani
Secretary	: Hendy Setiawan
Treasurer& Administration	: Wita Dyaswati Maya Kristine Kusumaningtyas
Technical Program	: Wahyu Wilopo Wiwit Suryanto Lucas Doni Setijadji Didit Hadi Barianto Gayatri Indah Marliyani Haryo Edi Wibowo Esti Handini Esti Anantasari Budiarjo
Logistic & Transport	: Diyaning Ratri Raja Susatio Azmin Nuha Thema Arrisaldi Egy Erzagian Juwahir Sahid
Media & Documentation	: Antonius Chandra Widihermawan
On-site Assistant	: Rilo Restu Surya Atmaja Reno Manggalajati Athallah Laily Fidya Raden Aditya Aryo Wicaksono Muhammad Naufal Dzaky Premira Arifatul Khorida Gabriel Listyawan Lalu Aliyya Tirangga Aji Buana

Field Course Description

Geological process of volcanic environment in Yogyakarta Province had given a significant control to the population growth as well as their activities in agriculture, plantation, livestock, mining, land use and other resources since the ancient time. Historical evidences from society, temples, artifacts and old manuscripts have shown that Merapi volcano gives two elements of natural resources from geological process to human civilization and their social-economy i.e. fertile soils from eruption (Fire element) and groundwater (water element). The dynamic, connectivity and interaction between 'fire element' and 'water element' for people and their living environment need a comprehensive understanding and holistic knowledge to disseminating measures and constructive solutions to the society and policy makers towards possible problems and challenges in the near future.

UGM welcome you to the International Summer Field Course in Geoscience 2019 entitled "Fire and Water – Volcanism, Groundwater and Society". This summer field course is targeted for International Master and Graduated Students who have background or encouraging their enthusiasm in the study of volcanology, tectonics, geo-environment, geo-cultural heritage and society, geo-engineering, hydrogeology, karst topography, engineering geology, slope stability and geohazards, or geo-disaster mitigation and management.

Welcome to Indonesia, enjoy the field course and feel the ambience of this country through richness culture, friendly society, traditional foods and wonderful nature.

Learning Outcome

After completing the field course, participants are expected to be able to:

- a. Understand fundamentals and principles of volcanic environment, forming process and dynamic of the aquifer, alluvial plan and the karst area.
- b. Understand and analyze technical information of groundwater and the aquifer condition through regional

mapping, hydro-stratigraphy and evaluating them in spatial and geo-statistical methods.

- c. Identify the change of groundwater condition by means of geo-electrical survey and geo-chemical analysis both during site investigation and laboratory experiments.
- d. Understand geological condition in volcanic environment and karst topography, and their relation with hydrogeological process of groundwater surrounding the area.
- e. Identify and analyze slopes and hills stability due to fissures, fractures, structure discontinuities, weathering and external factors through mapping and terrestrial scanning.
- f. Understand social condition, economy and culture of the society who live in the environment of volcano, mountains, alluvial plain and karst area, then able to assess their future challenges and measures in regard with the sustainability of water and earth resources, as well as possible threads from eruption, landslides, drought, floods and other geo-water-disasters.
- g. Have the capabilities to collaborate cross-disciplinary and inter-disciplinary in the background of geo-science and geo-environment which have relation with socio-culture and cultural heritage in the societies.

Method and Output

International Summer Field Course in Geoscience 2019: Fire and Water – Volcanism, Groundwater and Society is held with the combination of several activities:

- i. Visitation to volcanic environment, geo-karst and geo-cultural heritage spots.
- ii. On-site explanation and observation, in regard with volcanism, groundwater resources, land subsidence, rock-cliffs, and karst topography.
- iii. On-site measurement and analysis, through GPS, geological compass, level meter, water sampling, conductivities, terrestrial scanning, resistivity methods and other methods.

- iv. Evening general lectures, blended with group discussions, exercises, sharing and presentation.
- v. Upon completing the field course, students will be granted 2 credits of unit certification.
- vi. Students and participants are able to have further communication and correspondence with professors and supervisors for their own-project, joint-research, thesis supervision and or joint-publication.

Time and Place

This International Summer Field Course in Geoscience 2019 held during dry season in Indonesia from 15 July to 27 July 2019, which consists of two parts:

- **Part-1 : 15 – 23 July 2019**
Cities : Yogyakarta, Semarang and Klaten
Location : UGM, Merapi Volcano, Merapi Museum, UNDIP, Tembalang, Kota Lama, Jatibarang Dam Reservoir, and Bayat Geological Field Campus



▪ **Part-2 : 24 – 27 July 2019**

Cities : Yogyakarta, Pasuruan and Surabaya

Location : Goa Pindul, Kali Suci, Indrayanti Beach, Umbulan Spring, Mt. Bromo, and Surabaya city



General Schedule

Day	Date	Locations	Activities
Mon	15 July	Yogyakarta	Cultural Pre-Summer Field Course Trip*: Borobudur Temple <u>Start Part-1 of Summer Field Course</u> Welcome reception and Opening Ceremony at Central Building (Balairung) Campus UGM
Tue	16 July	Yogyakarta	Geo-heritage Geo-environment Excursions: Merapi Jeep Tour, Volcano field excursion, Visit Merapi Museum Trip to Semarang
Wed	17 July	Semarang	Welcome meeting at UNDIP Field excursion: - <i>Kawasan Kota Lama</i> (Old City area) - Brown Canyon - Jatibarang Dam Reservoir
Thu	18 July	Klaten	Trip to Bayat Geological Field Campus: - Preparation of the field equipment, - Technical explanation for field observation and field work - Evening lecture, group discussion and presentations
Fri	19 July	Klaten	Field Work, Evening Lecture, Discussions
Sat	20 July	Klaten	Field Work, Evening Lecture, Discussions
Sun	21 July	Klaten	Field Work, Evening Lecture, Discussions
Mon	22 July	Klaten	Field Work, Evening Lecture, Discussions

Tue	23 July	Klaten	Field Work, Evening Lecture, Group Presentation
Wed	24 July	Gunungkidul	<u>Start Part-2 of Summer Field Course</u> Trip to Gunungkidul: - Karst and Cave excursion at Goa Pindul and Kali Suci - Evening stay at Indrayanti Beach
Thu	25 July	Pasuruan	Trip to Pasuruan Umbulan Spring excursion with Danone Water Move to Mt. Bromo
Fri	26 July	Mount Bromo, Surabaya	Trekking for Sunrise at Bromo Bromo Jeep Tour Volcanism and geo-environmental excursion Trip to Surabaya, Farewell reception
Sat	27 July	Surabaya	End of Summer Course Activities

**)Transport to locations for culture pre-summer field course trip is provided, but all participants should cover the entrance fee by themselves.*

List of Supervisors

1. Prof. Dr. Thomas R. Rüde



Since 2005, I am full professor for hydrogeology at the RWTH Aachen University, the leading technical university in Germany, and Head of the Institute of Hydrogeology. I'm also Rector's Delegate for the cooperation with Indonesia.

I started my career at the University of Karlsruhe, now the KIT, in hydrogeology and geochemistry. My Ph.D. thesis focused on arsenic in the environment. For post-doc, I

moved to the University of Munich and worked on geogenic arsenic, heavy metal release from steel slags, natural attenuation of contaminated aquifers and regional groundwater systems.

Topics of my research are flow and transport in aquifer systems used for water supply, geogenic arsenic and uranium in groundwater, mine drainage and groundwater protection, tracer tests and hydraulic tests, hydrogeological and numerical modelling of aquifers, and groundwater remediation.

I do academic teaching since more than 30 years and was awarded several times for best teaching. Since 2007, I work with colleagues of Universitas Gadjah Mada and Universitas Diponegoro on groundwater issues and represent the RWTH Aachen as GetIn-CICERO Campus Dean.

Topics: *Hydrogeology, groundwater hydraulics and groundwater remediation*

E-mail: ruede@hydro.rwth-aachen.de

2. Prof. Toshifumi Igarashi, Dr. Eng.

I am a professor in the Division of Sustainable Resources Engineering, Faculty of Engineering Hokkaido University. I am researching geochemistry and geoenvironmental engineering related to groundwater, soil, rock and sediment contamination by heavy metals. I graduated from the Department of Sanitary Engineering of Hokkaido University, Japan.

The general topic of my research is to evaluate groundwater flow and solute migration in the subsurface environment. I was interested in interactions of solutes and soils that retard the solute transport. I have been studying the mobility of heavy metals originating from hydrothermally altered rocks and tailings of closed mines for last ten years.

Topics: *Geochemistry, heavy metals contamination, geoenvironmental engineering*

E-mail: tosifumi@eng.hokudai.ac.jp



3. Prof. Peter Kukla



Peter Kukla is a professor of geology in the Institute of Geology and Palaeontology, Energy and Mineral Resources Group at RWTH Aachen University, Germany. He holds Ph.D. from Department of Geology, University of the Witwatersrand/Johannesburg in 1991 with thesis "Tectonics and sedimentation of a Late Proterozoic Damaran convergent continental margin, Khomas Hochland, Central Namibia". He worked as a principal geologist at Shell International Exploration and Production (1991-1996) and as a senior exploration geologist at

Woodside Energy Ltd (1996-2000), before move to RWTH Aachen University. His specialties are in geodynamics, salt dynamics, seismic stratigraphy, sedimentology, and pressure research. Since 2016, he is one of the editorial board members of the International Journal of Earth Sciences. Since Nov 2018, he is currently serving as the Dean of the Faculty of Georesources and Materials Engineering, RWTH Aachen University

Topics: *Sedimentology, geodynamics, seismic stratigraphy, geology*

E-mail: peter.kukla@emr.rwth-aachen.de

4. Prof. Hemanta Hazarika



Hemanta Hazarika is currently a professor in the Department of Interdisciplinary Science and Innovation, Kyushu University, Fukuoka, Japan. He obtained his bachelor of technology (B. Tech) degree in Civil Engineering from the Indian Institute of Technology (IIT), Madras, India in 1990. In 1991, he moved to Japan and obtained his master degree in Civil Engineering in 1993 from

Nagoya University, Nagoya, Japan and Ph.D. degree in Geotechnical Engineering from the same university in 1996.

Prof. Hazarika has working experiences in all the three sectors: industry, government and academia. His main research is on disaster (earthquake, tsunami and rainfall) prevention and mitigation. His activities include soil-structure interaction, stability of soil-structures during earthquakes and tsunami, ground improvement, application of recycled waste and lightweight materials in constructions, stability of cut slopes, and landslides and protection against them.

Prof. Hazarika has more than 200 technical papers in various international journals, conferences and symposia. He has authored two books on Soil Mechanics: First one is the "Soil Mechanics

Fundamentals and Applications" (published by CRC Press) which is in English, and the second one is the Japanese version of his first book. He is also credited with serving as the editor of three books in his research areas: One is the "Geotechnical Hazards from Large Earthquakes and Heavy Rainfalls", which is a compilation of papers presented on the 6th Japan Taiwan Workshop held in 2014, the second one is "Earthquake Hazards and Mitigations", and the third one is "Scarp tire derived geomaterials – opportunities and challenges-".

Presently, he is serving as the secretary of two Asian technical committees of ISSMGE (International Society of Soil Mechanics and Geotechnical Engineering). One is ATC3 (Geotechnology for Natural Hazards), and the other is ATC1 (Mitigation and Adaptation to Climate Change-induced Geodisasters). He also served as the secretary of the ISSMGE technical committee No. 4 (then TC4) on "Geotechnical Earthquake Engineering and Associated Problems". He was also serving as the chairman of the Japanese Geotechnical Society technical committee on "Integrated Approach to Risk Management of Geodisasters and Climate Change Adaptation".

He is also currently serving as World Bank Project Expert on Resiliency of Roads in Nepal against disaster, and also JICA (Japan International Cooperation Agency) experts of Government of Japan on various projects related to Asian countries.

Topics: *Geotechnical engineering, disaster prevention and mitigation, ground improvement, slope stability, and soil-structure interaction*

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5. Prof. Tsutomu Sato

Tsutomu Sato is a professor in the Laboratory of Environmental Geology, Research Group of Geoenvironmental Engineering, Division of Solid Waste, Resources and Geoenvironmental engineering, Faculty of Engineering of Hokkaido University, Japan.

He obtained his Ph.D. in Department of Mineral Resources Engineering, Waseda University, Japan with Doctoral Thesis entitled 'Crystallochemical study of expandable clay minerals: relationship between expansion, dehydration and rehydration and crystallochemical factors'.



He was a chairman of Environmental Mineralogy Working Group, International Mineralogical Association in 2010-2015. Now actively as member of Japan Association of Mineralogical Science, member of Geochemical Society, member of Atomic Energy Society Japan (AESJ) and member of Mining and Materials Processing Institute of Japan. He received several awards such as from Clay Science Society of Japan Award (CSSJ) in 2010, 2012, 2014 and 2015, and best paper award from AESJ in 2016. He published numerous journals particularly in the topic of clay minerals, crystallochemistry, radiochemistry and mineral processing.

Topics: *Clay minerals, radiochemistry, crystallochemistry, mineral processing*

E-mail: tomsato@eng.hokudai.ac.jp

6. Prof. Dr. Klaus Reicherter



Klaus Reicherter is a professor for Neotectonics and Natural Hazards at RWTH Aachen University, Germany. He holds doctoral degree (Dr.rer.nat.) in Geology from Tübingen University in 1994 with Ph.D. thesis of 'The Mesozoic tectono-sedimentary evolution of the central Betic Seaway (external Betic Cordillera, southern Spain). In 2001, he obtained

habilitation in Geology at Hamburg University with thesis "Neotectonics and paleoseismology of the northern Gibraltar Arc".

Since 2018 he is serving as center coordinator of IGCS (Indo-German Center of Sustainability) delegate for India/RWTH Aachen University. He does teaching, giving seminars, lab and field courses, and advising young scientist since 1989 in Hamburg University, Hannover University and Leipzig University, before move to RWTH Aachen University in 2006. He supervised more than 25 PhD students and more than 50 master students since 2001.

His research interests and published articles cover the topic of active faults, palaeoseismicity and historical seismicity, secondary earthquake effects, tsunami, landslides, palaeoclimatology of the Late Pleistocene and Holocene and tectonics.

Topics: *Active tectonics, geology, palaeoseismicity, earthquake, palaeoclimatology*

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7. Dr. Nguyen Bach Thao

I am senior lecturer at the Hanoi University of Mining and Geology (HUMG, Vietnam). I did my PhD in Hydrogeology at University of Avignon, France (2016) study on saltwater intrusion in coastal aquifers by coupling geophysics, isotope and numerical modeling approaches. Over 20 years of experience in doing research and teaching on groundwater and environmental hazards in Vietnam.

Topics of my research are saltwater intrusion, groundwater hydraulics and hydraulics tests, groundwater flow and transport numerical modeling, mine drainage and isotopes. Prior to my current position, I am Head of Hydrogeology Department; Head of Hydrogeology and Environment laboratory (Centre for Excellence in Analysis and Experiment (CEAE).



Topics: *Hydrogeology, groundwater hydraulics, groundwater modeling, saltwater intrusion*

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8. Assoc. Prof. Dr. Mohd Ashraf Mohamad Ismail



Dr Mohd Ashraf is an Assoc. Prof. at School of Civil Engineering, USM. He obtained his Bachelor of Civil Engineering from USM in 2004 and pursues his Master in Geological Engineering at Gadjah Mada University under the sponsorship of AUNSEED Net JICA Project. In 2010, he obtained his PhD in Geotechnical Engineering in the research area of Underground Energy Storage and Hydrodynamic Containment for hydrocarbon storage cavern from

Kyoto University under JICA scholarship.

He has conducted researches specializing in various aspects of geotechnical and rock engineering such as, evaluation of rock over stressing in hard rock tunnel, urban tunneling, slope stability analysis, geohazard and geophysical applications in Civil and Geological Engineering. Recently he has involved in aerial mapping and photogrammetry analysis using UAV for building maintenance, landslide forensic and landslide disasters evaluation, construction planning and progress monitoring including landfill and quarry assessment. He has been integrating UAV technology and reality modelling into his teaching and research interests since 2015.

Topics: *Geotechnical and rock engineering, tunnel engineering, slope stability analysis*

E-mail: ceashraf@usm.my

9. Assist. Prof. Dr. Pipat Laowattanabandit, Ph.D.

Currently, I am a lecturer and researcher at Department of Mining and Petroleum Engineering, Chulalongkorn University, Thailand. My main professional fields are in geological engineering, rock engineering, mining engineering, and underground excavation.

Apart from academic works, I have been also involved in a number of actual engineering practices, mainly in mining and civil engineering projects.



Topics: *Geological engineering, mining engineering, rock engineering, underground excavation*

E-mail: Pipat.L@chula.ac.th

10. Dr. Phetnakhone Xaixongdeth



I am a lecturer at Environmental Engineering, Faculty of Engineering of National University of Laos. Recently, I am coordinator of research group of Environmental Engineering, and I do research on treatment arsenic groundwater by brick and coconut coal.

I graduated PhD from Gadjah Mada University and Hokkaido University on geochemistry. I have been studying the mobility of copper from batik painting industry through unsaturated soils in past 5 years.

Topics: *Hydrogeology, heavy metal contamination, geochemistry*

E-mail: phetxai@gmail.com

11. Esti Anantasari, MA.

Esti Anantasari is an anthropologist at the Center for Asia Pacific Studies, Universitas Gadjah Mada, Indonesia. She has experience in understanding the mechanisms of local knowledge and practices and how these inform disaster preparedness, policy development and gender relationships. She is part of the StIRRDR, a local government capacity-building project in Indonesia which collaborated with GNS Science New Zealand.



Topics: *Local knowledge, disaster risk reduction, climate change adaptation, gender*

E-mail: esti.anantasari@ugm.ac.id

12. Sara Pena Castellnou, Ph.D. (cand.)



I am a Ph.D. student at the Institute for Neotectonics and Natural Hazards (NUG) of the RWTH Aachen University (Germany). I have studied Geology and specialized in Geological Hazards at the University of Barcelona (Spain). My research interests are active tectonics and earthquake geology. Previously, I have

worked in the Eastern Betic Shear Zone, a fault system located in the southeast of the Iberian Peninsula. Currently, my Ph.D. research focuses on the tectonic geomorphology of the Opak Fault System (Yogyakarta, Indonesia).

Topics: *Active tectonics, earthquake geology*

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13. Claude Thielen, Ph.D. (cand.)

I am a Ph.D. researcher at the Institute of Hydrogeology at the RWTH University in Aachen and currently researching the hydraulic and hydrochemical properties of groundwater flow through fractures in calcite cemented sandstone which is the most important aquifer in my home country Luxembourg, the Luxembourg-Sandstone-Aquifer. Born and raised in Luxembourg, I moved to Germany for my Bachelor and Master Degree in the field of Applied Geosciences after which I started my doctoral studies and work as a research associate since the beginning of 2018.



I have studied catchments and available groundwater resources in Luxembourg and did field tests of aquifer hydraulics and hydrochemical analyses. At RWTH I teach courses in the application of GIS for hydrogeology among others.

Topics: *Hydrogeology, hydrochemical of groundwater flow, GIS*

E-mail: thielen@hydro.rwth-aachen.de

14. Dr. Ir. Heru Hendrayana



Heru Hendrayana is an Associate Professor at Laboratory of Environmental Geology, Department of Geological Engineering, Faculty of Engineering, Universitas Gadjah Mada. He holds doctoral degree from RWTH Aachen University, Germany in 1993 with thesis "hydrogeology and groundwater extraction in Yogyakarta, Indonesia". His specialties are in hydrogeology

and groundwater management. Currently, Dr. Heru also serves as the Head of Department of Geological Engineering, Faculty of Engineering UGM.

In 2015, he initiated Groundwater Working Group (GWWG) as professional organization in groundwater, which he also serving as the chairman up to now. The GWWG positioned and served as the front liner for information and facilitator specifically in groundwater management, conservation and technological development. As being recognized by Faculty of Engineering UGM, government of Indonesia, practitioners, as well as local authorities and Indonesian society, GWWG conducted research activities, education and training, workshop, seminar and also publication which cover groundwater resource and management issues.

In GWWG, a key tool called MATA PERSADA as matrix assessment for groundwater protection and management is used for the above activities. MATA PERSADA consists of five major parameters i.e. Data and Information (DAT), Conservation and Management (KON), Utilization (GUN), Control (DAL), and Institute and Partnership (MIT). GWWG has introduced MATA PERSADA and already recognized in national level as well as international level, such as in forum of Singapore International Water Week (SIWW) and International Association of Hydrogeologist (IAH) held in Montpellier, France.

Topics: *Hydrogeology, groundwater management*

E-mail: heruha@ugm.ac.id

15. Dr. rer.nat. Doni Prakasa Eka Putra

Doni Prakasa Eka Putra is an Associate Professor at Laboratory of Environmental Geology, Department of Geological Engineering, Faculty of Engineering, Universitas Gadjah Mada. He obtained his doctoral degree from RWTH Aachen University in 2007 with thesis "The Impact of Urbanization on Groundwater Quality, A Case Study in Yogyakarta City, Indonesia". His specialties are in hydrogeology,



groundwater modeling and environmental geology.

He conducted research which covers groundwater contamination in urban area, groundwater flow modeling, geochemical fractionation analysis and hydrogeology assessment for mining area. Currently, he is also serving as the Vice Dean of GetIn-CICERO Joint Campus representing Universitas Gadjah Mada.

Topics: *Hydrogeology, groundwater modeling*

E-mail: putra_dpe@ugm.ac.id

16. Prof. Teuku Faisal Fathani, Ph.D.



Teuku Faisal Fathani is a professor, lecturer and researcher in the Department of Civil and Environmental Engineering, Faculty of Engineering Universitas Gadjah Mada. He holds Doctor of Philosophy (Ph.D.) majoring in geotechnical engineering from Tokyo University of Agriculture and Technology, Japan in 2005. He also teaches geotechnical engineering and disaster

management technology in Department of Geological Engineering, Magister of Natural Disaster Management and Magister of Disaster Management in UGM.

He is currently serving as Director of Center for Disaster Mitigation and Technological Innovation (Gama-Inatek) as center of excellence for research in disaster mitigation and technological innovation, that recognized nationally by Ministry of Research, Technology and High Education of Indonesia. He has five patents in landslide monitoring and early warning. His research interest is in numerical modeling for landslide and debris flow, landslide monitoring and early warning system, landslide mitigation, hazard and risk mapping.

He is also currently serving as vice president of the International Consortium on Geo-Disaster Reduction (ICGdR), Director of World Center of Excellence on Landslide Disaster Reduction, International

Consortium on Landslide (ICL), Co-Director of StIRRRD (Strengthening Indonesian Resilience: Reducing Risk from Disasters), and Director of Master Program in Disaster Management (MMB) Graduate School UGM. He is the project leader for National and International Standard on Multi-disasters Early Warning System that has been published as SNI 8235:2017 and ISO 22327:2018 on Landslide Early Warning System.

Topics: *Geotechnical engineering, foundation engineering, landslides modeling, monitoring and early warning system*
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17. Dr. Eng. Wahyu Wilopo

Wahyu Wilopo is an Associate Professor at Laboratory of Environmental Geology, Department of Geological Engineering, Faculty of Engineering, Universitas Gadjah Mada. He obtained his doctoral degree from Kyushu University, Japan with thesis "Chemical and microbiological immobilization of arsenic and manganese by permeable reactive barrier". His specialties are in hydrogeology, groundwater geochemistry and remediation, engineering geology, landslides and environmental geology.



Currently, he is also serving as the head laboratory of geology in Department of Geological Engineering, Vice Director of Center for Disaster Mitigation and Technological Innovation (Gama-Inatek) as center of excellence for research in disaster mitigation and technological innovation. He also involved in the community-based and provincial government-based in policies and strengthening capacities towards disasters and groundwater resource.

Topics: *Hydrogeology, groundwater geochemistry, environmental geology, landslides*
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18. Dr. rer.nat. Wiwit Suryanto

Wiwit Suryanto is an Assistant Professor of Geophysics in the Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Gadjah Mada. He holds doctoral degree from Ludwig-Maximilians-Universitaet Muenchen in 2006 with thesis "Rotational motion in Seismology". His research interest in seismology, microearthquake, earthquake hazard, numerical method, computational seismology and signal processing.

He has been working on passive seismic for several practical applications, as for monitoring volcanic activity (with GFZ Postdam, Germany, IRDFrance), earthquakes monitoring (with Indonesian Nuclear Agency), hydrocarbon prospecting (Pertamina UTC), micro-earthquake for geothermal (PT. Supreme Energy) and seismic hazard mitigation. He is the member of SSA, SEG and AGU as well as HAGI. Now he is serving as the IRIS (Incorporated Research Institution for Seismology) representative of UGM.



Topics: *Seismology, microearthquake, computational seismology, passive seismic data analysis, earthquake hazard*

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19. Dr.rer.nat. Thomas Triadi Putranto

Thomas Putranto is an Assistant Professor and Researcher at Laboratory of Hydrogeology, Department of Geological Engineering, Diponegoro University. Currently, he is also serving as the head of



hydrogeology laboratory at his department. He obtained Master of Geological Engineering at Universitas Gadjah Mada, and holds Doctoral Degree from RWTH Aachen University, Germany. His specialties are in groundwater modeling and any other topics related to hydrogeological framework.

Topics: Hydrogeology, groundwater modeling

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20. Dr. Eng. Lucas Donny Setijadji

Lucas Donny Setijadji is an Assistant Professor at Laboratory of Mining and Mineral Resources, Department of Geological Engineering, Faculty of Engineering, Universitas Gadjah Mada. He obtained Doctoral of Engineering in Earth Resources Engineering from Kyushu University, Japan in 2005 with thesis "Geoinformation of island arc magmatism and associated earth resources: A case study of Java Island, Sunda Arc, Indonesia". His specialties are in petrology of igneous rocks, geology of mineral resources, geoinformation, mining system and GIS spatial analysis. He is currently also member of in International Society of Economic Geologists (SEG).



Topics: *Petrology, igneous rocks, economic geology, mining and mineral resources*

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21. Dr. Eng. Didit Hadi Barianto

Didit Hadi Barianto is an Assistant Professor at Laboratory of Paleontology, Department of Geological Engineering, Faculty of Engineering, Universitas Gadjah Mada. He obtained Doctoral of Engineering in Engineering Geology from Kyushu University, Japan in 2009.

His specialties are in geological analysis and remote sensing on stratigraphy, paleontology, palynology and quaternary geology. He is a member of Carbonate Study Group and Southern Mountain Karst Study Group of Indonesia.



Topics: *Petrology, igneous rocks, economic geology, mining and mineral resources*

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22. Dr. Gayatri Indah Marliyani



Gayatri Indah Marliyani is a Senior Lecturer and Researcher at Laboratory of Geology Dynamic, Department of Geological Engineering, Faculty of Engineering, Universitas Gadjah Mada. She obtained Doctoral of Geological Sciences from Arizona State University, USA in 2016, with thesis "Neotectonics of Java, Indonesia: Crustal Deformation in the Overriding Plate of an Orthogonal Subduction System". Her specialties are in active tectonics, earthquake geology,

tectonic geomorphology, structural geology and paleoseismology.

She is one of members in Geology Group in publishing the book of Earthquake Source and Hazard Map of Indonesia year 2017 by Research Center of National Earthquake and Research Center of Housing and Settlements under Ministry of Public Work and Housing, Government of Indonesia.

Topics: *Active tectonics, tectonic geomorphology, earthquake geology, paleoseismology*

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23. Dr. Haryo Edi Wibowo

Haryo Edi Wibowo is a Senior Lecturer at Laboratory of Geochemistry, Department of Geological Engineering, Faculty of Engineering, Universitas Gadjah Mada. He obtained Doctoral Degree from Hokkaido University in 2017. His specialties are in volcanology and petrology. He does research of volcanology, petrological and geochemical of volcanoes in Java Island such as Mt. Sundoro, Mt. Merapi, Dieng Volcanic Complex, and Mt. Semeru.



Topics: *Volcanology, petrology*

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24. Hendy Setiawan, Ph.D.



Hendy Setiawan is a Lecturer and Researcher at Laboratory of Environmental Geology, Department of Geological Engineering, Faculty of Engineering, Universitas Gadjah Mada. He holds Ph.D. from Department of Civil and Earth resources Engineering, Kyoto University, Japan in 2017 with thesis "Landslide Hazard Assessment on the Upstream of

Dam Reservoir” focusing on undrained dynamic ring shear tests integrated with numerical modeling and catchment water balance under Prof. Kyoji Sassa and Prof. Kaoru Takara.

He did research also in Disaster Prevention Research Institute (DPRI) of Kyoto University since 2011 up to 2017. His research interest covers landslide dynamics, geotechnical engineering, slope stability, earth-fill dam, tunnel engineering and water-related disaster prevention and mitigation. He conducted research of earthquake induced landslides e.g. hypothetical submarine megaslide in Suruga Bay, Japan (2011-2012), Aratozawa landslide, Japan (2012-2016), Kumamoto earthquake induced Minami-Aso landslides (2016-2017), Palu earthquake induced liquefaction and landslides in Central Sulawesi (2018-present); and also rainfall induced landslides such as Hiroshima case (2014), Kii Peninsula landslides (2015) and Brebes landslide of Central Java (2018-2019).

Topics: *Landslide dynamics and modeling, geotechnical engineering, engineering geology of dams and tunnels*

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25. Dr. Esti Handini

Esti Handini is a Lecturer and Researcher at Laboratory of Optical Geology, Department of Geological Engineering, Faculty of Engineering, Universitas Gadjah Mada. She obtained Doctoral Degree



from Kumamoto University in 2018 with thesis “Evaluating Subduction Signature in Java Arc Volcanics, Sunda Arc, Indonesia” under Prof. Toshiaki Hasenaka.

She teaches and doing research assistant in volcanology, geochemistry, and petrology. Her research interest is quantifying the input from subducting slab to the mantle wedge across and along Sunda arc, Indonesia. She develops geochemical models in order to understand the amount of

subduction components donated from both altered oceanic crust and marine sediment. She already worked on volcanic rocks from 15 volcanoes in central and eastern part of Java Island. She highly interested also in the study of climatic impact of volcanoes in the present, future, and past.

Topics: *Petrology, volcanology*

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26. Budiarjo, M.Eng. (Dr.cand.)

Budiarjo is a Lecturer and Researcher at Geophysics Laboratory, Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Gadjah Mada. He obtained Master in Geology Engineering (M.Eng.) from Department of Geological Engineering UGM (2019) and now currently pursuing Doctoral Degree in the same department. He teaches, manages education and research center in Geophysics Laboratory since 2014. His research interest covers analysis and modeling of hydrogeology and geophysics, with specialties in acquisition, processing, modeling and analysis data and geophysics and geology through Matlab, Surver, Voxler, GlobalMapper and RockWork. In addition, he is willing to achieve and learn something novel, which related with management, information public and leadership.

Topics: *Hydro-geophysics modeling, hydrogeology*

E-mail: budiarjo@mail.ugm.ac.id



List of Participant

No.	Name	University	Country
1.	Sota Tsujitani	Hokkaido University	Japan
2.	Hiroki Ojima	Hokkaido University	Japan
3.	Daiki Shimazui	Hokkaido University	Japan
4.	Hiroaki Kamegamori	Hokkaido University	Japan
5.	Muhammad Najmi bin Mohamad Ali Mastor	Universiti Teknologi Malaysia	Malaysia
6.	Vynotdni Rathinasamy	Universiti Teknologi Malaysia	Malaysia
7.	Nurizaty binti Zuhan	Universiti Teknologi Malaysia	Malaysia
8.	Mohd Faiz bin Mohammad Zaki	Universiti Sains Malaysia	Malaysia
9.	Sharan Kumar Nagendran	Universiti Sains Malaysia	Malaysia
10.	Nway Htway Lwin	University of Yangon	Myanmar
11.	Nwai Oo Yin	University of Yangon	Myanmar
12.	Shumawa	University of Yangon	Myanmar
13.	Nur Hanifah	Universitas Diponegoro	Indonesia
14.	Dhinar Luhung Anggita	Universitas Diponegoro	Indonesia
15.	Rheza Farhan Hidayat	Universitas Diponegoro	Indonesia
16.	Ariq Mufid Albari	Universitas Diponegoro	Indonesia
17.	Arif Febrianto	Universitas Diponegoro	Indonesia
18.	Mai Cong Nhut	Ho Chi Minh University of Technology	Vietnam
19.	Simon Bernard	RWTH Aachen University	Germany
20.	Nicole Michaela Grevenstein	RWTH Aachen University	Germany
21.	Ben Juan Peeters	RWTH Aachen University	Germany

22.	Katharina Schlüter	RWTH Aachen University	Germany
23.	Natalie Drießen	RWTH Aachen University	Germany
24.	Meret Görgens	RWTH Aachen University	Germany
25.	Simone Aschenbrenner	RWTH Aachen University	Germany
26.	Felix Fahrenbach	RWTH Aachen University	Germany
27.	Jessica Celine Timm	RWTH Aachen University	Germany
28.	Lisa Miriam Müller	RWTH Aachen University	Germany
29.	Jacqueline Baumgärtner	RWTH Aachen University	Germany
30.	Lena Kaempfner	RWTH Aachen University	Germany
31.	Berna Balik	RWTH Aachen University	Germany
32.	Luisa Helm	RWTH Aachen University	Germany
33.	Jana Mareen Schreiber	RWTH Aachen University	Germany
34.	Gina Querengässer	RWTH Aachen University	Germany
35.	Max Wette	RWTH Aachen University	Germany
36.	Vanessa Maria Steinritz	RWTH Aachen University	Germany
37.	Maximilian Mohrdieck	RWTH Aachen University	Germany
38.	Nikolas Wittkowski	RWTH Aachen University	Germany
39.	Reno Manggalajati Athallah	Universitas Gadjah Mada	Indonesia
40.	Laily Fidya	Universitas Gadjah Mada	Indonesia
41.	Raden Aditya Aryo Wicaksono	Universitas Gadjah Mada	Indonesia
42.	Muhammad Naufal Dzaky	Universitas Gadjah Mada	Indonesia
43.	Premira Arifatul Khorida	Universitas Gadjah Mada	Indonesia
44.	Lalu Aliyya Tirangga Aji Buana	Universitas Gadjah Mada	Indonesia
45.	Gabriel Listyawan	Universitas Gadjah Mada	Indonesia
46.	Rilo Restu Surya Atmaja	Universitas Gadjah Mada	Indonesia

Working Group

Field work session for the International Summer Field Course in Geoscience 2019 “Fire and Water – Volcanism, Groundwater and Society” will be held in **Bayat Geological Field Campus and its surrounding areas from 18 to 23 July 2019**. This session will be the focal point of this summer field course. Field work will be started from morning to late afternoon and ended with the evening lectures on each day. To smooth these activities, students will be arranged into several groups below with each topic, method and data evaluation. Briefing and coordination for this activity will be conducted soon when arrived in Bayat Geological Field Campus on 18 July 2013.

Gr	Topics	Methods	Data Evaluation	Supervisor/ Assistant
1	Groundwater level, contour map, west section	Level meter, dGPS	Geostatistics	Claude Thielen et al.
2	Groundwater level, contour map, east section	Level meter, dGPS	Geostatistics	Esti Handini et al.
3	Groundwater hydro-chemistry, west section	Water sampling, in field lab	Water balance, typing	Thomas Rüde et al.
4	Groundwater hydro-chemistry, east section	Water sampling, in field lab	Water balance, typing	Thomas Putranto et al.
5	Hydro-stratigraphy	Evaluation of rocks-conductivity, UAV	Regional map of hydrogeological units	Doni Prakasa Eka Putra, Didit Barianto, Rilo Restu Surya Atmaja

6	Mapping structure faults, fractures and joints	Terrestrial scanning	Pol projections, rose diagrams, aperture	Gayatri Marliyani, Sara Pena Castellnou
7	Mapping landslides, mass movement hazard	Mapping, dGPS, drone	GIS hazard map	Wahyu Wilopo, Hendy Setiawan, Egy Erzagian
8	Geoelectrical profiling (3 lines)	Wenner lines	Geoelectrical subsurface modelling	Budiarjo, Ekrar et al.

Detail Rundown of Summer Field Course 2019

Time	Activities	Location/ Remarks
Monday, 15 July 2019		
09:20	Ready to Borobudur Temple	Griya Mahendra & other hotels
09:30 – 11:00	On the way to Borobudur Temple	
11:00 – 13:00	Cultural field trip in Borobudur Temple	Borobudur Temple
13:00 – 14:30	Lunch	
14:30 – 16:00	Back to Hotel/ Guest House	Griya Mahendra & other hotels
16:00 – 17:30	Refreshment/ Free time	
17:30 – 18:30	On the way to UGM campus	
18:30 – 21:00	Dinner and Welcome Reception	Main Building UGM
21:00	Back to Hotel/ Guest House	
Tuesday, 16 July 2019		
07:20	Check out, ready to Merapi volcano	Griya Mahendra & other hotels
07:30 – 08:30	On the way to Merapi volcano area	
08:30 – 11:00	Merapi Lava Tour with Jeep	Kaliadem, Alienstone
11:00 – 11:30	Break	
11:30 – 12:00	On the way to Merapi Museum	Merapi Museum
12:00 – 13:00	Excursion in Merapi Museum	
13:00 – 15:00	Lunch	
15:00 – 17:00	Trip to Semarang	
17:00	Check in, evening stay in Semarang	Amaris Hotel
Wednesday, 17 July 2019		
07:30 – 08:00	Depart to UNDIP	Amaris Hotel
08:00 – 09:30	Welcoming remarks at UNDIP	UNDIP campus
09:30 – 11:30	Field excursion to Brown Canyon	Rowosari, Tembalang
11:30 – 13:30	Lunch	
13:30 – 15:30	Field excursion to Jatibarang Reservoir	Gunung Pati

15:30 – 16:00	Back to Semarang city	
16:00 – 17:30	Area of <i>Kota Lama</i> (old city)	Semarang
17:30 – 18:00	Back to Hotel	Amaris Hotel
18:00	Evening stay in Semarang	
Thursday, 18 July 2019		
08:00 – 09:00	Check out hotel	
09:00 – 10:30	Depart to Klaten, Central Java	by Bus
10:30 – 12:00	Arrive in Bayat Geological Field Campus	Bayat Geological Field Campus, Klaten, Central Java
	Deploy & arrangement goods, tools, equipment	
12:00 – 13:30	Lunch time	
13:30 – 15:00	Briefing and technical explanation	
15:00 – 16:30	General Lecture 1: Prof. Tsutomu Sato	
16:30 – 18:00	Refreshment/ free time	
18:00 – 19:30	Dinner	
19:30 – 21:00	General Lecture 2: Dr. Phetnakhone Xaixongdeth	
21:00	Rest	
Friday, 19 July 2019		
07:00 – 08:30	Breakfast	Bayat Geological Field Campus, Klaten, Central Java
08:30 – 09:00	Deployment group to the field	
09:00 – 12:00	Field work: morning session	
12:00 – 13:00	Lunch	
13:00 – 15:00	Field work: afternoon session	
15:00 – 16:00	Back to Bayat Geological Field Campus	
16:00 – 16:30	Refreshment/compiling data/free time	
16:30 – 18:00	General Lecture 3: Prof. Toshifumi Igarashi	
18:00 – 19:30	Dinner	
19:30 – 21:00	General Lecture 4: Dr. Pipat Laowattanabandit	
21:00	Rest	

Saturday, 20 July 2019		
07:00 – 08:30	Breakfast	Bayat Geological field Campus, Klaten, Central Java
08:30 – 09:00	Deployment group to the field	
09:00 – 12:00	Field work: morning session	
12:00 – 13:00	Lunch	
13:00 – 15:00	Field work: afternoon session	
15:00 – 16:00	Back to Bayat Geological Field Campus	
16:00 – 16:30	Refreshment/compiling data/free time	
16:30 – 18:00	General Lecture 5: Dr. Hemanta Hazarika	
18:00 – 19:30	Dinner	
19:30 – 21:00	General Lecture 6: -tbd-	
21:00	Rest	
Sunday, 21 July 2019		
07:00 – 08:30	Breakfast	Bayat Geological Field Campus, Klaten, Central Java
08:30 – 09:00	Deployment group to the field	
09:00 – 12:00	Field work: morning session	
12:00 – 13:00	Lunch	
13:00 – 15:00	Field work: afternoon session	
15:00 – 16:00	Back to Bayat Geological Field Campus	
16:00 – 16:30	Refreshment/free time	
16:30 – 18:00	Compiling field work data and group discussion (FGD 1)	
18:00 – 19:30	Dinner	
19:30 – 21:00	General Lecture 7: -tbd-	
21:00	Rest	
Monday, 22 July 2019		
07:00 – 08:30	Breakfast	Bayat Geological Field Campus, Klaten, Central Java
08:30 – 09:00	Deployment group to the field	
09:00 – 12:00	Field work: morning session	
12:00 – 13:00	Lunch	

13:00 – 15:00	Field work: afternoon session	
15:00 – 16:00	Back to Bayat Geological Field Campus	
16:00 – 16:30	Refreshment/compiling data/free time	
16:30 – 18:00	General Lecture 8: Dr. Nguyen Bach Thao	
18:00 – 19:30	Dinner	
19:30 – 21:00	Compiling field work data and group discussion (FGD 2)	
21:00	Rest	
Tuesday, 23 July 2019		
07:00 – 08:30	Breakfast	
08:30 – 09:00	Deployment group to the field	
09:00 – 13:00	Additional field work (<i>if necessary</i>)	Bayat Geological Field Campus, Klaten, Central Java
13:00 – 14:00	Lunch	
14:00 – 15:00	Refreshment/compiling data/free time	
15:00 – 16:30	General Lecture 9: Assoc. Prof. Dr. Mohd Ashraf	
16:30 – 18:00	Group Presentation: Part 1	Each group 20 minutes including Q&A
18:00 – 19:30	Dinner	
19:30 – 21:30	Group Presentation: Part 2	Each group 20 minutes including Q&A
21:30	Closing Part 1 of Summer Course, Rest	
Wednesday, 24 July 2019		
07:00 – 08:30	Breakfast	Bayat Geological Field Campus, Klaten, Central Java
08:30 – 09:00	Loading & check out	
09:00 – 10:00	Trip to Gunungkidul (GK)	
10:00 – 11:30	Karst and cave excursion part 1	Goa Pindul, GK
11:30 – 13:30	Lunch	

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13:30 – 15:00	Karst and cave excursion part 2	Kali Suci, GK
15:00 – 16:00	Trip to Indrayanti Beach	
16:00 – 16:30	Check in Hostel	
16:30	Refreshment, free time, beach time, evening stay, rest (dinner start from 18:30)	Radika in Paradise, Indrayanti Beach
Thursday, 25 July 2019		
05:00 – 06:00	Loading & check out	
06:00 – 12:30	Trip to Pasuruan	Breakfast box
12:30 – 16:30	Excursion to Danone & Umbulan Spring Reservoir	Pasuruan
16:30 – 17:30	Move to Bromo area	
17:30 – 18:30	Check in & unloading	Hostel in Bromo
18:30 – 01:00	Dinner, refreshment, free time, evening stay in hostel	
Friday, 26 July 2019		
02:00 – 03:00	Preparation for trekking	Hostel in Bromo
03:00 – 06:00	Sunrise hunting in Bromo	Bromo area
07:00 – 10:00	Jeep touring and excursion	
10:00 – 11:00	Breakfast	
11:00 – 12:00	Loading & check out	Hostel in Bromo
12:00 – 13:00	Move to Surabaya	
13:00 – 14:30	Lunch at local restaurant	Surabaya
14:30 – 15:30	Move to hotel	
15:30 – 16:30	Check in & unloading	Hotel in Surabaya
16:30 – 18:30	Refreshment, free time	
18:30 – 21:00	Dinner, Closing remarks	
21:00	Evening stay in Surabaya	
Saturday, 27 July 2019		
07:00 – 08:30	Breakfast	Hotel in Surabaya
08:30 – 09:00	Check out & loading	
09:00 – 12:00	Refreshment, free time	Museum Nasional Surabaya & surrounding city

12:00 – 14:00	Lunch, drop in the airport	Juanda International Airport
15:00	Back to Yogyakarta	

Remarks:

Detail rundown above can be changed or adjusted according to the weather, access, and updated conditions in the field.

Highlights of the Evening Lectures

Prof. Tsutomu Sato

Date : Thursday, 18 July 2019

Title : **Why do you measure pH of groundwater and wastewater on sites?**

Abstract:

If you want to study and monitor of groundwater and wastewater, pH is usually measured on site. Do you understand why you measure pH and why on site? In this lecture, importance of pH for understanding on geochemistry of groundwater and wastewater will be reviewed in terms of chemical speciation, adsorption, solubility of contaminants, and alkalinity of the water.

Pipat Laowattanabandit, Ph.D.

Date : Thursday, 18 July 2019

Title : **Geology applied in civil and mining engineering: A link for successful projects**

Abstract:

The application of geology to engineering practices is either science or art. It is important for young geologists to learn further how does the knowledge can applied in their future careers, especially in the field of civil and mining engineering. This lecture will demonstrate the link or the interface between geology and the engineering. In addition, some applications in geohazard mitigation will be described particularly respected to unbalance fire and water.

Prof. Toshifumi Igarashi, Dr. Eng.

Date : Friday, 19 July 2019

Title : **How do we remediate abandoned mine sites?**

Abstract:

My main research subjects are how to remediate reasonably the contaminated sites by heavy metals by considering their mobility in the environment. The remediation of closed mine sites and disposal sites of hydrothermally altered rocks is in my scope. I am now

expanding the research areas overseas because there are severely contaminated sites that directly affect human health. Thus, I am involved in the remediation projects in Zambia and Vietnam. The above picture was taken during the field work in Zambia. This site is contaminated by lead, and known as one of ten most polluted places in the world. I hope that young generation takes interest in the environmental issues not only in our own country but also in the other countries and contributes to the restoration of contaminated sites.

Dr. Phetnakhone Xaixongdeth

Date : Friday, 19 July 2019

Title : *-will be announced-*

Summary:

Prof. Hemanta Hazarika, Ph.D.

Professor, Faculty of Engineering

School of Interdisciplinary Science and Innovation

Kyushu University, Fukuoka, Japan

Date : Saturday, 20 July 2019

Title : **Geological and geotechnical aspects of extensive landslides during the 2016 Kumamoto Earthquake, Japan**

Abstract:

Chain events of 6.5 magnitude foreshock and 7.0 magnitude main shock (called the 2016 Kumamoto earthquake) that occurred within 28 hours in Kumamoto area, Japan, resulted in heavy damage to infrastructures and loss of lives due to large-scale landslides, slope failures and debris flows. This lecture will first describe the landslides related damage in volcanic soils that occurred in and around Aso caldera area during that earthquake. The lecture will also deal with a detailed case study on a landslide that occurred on a moderately inclined slope (inclination: 10° to 15°), composed of volcanic deposits. The objective of this case study was to elucidate the mechanism of slope failures in gentle slopes during the Kumamoto earthquake

from the perspectives of geology and geotechnics of volcanic soils. To that end, an integrated approach was adopted: collections of basic data through field survey, obtain borehole data of the failed and intact parts of the slope, conduct resistivity imaging at the crown of the slope and cyclic testing of collected soil samples (disturbed and undisturbed) in the laboratory. Deformation and failure of pumice layer situated above a non-permeable tephra layer was found to be the primary cause of such extensive earthquake-induced landslides in the gentle slope.

Esti Anantasari, M.A.

Date : Saturday, 20 July 2019

Title : **Understanding water as social and cultural representations: A case study from Indonesia**

Abstract:

Water is probably the only natural resource to touch all aspects of human civilization. The need and demand for water have been a driving force for health, for society, for economic prosperity, for cultural significance, and development throughout human history. The way water is used and valued constitutes an integral part of a society's cultural identity. Cultural differences play a key role in the way water is perceived, valued and managed in different societies. Water resources management strategies must take culture fully into account. Intercultural dialogue should be a guiding principle for raising awareness, promoting and developing educational tools.

Dr. Nguyen Bach Thao

Date : Monday, 22 July 2019

Title : **Groundwater resources in Vietnam: problems, management and protection**

Abstract:

Groundwater has been the precious natural resources and Vietnam is one of the countries where groundwater has been the main water

supply for a long time with increasing pumping volumes. Groundwater resources in Vietnam are abundant with the total potential exploitable reserves of the country's aquifers estimated at nearly 60 billion m³ per year. Nevertheless, in some parts the ongoing exploitation already reached the limits of the aquifer's capacity, which contributes to groundwater contamination, land subsidence and salinity intrusion, especially in the Mekong River Delta. The over-pumping with limited insights into groundwater systems, inappropriate planning of wells, weak protection and management policies could result in severe environmental impacts in many localities throughout the country. Therefore, this issue is challenging scientists and decision makers in order to satisfy the increasing water demand. This topic will provide an overview of the hydrogeology in the Vietnamese based on recently published and unpublished studies and the numerous evolving challenges in which groundwater deterioration especially in urban areas; groundwater contamination and salinization; land subsidence; increasing pressures on groundwater due to economic development, urbanization and climate change, challenges in water governance regime are of great concerns. To overcome such challenges, a number of strategies and initiatives are being taken in Vietnam including the improvement of legal framework and its enforcement; International and regional cooperation; the basic investigation, monitoring and prediction, planning; the public communication and education.

Assoc. Prof. Dr. Mohd Ashraf Mohamad Ismail

Date : Tuesday, 23 July 2019

Title : **2-D and 3-D Limit equilibrium rock slope stability evaluation using anisotropic material models**

Summary:

This presentation will highlight the 2-D and 3D effects on slope stability analysis by incorporating anisotropic materials model through 3-D limit equilibrium slope stability, Slide3 program. The methodology used in Slide3 is by extending the 2-D methods of slices which are based on satisfying force and moment equilibrium to a 3-D method of columns where forces and moments are solved in

two orthogonal directions. The application of generalized anisotropic strength allows the user to define the anisotropy based on dip/dip direction or deterministic weak surface (e.g. folded bedding strata). Each anisotropic plane or surfaces can be assigned by its own failure criterion such as Barton-Bandis or Mohr Coulomb while using Generalized Hoek Brown for the rock mass. Two case studies, (1) Open pit mine in Australia and (2) Rock slope along the open channel in Perlis, Malaysia will showcase ways on how to construct geometry fully in 3-D using UAV photogrammetry approach, incorporates anisotropic materials models and uses metaheuristic algorithms of cuckoo search and surface optimization to locate critical slip surfaces of any shape in 3-D. The results indicate that for rock slope stability assessment, the directional variations of anisotropic of the fractured rock mass must be treated properly because the failure mechanisms are dependent on the shearing direction relative to the angle of anisotropy of the rock mass concerned.

Highlights of the Locations

1. Merapi

Merapi has always been famous for being an active volcano in the heart of Java, the most populous island of Indonesia. The volcano is almost 3000 meters tall. A population map which was published in 2010 by Indonesian National Board for Disaster Countermeasure (BNPB) suggests that approximately 300,000 people from 8 sub-districts live in 10 km radius from Merapi summit and around 1 million in the whole flank area of the volcano.

The slope of Merapi is brimming with villages, something that is not uncommon here in Indonesian active or dormant volcanoes. For centuries, the fertile land in the slopes of volcano attracts people to live in the volcanic hazard zone. To these people, mostly farmers and stock farmers, Merapi is a familiar place that they call home. To some other people, Merapi is a bless as it provides high quality sand and stone deposits to mine. Some of the Merapi summit area is now part of Merapi National Park which is managed by Ministry of Environment and Forestry, which limits the activity of the local residents to a more secure zone.

Like other volcanoes in Indonesia, Merapi is culturally significant for the local residents. Merapi had one famous Gatekeeper who goes by the name Mbah Maridjan who was one of the victims of explosive eruptive events in November 2010. In previous eruptive events, the Gatekeeper holds a vital role in residents' evacuation process. In 2010 eruption, the Gatekeeper and some of his local resident followers declined being evacuated by the authorities which then lead to 275 fatalities.

Eruptive History of Merapi

Merapi is the Quaternary volcanic front of middle section of Java Island, Sunda arc, Indonesia, and corresponds to ~140 km depth of Wadati Benioff zone. This volcano, dubbed as the most active volcano in Indonesia, has erupted a wide range of magma compositions.

History of Merapi volcano can be summarized into four stages. The earliest activity of Merapi was thought to be Gunung Bibi, lies in the NNE of modern edifice of Merapi. Bherthommier (1990) and Camus et al. (2000) suggest that K-Ar age of a lava flow from this Pre-Merapi is 0.67 ± 0.25 Ma. This stage is thought to be Pre-Merapi activities.

The four stages of Merapi activities are the following.

1. The first stage of Merapi volcanism is Proto Merapi or Ancient Merapi which is represented by Turgo-Plawangan Hills in the south of Merapi (Berthommier, 1990; Newhall et al. 2000; Camus et al. 2000). This stage is thought to have begun 40000 yBP. The K-Ar age measurement of Plawangan Hill lava is dated to 135 ± 3 ka (Gertisser et al. 2012).
2. Middle Merapi period or Old Merapi is the second stage of Merapi volcanism. This period is represented by Batulawang and Gajah Mungkur (Bahar, 1984) which mainly produced scoria flow or St. Vincent-type nuee ardentes (Camus et al. 2004). Bherthommier (1990) suggests that Kukusan fault is a remnant of an avalanche caldera. Several ^{14}C dating results suggest that this stage may have started at 9630 ± 60 yBP (Newhall et al. 2000) or older 11792 ± 90 yBP (Gertisser, 2001).
3. Recent Merapi period, is thought to have started at approximately 2220 yBP and some of its last eruptions are recorded in 15th century (Camus et al. 2000).
4. Modern Merapi period which first recorded eruption was in 17th century (van Boekhold, 1972; Camus et al. 2000). This period is indicated by episodes of dome growth and collapse throughout its history. Many reports detail the 2006 eruption event (Charbonnier and Gertisser, 2008; Ratdomopurbo et al. 2013). This eruption is a classic example of Modern Merapi which is characterized by Merapi type eruption which produces dome collapse pyroclastic flows. Some of the famous modern eruptions were in 1992, 2006 (Figure 1), and 2010.

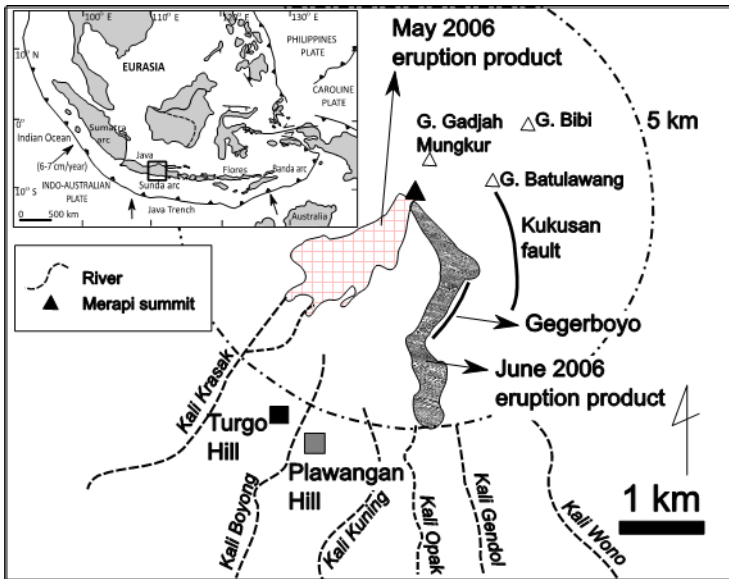


Figure 1. Map taken from Handini et al (2017). Delineated May and June 2006 eruption product distribution is modified from Charbonnier and Gertisser (2008). G stands for Gunung and Indonesian word for mountain. Kali is an Indonesian word for river.

Volcanic Hazard

Despite its reputation as one of the most dangerous volcanoes in the world, Merapi's historical eruption is mostly VEI 2 and 3 eruptions, with occasional VEI 1 and 4. Some of the last eruptions were in January 1992, March 2006, October 2010, November 2013, and March 2014. The latest eruption was in May 2018 which is preceded by a phreatic eruption.

Most of Modern Merapi eruptions produce dome-collapse pyroclastic flows which most of the time flow to the southern and southeastern valleys of the volcano. Another type of common volcanic hazard in Merapi is lahar or mudflow (yellow colored river area in Figure 2). Unlike the pyroclastic flow, lahar will usually flow to the rivers in the western and southern parts of the volcano. Sabo

dams were built in the upper section of these rivers to reduce the impact of lahar flow.

Volcanology Agency of Indonesia (PVMBG) and Indonesian National Board for Disaster Countermeasure (BNPB) have published digital map of Disaster Prone Area or Kawasan Rawan Bencana (abbreviated to KRB, shown in Figure 2).

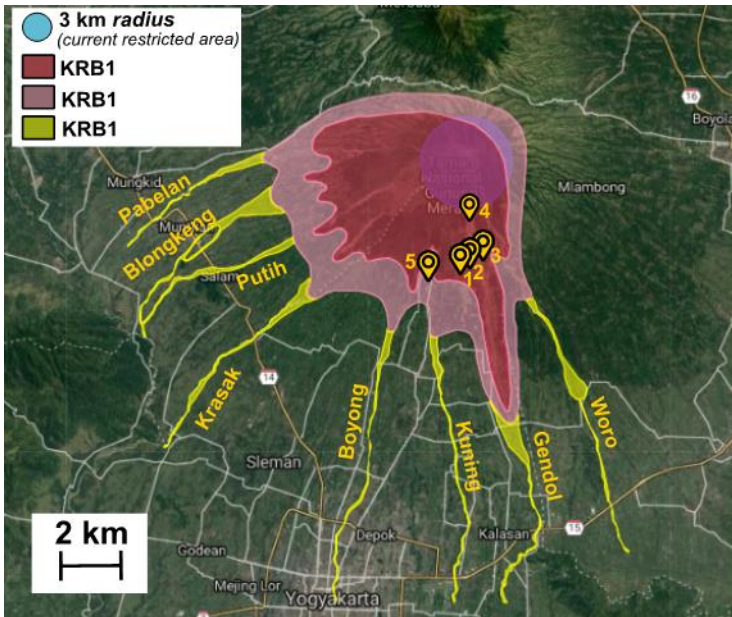


Figure 2. Map is modified from digital map of Disaster Prone Area (Kawasan Rawan Bencana or KRB) published by Volcanology Agency of Indonesia (PVMBG) and Indonesian National Board for Disaster Countermeasure (BNPB). Number 1 to 5 corresponds to locations we visit during the jeep lava tour.

What you will see on the lava tour

1. “Omahku Memoriku” Museum

This place refers to location number 2 of Figure 2. This museum’s name literally translates into ‘My House, My Memory’. The museum is managed privately by local residents who were directly affected by November 2010 eruption. This museum was formerly a family residence which preserves the aftermath of the farthest reach of pyroclastic flow in the modern eruption of Merapi.



Figure 3. This museum is run by local and is location number 2 on figure 4. (Photo source: <https://www.gudeg.net/direktori/7742/museum-sisa-hartaku-ii-omahku-memoriku.html>).

Some of the eruptive events in the early 2000s produce pyroclastic flows which reach as far as 6 to 7 km from the summit. In November 5, 2010, however, the farthest pyroclastic flow is approximately 15-16 km from the summit. Interestingly, this whole area was actually swept by the ash cloud, not by the pyroclastic flow itself. This particular eruption also took live of a famous faithful Gatekeeper of Merapi who goes by the name “Mbah Maridjan”.

2. *Alien stone*

The alien stone was actually a large boulder product of 2010 eruption. Some very fortunate and chosen people can see a “face” in the stone (Photo A). From this location we can look into local scale of sand and stone mining in the Kali Gendol (Kali is a Javanese word for River).



Figure 4. (A) An alien face and therefore the name is “alien stone”. (B) Ongoing sand and stone mining. Photo credit for A is <http://www.jeepwisata-merapi.com/2015/03/ objek- wisata- gunung>

[-merapi.html](#) and for B is <http://cermin-jayaperkasa.blogspot.com/2016/12/paket-lava-tour-merapi-wisata-merapi.html>.

3. *Bunker Kaliadem*

In this site, we can see a bunker covered by product of 2006 eruption. This VEI-1 scale eruption took lives of 2 volunteers who hid in the bunker during the eruptive event. The bunker was intended to avoid lahar.



Figure 5. Bunker Kali Adem Merapi. Photo credit for A is http://www.jeepwisatamerapi.com/2015/03/objek-wisata_gunung_merapi.html.

2. Mount Merapi Museum

The museum houses many photos and volcanics from historical eruptive events. We can see closely some records of the large eruption in historical time. The museum is managed by local government and Volcanological Agency of Indonesia (PVMBG).



Figure 6. Mount Merapi Museum is location number 5 on figure 2.
(Photo source: <https://bonvoyagejogja.com/museum-gunung-merapi-wisata-membangun-kesadaran-tanggap-bencana/>)

3. Borobudur Temple

Borobudur is the largest Buddhist temple which was built during Syailendra Dynasty in 650-1025 CE. The temple is now a UNESCO World Heritage Site. This temple is located around 40 km to the northwest of Yogyakarta, in an area between Sundoro and Merapi volcanoes. This temple was actively used to perform pilgrimage and Buddhist rituals in the 14th and 15th centuries CE. The temple was soon abandoned as many Javanese converted to Islam. It was rediscovered in 1814 CE and has undergone years of restoration in the 1970s and 1980s.



Figure 7. Borobudur temple. This temple is sometimes referred as Barabudur. (Photo source: (<https://www.ancient.eu/Borobudur/>).

4. Universitas Gadjah Mada

Universitas Gadjah Mada (UGM) is a national research university located in Yogyakarta and one of the largest and the oldest universities in Indonesia. The university is named after Gadjah Mada, the leader of Majapahit Empire which was prosperous in a 14th century Java. This university was founded on 19 December 1949. As of February 2019, UGM has 47,689 total students which enrolled in 18 faculties. The campus of Universitas Gadjah Mada is in an area of 357 hectares at around 30 km in the south of Merapi Volcano.



Figure 8. Balairung, one of the main and oldest buildings of Universitas Gadjah Mada. This building now serves as the university's central administration office. (Photo source: <https://ugm.ac.id/id/tentang>)).

5. Universitas Diponegoro

Universitas Diponegoro (UNDIP) is a public university in Semarang, the capital of Central Java province. It was officially founded in 9 January 1957 as a private university by Semarang University Foundation.



Figure 9. Faculty of Engineering, Universitas Diponegoro, (Photo source: <https://um.undip.ac.id/fakultas/detail/3>)

6. Brown Canyon

Brown Canyon is actually a part of Damar Formation (QTd, in Figure 10A), a Quaternary rock formation which consists of tuffaceous claystone, volcanic breccia, sandstone, tuff, and conglomerate. Lahar deposit is observed in places. The lithologies suggest a non-marine depositional environment. This formation overlays a wide area in the northern part of Jawa, extending from Semarang all the way to Batang. The area is a remnant of a local scale sand and stone mining.

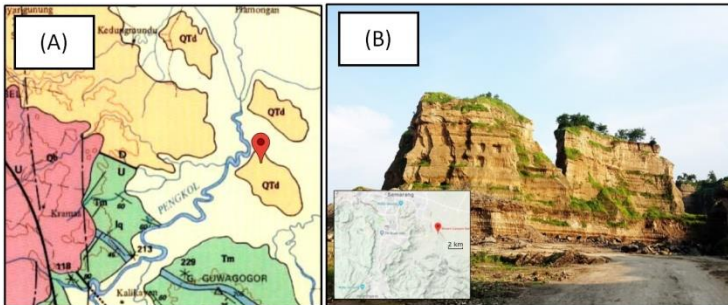


Figure 10. (A) Geological map of Brown Canyon area. (B) The abandoned mining site is now a tourist spot. (Photo source: https://id.wikipedia.org/wiki/Berkas:Brown_Canyon_1.jpg).

7. Kota Lama Semarang

Kota Lama Semarang literally translates into Old City of Semarang. The Old City was the main trading center of Semarang in the 19th to 20th century. This area is often called Outstadt or Little Netherland. Like other cities which were Dutch colony, fortifications were also built in the area as a military center.



Figure 11. One of the buildings in Kota Lama Semarang (https://id.wikipedia.org/wiki/Berkas:Kota_Lama_Semarang_Central_Java.jpg).

8. Jatibarang Reservoir

Jatibarang water reservoir was mainly built in an effort to reduce floods in Semarang city area which occurred in 1970s to 1990s. The dam also supplies water and electricity to its surrounding cities. The lithology in this area mainly consists of sedimentary rock formations including Tm/Tmk (Miocene-Kerek Formation) and QTd (Quaternary-Damar Formation).

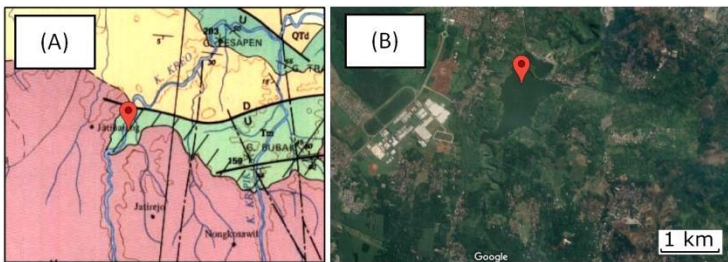


Figure 12. (A) and (B) Geological map of Jatibarang water reservoir.

9. Geology Field Station of UGM in Bayat

Geology Field Station of UGM is located in Bayat area, approximately 25 km to the east-southeast of Yogyakarta. The field station is managed by Geological Engineering Department of Universitas Gadjah Mada. The field laboratory is a home to mostly Paleogene and Neogene rock formations and some Pre-Tertiary metamorphic rocks which are relatively uncommon in Java Island. During the field course, the participants of the summer course will be staying in the geology field station (Figure 13, red star in Figure 14).

Geology of Bayat and Southern Mountain area

Most of the places that are going to be visited during the course are part of Southern Mountain area. This area is mostly pre-Quaternary and some area in the northern parts is overlain by Quaternary volcanic products from Merapi and Lawu (Figure.14).

Southern mountain area is mostly built by Pre-Quaternary volcanic products and limestones. The Pre-Quaternary volcanics are generated by the first cycle of magmatism in Java arc and is known as Old-Andesite Formation (van Bemmelen, 1949). Some of the volcanic facies from this age is represented by Kebobutak, Mandalika, Semilir, and Nglanggran Formations. These volcanics are overlain by calcareous rock formations which are mostly separated into Wonosari-Punung and Kepek Formations. Older limestone formation (Tew, Wungkal-Gamping Formation) is observed in the north of the younger calcareous rock formation. These rocks formations are underlain by the old metamorphic suites and sub-volcanic rocks which are outcropped in Kebo, G. Konang, and its vicinity.



Figure 13. Geological Field Station in Bayat

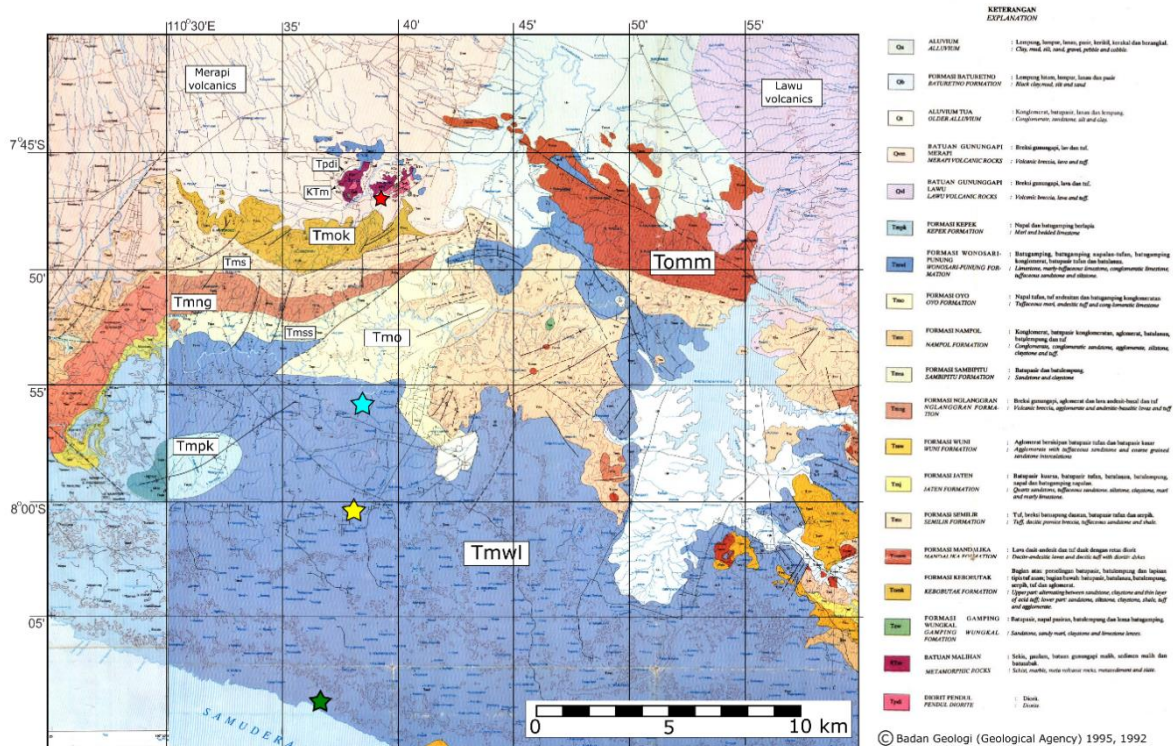


Figure 14. Geological map of Bayat and Southern Mountain area

10. Kali Suci, Pindul Cave, and Indrayanti Beach

These three locations that are going to be visited at the end of the field course series in Bayat are part of the Wososari-Punung Formation. These locations are shown in coloured star symbols in Figure 14 (yellow, light blue, and green for Kali Suci, Pindul Cave, and Indrayanti beach respectively). Some of the members of this formation are limestone, marly-tuffaceous limestone, conglomeratic limestone, tuffaceous sandstone and siltstone.

These locations are part of a large Karst system called Gunungsewu complex. Typical major karst morphology such as a complex of conical hills is well observed in this rock formation.

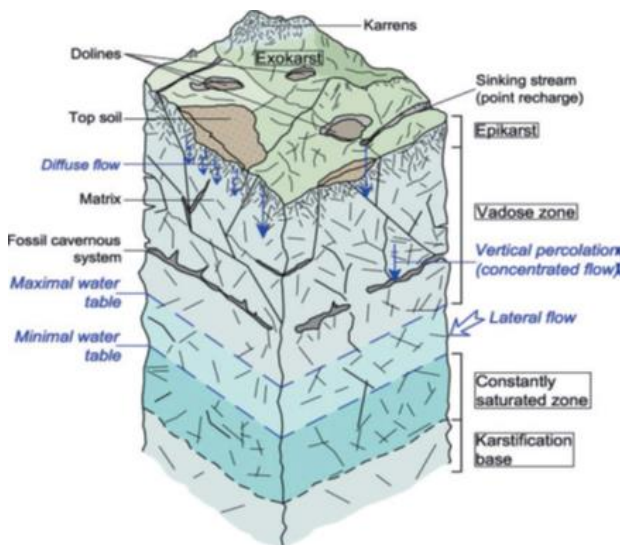


Figure 15. Schematic model of unconfined karst aquifer (Stevanovic, 2014, in Hermawan and Putra, 2016)

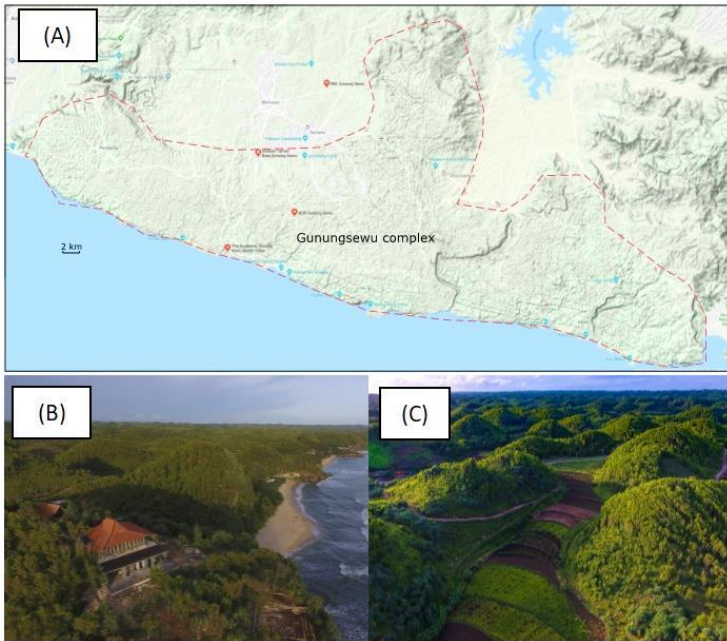


Figure 16. Schematic Major karst morphology in Gunungsewu complex. This complex is now a recognized geopark. (Photo source (B) and (C): <https://investigasi.tempo.co/karst-yogyakarta/index.html>, accessed 24 June 2019).

Endokarst cave develops well in the surface of Kali Suci. A 2D geoelectrical survey using the Wenner-Schlumberger method was conducted in order to map underground river in Kalisuci (Hermawan and Putra, 2016). The measured stratigraphy from this area shows that the cave wall consists of four types of limestones (i.e. packstone, wackestone, grainstone, and crystalline limestone). The result of the survey is shown in Figure 17.

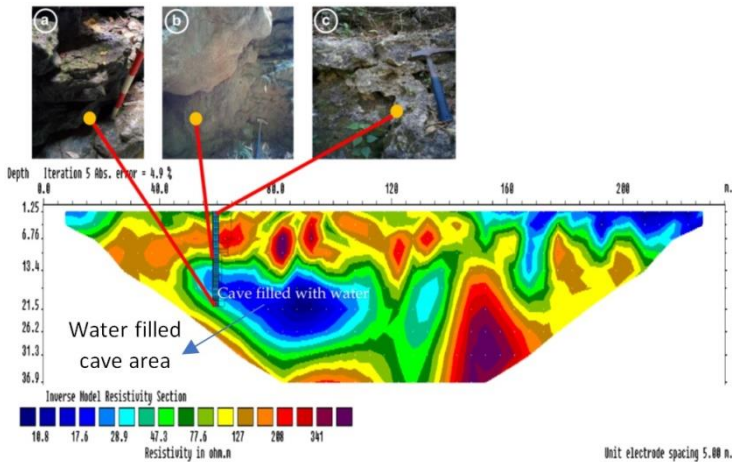


Figure 17. Cross-section of resistivity inversion result of Kali Suci with Wenner-Schlumberger configuration overlain with measured stratigraphy data. a) packstone-grainstone, b) wackestone, c) crystalline limestone. Figure is from Hermawan and Putra (2016)

Similar rock formation is observed all the way to the south to Indrayanti Beach where limestones are easily spotted.



Figure 18. Limestones of Wonosari-Punung Formation in Indrayanti beach. (Photo source: <http://www.kanaljogja.com/2018/07/the-beauty-of-indrayanti-beach.html>).

11. Umbulan Spring in Pasuruan

Umbulan spring is located in the northwest flank of Ngadisari-Tengger caldera. The rock formation in this area mainly consists of Quaternary pyroclastic products from Old Tengger caldera including volcanic breccia, tuff, lava, agglomerate, and lahar. Thick layers of volcanic/pyroclastic breccia such as observed in Aso caldera, most of the time, serve as aquifer layers. Umbulan spring debit reaches $4600 \text{ liter} \cdot \text{sec}^{-1}$. This spring supplies some of the largest cities in East Java including Surabaya, Sidoarjo, and Gresik.

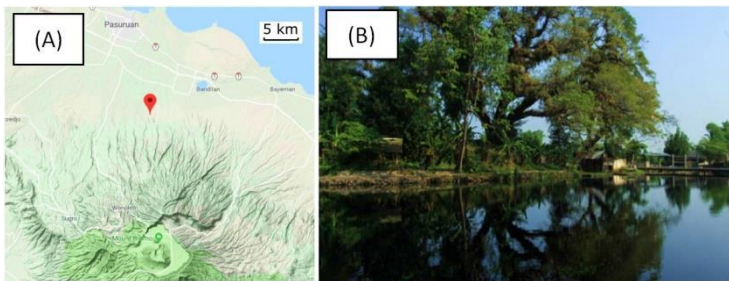


Figure 19. (A) Umbulan spring location. (B) One of the largest springs in the area (Photo source: https://www.gureta.com/post/_redupnya-air-surga-mata-air-kabupaten-pasuruan).

12. Mount Bromo (Tengger Caldera)

Mt. Bromo is part of Tengger Caldera, a Quaternary basaltic caldera located in the eastern section of Java arc. This caldera is part of a double volcanic chain with Semeru volcano as the volcanic front in Java arc system. Java arc itself is part of 3700 km-long Quaternary Sunda-Banda arc system which extends from Sumatra to eastern end of Flores. Bromo-Tengger Caldera is one of three calderas in Java Island. The other two calderas in the island are Dieng Caldera in the

middle section and Ijen Caldera in the eastern end section of Java arc. The population within 10 km radius is nearly 70,000.

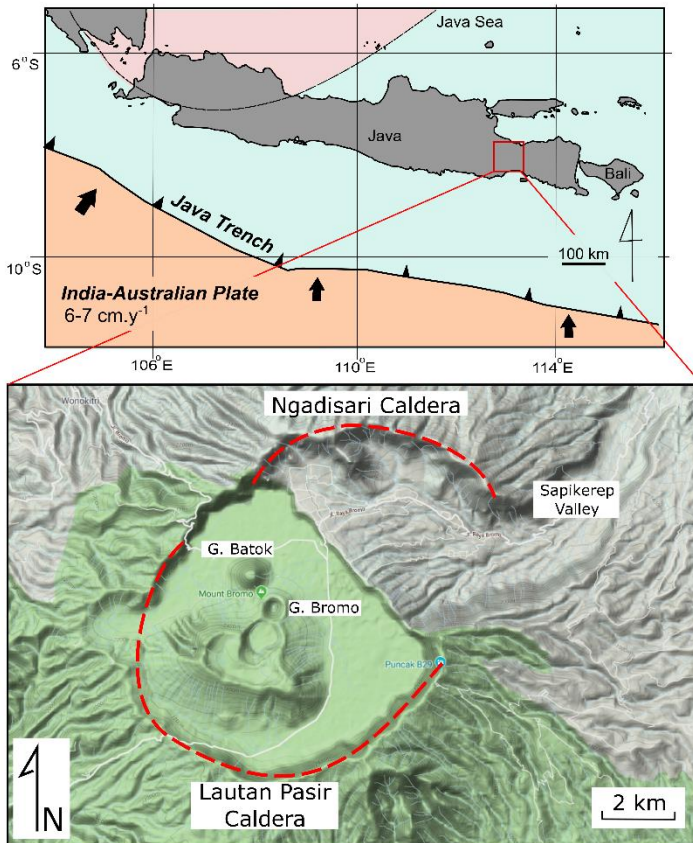


Figure 20. Bromo-Tengger caldera terrain map. The currently active Mt. Bromo is the small crater in the middle of Lautan Pasir caldera, the second caldera stage.

Bromo-Tengger caldera is 16-km wide (Figure 20). The volcanic complex consists of five strato-volcanoes truncated by a caldera. The

first caldera stage is Ngadisari caldera which formed about 150 ky ago at the northern end of the volcanic complex (GVP, 2013). The second caldera stage is Lautan Pasir caldera, which literally translates into Sandsea caldera, and is formed in the southwest of the complex. The second caldera stage has gradually formed since late Pleistocene (around 0.126 Ma). The youngest volcanic center in this complex is Bromo which is located in the central of the caldera (Figure 20).

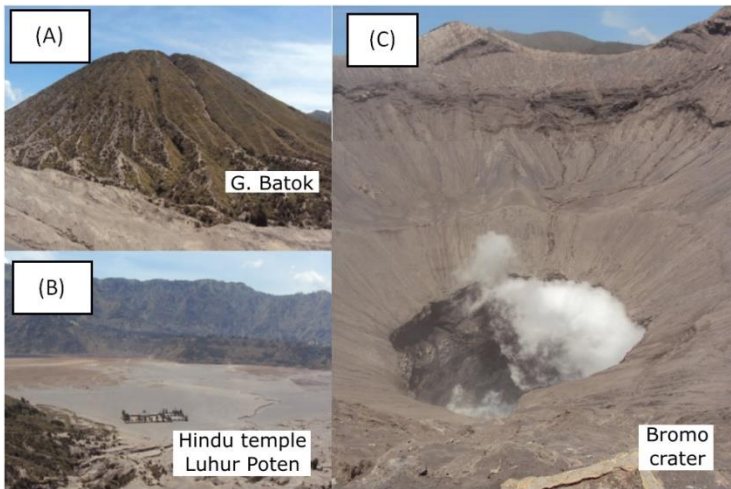


Figure 21. (A) Batok cone and (B) Hindu temple Luhur Poten seen from the hiking train to Bromo. (C) Bromo crater seen from the crater rim.

Most recent eruptive activities were on 24-30 April 2019. During this eruptive event, white plume as high as 500-600 m was seen above the crater. Prior to this eruptive event, another recent eruption was recorded began in November 2015 and lasted for nearly a year until December 2016. During these eruptive events, ash plumes occasionally affected the surrounding villages.

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