



First AOGS-RAC Webinar on  
***Initiatives in Regional Cooperation***

Wing Ip

January 27, 2021

# AOGS-RAC Mission

**The Regional Advisory Committee (RAC) is established to further fulfil the AOGS vision “In Asia for Asia and the World”. RAC members are AOGS Advocates who:**

- Promote and advise on the allocation of resources and services that will support geosciences research and scholarships in their home countries**
- Provide community-based support in planning and promoting AOGS strategic master plan and processes**

**RAC Mission is to develop AOGS into the largest non-profit, geoscience networking group in Asia and their main goals are to**

- Enhance membership and participation from the geoscientists in ASEAN and India**
- Promote multi-lateral academic interaction among various research labs**
- Identify opportunities that address diversity, equity and inclusion**

# AOGS-RAC (2020-2022)



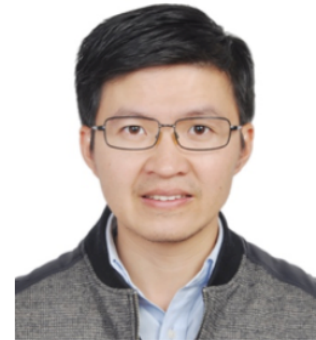
[Malaysia]  
**Zamri Zainal ABIDIN**  
*University of Malaya*



[India]  
**Punyasloke BHADURY**  
*Indian Institute of Science*



[India]  
**Jitendra GOSWAMI**  
*Physical Research Labor*



[China]  
**Jiansen HE**  
*Peking University*



**Wing-Huen IP**  
*National Central University*



[Indonesia]  
**Fajar Adi KUSUMO**



[Thailand]  
**Natt LEELAWAT**  
*Chulalongkorn University*



[Taiwan]  
**Lang-Huang LIN**  
*National Central University*

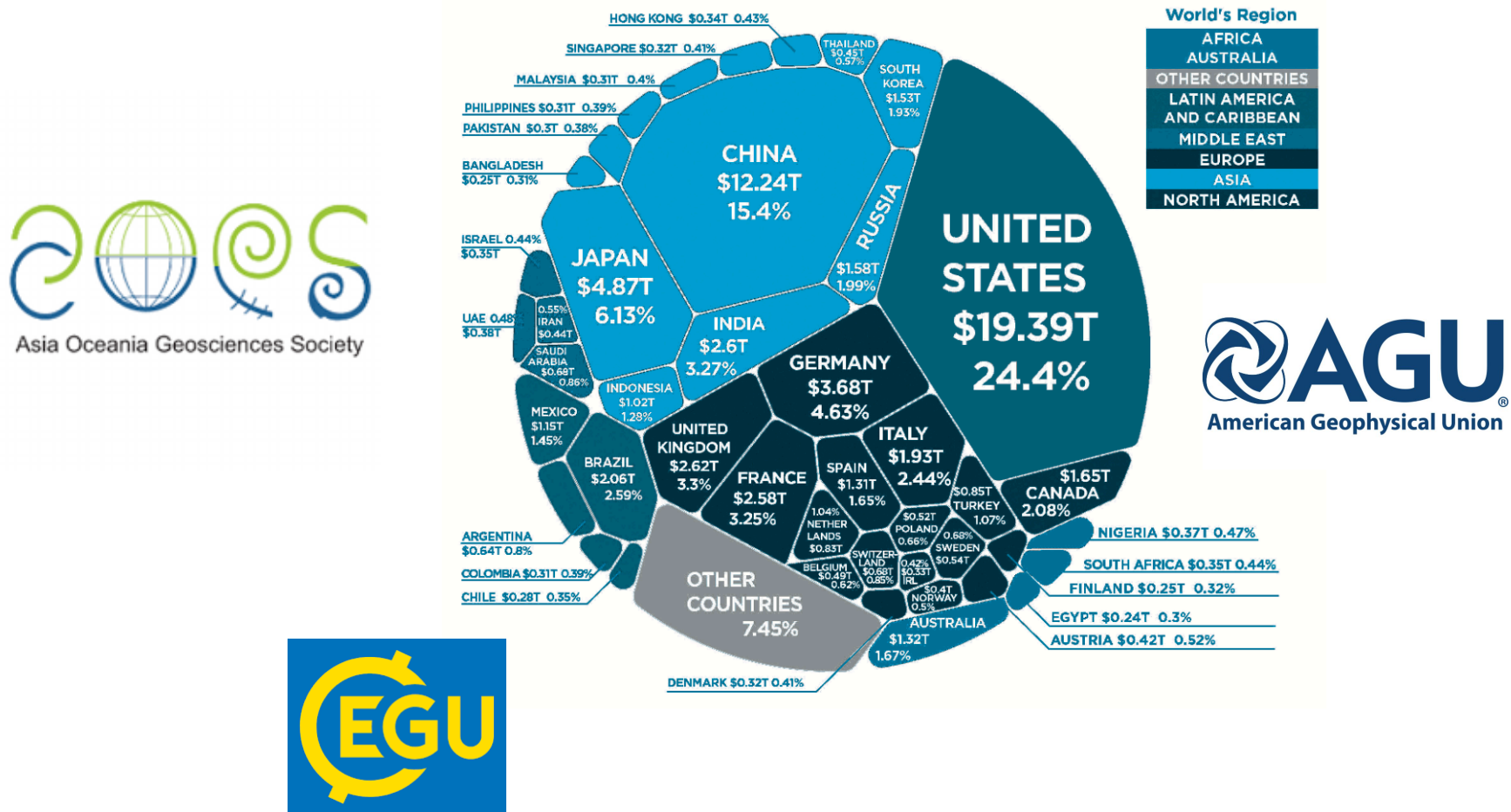


[Canada/Vietnam]  
**Van-Thanh-Van NGUYEN**  
*McGill University*



[Japan]  
**Takehiko Satoh**  
*Japan Aerospace Exploration Agency*

# The GDP Chart

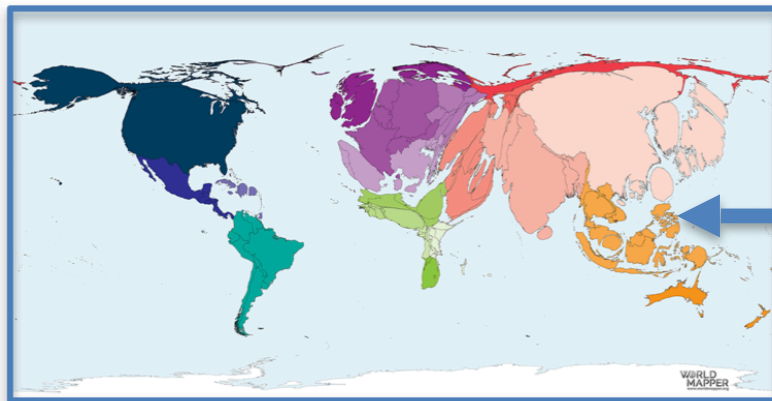
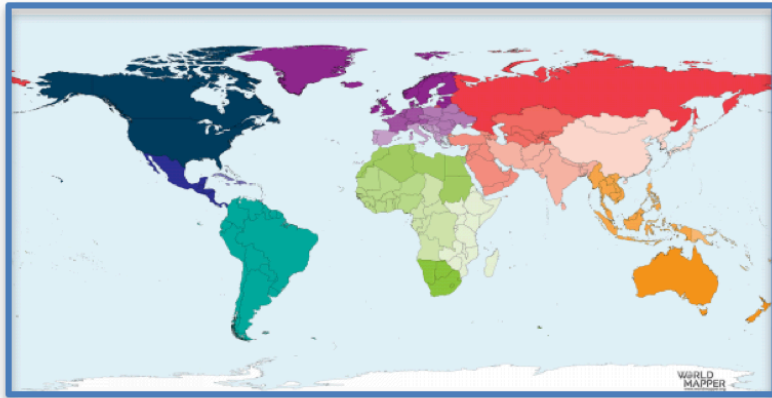


**Figure 1.** The Voronoi diagram of GDP distribution by country in 2017.

Figure source: <https://www.visualcapitalist.com/80-trillion-world-economy-one-chart/>



# The AOGS' New Map (in PPP)



<https://worldmapper.org/maps/gdp-2018/>

# Core Values

- Cooperative academic programs
- High-priority research topics for AOGS
- Scientific exchange and study opportunities
- Job opportunities
- Suggestions of topics for future scientific sessions

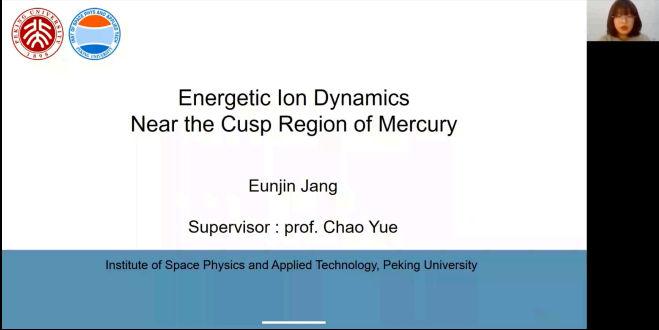
# Projects

- (1) Young Scientist Showcases Virtual Talks
- (2) Extended Abstracts/Proceedings
- (3) AOGS Satellite Meetings
- (4) Regional Cooperation Initiatives Webinar

# **(1) Young Scientist Showcases Project**

- Online talks by graduate students and early career researchers in Asia to introduce their works.
- Academic network building among young generation of Asian geoscientists.
- Development of scientific cooperation and mentorship across borders.

# (1) Young Scientist Showcases Project

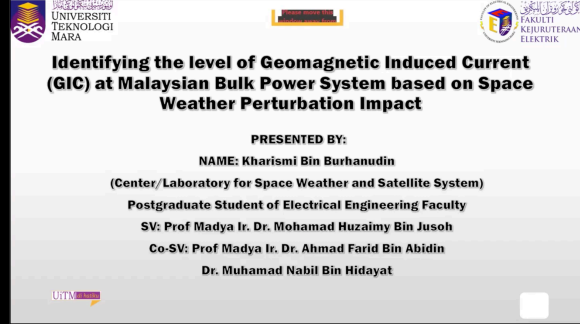


**Energetic Ion Dynamics  
Near the Cusp Region of Mercury**

Eunjin Jang

Supervisor : prof. Chao Yue

Institute of Space Physics and Applied Technology, Peking University



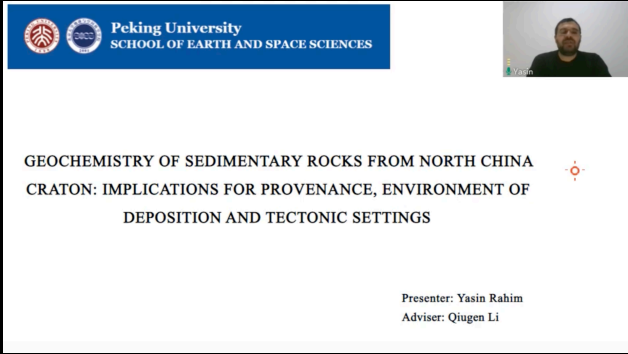
**Identifying the level of Geomagnetic Induced Current (GIC) at Malaysian Bulk Power System based on Space Weather Perturbation Impact**

**PRESENTED BY:**

**NAME:** Kharismi Bin Burhanudin  
(Center/Laboratory for Space Weather and Satellite System)

**Postgraduate Student of Electrical Engineering Faculty**

**SV:** Prof Madya Ir. Dr. Mohamad Huzaimy Bin Jusoh  
**Co-SV:** Prof Madya Ir. Dr. Ahmad Farid Bin Abidin  
**Dr. Muhamad Nabil Bin Hidayat**



**Peking University  
SCHOOL OF EARTH AND SPACE SCIENCES**

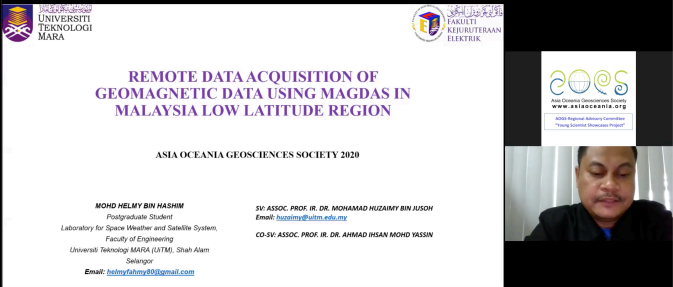
**GEOCHEMISTRY OF SEDIMENTARY ROCKS FROM NORTH CHINA  
CRATON: IMPLICATIONS FOR PROVENANCE, ENVIRONMENT OF  
DEPOSITION AND TECTONIC SETTINGS**

**Presenter:** Yasin Rahim  
**Adviser:** Qiugen Li



**Solar Radio Astronomy**

MOHD SHAZWAN MOHD RADZI  
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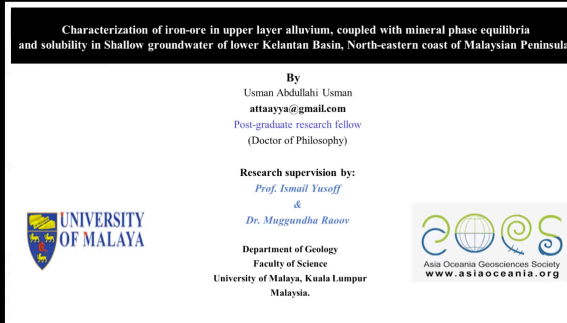
**REMOTE DATA ACQUISITION OF  
GEOMAGNETIC DATA USING MAGDAS IN  
MALAYSIA LOW LATITUDE REGION**

ASIA OCEANIA GEOSCIENCES SOCIETY 2020

**MOHD HELMI BIN HASHIM**  
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**CD-SV: ASSOC. PROF. IR. DR. AHMAD HANAN MOHD YASSIN**



**Characterization of iron-ore in upper layer alluvium, coupled with mineral phase equilibria and solubility in shallow groundwater of lower Kelantan Basin, North-eastern coast of Malaysian Peninsula**

**By**  
Usman Abdullahi Usman  
[attayya@gmail.com](mailto:attayya@gmail.com)  
Post-graduate research fellow  
(Doctor of Philosophy)

**Research supervision by:**  
*Prof. Ismail Yusoff*  
&  
*Dr. Muggundha Raoov*

**Department of Geology  
Faculty of Science  
University of Malaya, Kuala Lumpur  
Malaysia.**



# (1) Young Scientist Showcases Project

**Personal Information**

Name: Disyacitta Awanda  
Home country: Indonesia  
E-mail: disyaawanda@hotmail.com

**Education background:**  
2013-2018:  
• Undergraduate: Cartography and Remote Sensing, Faculty of Geography, Universitas Gadjah Mada, Indonesia.

2019-Present:  
• Master degree: Master Program of Remote Sensing Science of Technology, Center for Space and Remote Sensing Research, National Central University, Taiwan.



Disyacitta Awanda

**PERSONAL INFORMATION**

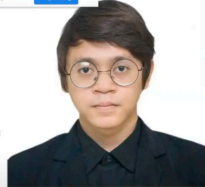
Monitoring Land Subsidence Induced by Groundwater Change Using Sentinel-1 and GRACE Satellite Observations

Yan Akhbar Pamungkas - Indonesian  
([yanakhbarpamungkas@cc.ncu.edu.tw](mailto:yanakhbarpamungkas@cc.ncu.edu.tw))

**Research Interests**  
Synthetic Aperture Radar (SAR), Landscape Evolution, Land Subsidence, Urban and Regional Planning, Tourism Management.

**Educational Background**  
2nd Year Master Student of Center for Space and Remote Sensing Research (CSRSR), National Central University, Taiwan (2019 – present)  
Bachelor degree of Urban and Regional Planning, Universitas Brawijaya, Indonesia (2013 – 2017)

**Working Experiences**  
Urban Planner (September 2018 – January 2019)  
Urban and Regional Scientist (2017-2018)




巴漢新

**Identifying The Seasonal Relationship between Aerosol Properties and Urban Heat Island (UHI) in Megalopolis Cities**

**Presenter: Debora Truly Marpaung**


**Advisor: Prof. Lin, Tang-Huang**

國立中央大學  
2020/12/04



Debora Truly




**Personal Information**



- Name: **PhD. DUONG THI LOI**
- Nationality: **VIET NAM**
- Occupation: **Lecturer, Cartography – Remote Sensing and GIS Department, Faculty of Geography, HNUE.**
- Email: [duongloi1710@gmail.com](mailto:duongloi1710@gmail.com)
- Interests: **geography, application of GIS and remote sensing**


**INTEGRATION OF GIS AND REMOTE SENSING FOR EVALUATING FOREST CANOPY DENSITY INDEX IN THAI NGUYEN PROVINCE, VIETNAM**

**Authors: Trung-Hieu Ha, Loi Duong Thi**  
University of Transport and Communications, Vietnam  
Hanoi National University of Education, Vietnam

27/10/17

**PERSONAL INFORMATION**



Full name: **Ha Trung Hieu**  
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Lecturer, Researcher at University of Transport and Communications, Vietnam

**Education background**  
- Undergraduate student and Master student in Civil Engineering at University of Transport and Communication, Vietnam  
- PhD student (2017-2020) Ph.D. Program for Civil Engineering, Water Resources Engineering and Infrastructure Planning, major: Geo-informatics – Feng Chia University, Taiwan

**Research interests:**  
- Civil Engineering  
- Time series data analysis  
- Geo-informatics technologies and applications

16/10/17

# (2) Extended Abstracts

EPSC Abstracts  
Vol. 13, EPSC-DPS2019-575-1, 2019  
EPSC-DPS Joint Meeting 2019  
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EPSC  
EPSC-DPS Joint Meeting 2019  
15–20 September 2019 | Geneva, Switzerland

## DSMC Simulation of Europa's Gas Plume

I. L. Lai(1), M. Rubin(1), J. S. Wu(2), and W. H. Ip(3)  
(1) Physics Institute, University of Bern, Sidlerstrasse 5, 3012 Bern, Switzerland (2) Department of Mechanical Engineering, National Chiao Tung University, Taiwan (3) Graduate Institute of Astronomy, National Central University, Taiwan (ian-lai@space.unibe.ch)

### Abstract

The evidence of the water vapor plume at Europa has been found by [1]. We adopt a DSMC (Direct Simulation Monte Carlo) method with the gravitational effect to investigate the gas expansion from the collisional region close to the Europa's surface to the free flow region. It allows us to study the deposition of different size of icy dust grains on the surface. In addition, we also extend the model of gas ejection from Europa to the Jovian system. We will show the gas torus around the orbit of Europa.

### 1. Introduction

The one of the target of JUICE mission, the Jovian icy moon, Europa, with a radius of 1560 km and a bulk density of 3.03 g cm<sup>-3</sup> covered by an icy crust has an albedo 0.64, one of the highest of Galilean moons. The vapor plume activity has been detected on Europa by the ultraviolet emissions of Hubble Space Telescope observations in November and December, 2012. It was suggested that two 200 km high plumes of water vapor with line-of-sight column densities of about 10<sup>20</sup> m<sup>-2</sup>. The two sources are located at the southern hemisphere. [2] and [3] presented a new transit observation of Europa that show a second event of plumes raising the possibility of a consistently active source of erupting material on Europa. [4] showed the evidence of plume on Europa by using the in-situ observations of the Plasma Wave Spectrometer on the Galileo spacecraft. The water vapor plume might be related to the existence of the subsurface ocean [5] which has the potential to harbor life. In this work, we will show the motion of dust grains in the gas plume and the gas transfer to the Jovian system.

### 2. Method

#### 2.1 DSMC Method

The DSMC method is proposed by [6] for solving the Boltzmann equation using direct simulation of particle collision kinetics, which can capture the non-equilibrium phenomena automatically and without any convergence problem. This method can be applied to all the rarefaction regions of gas flow from the collisional region to the free flow region. The ideal of DSMC method is to decouple the movement and collision phase by assuming a time step which is smaller than the mean collision time. By simulating a large amount of particles and taking average of steady flow samples, the gas flow distribution can be calculated. A 3D DSMC code, called PDSC++ [7], has been developed by using unstructured grid, variable time step scheme, and being parallelized for the cluster computing [8] [9].

#### 2.2 Motion of Dust Grains

The motion of dust grains in the gas flow is by the gravity force and the drag force which can be written as:

$$m \frac{d\mathbf{v}}{dt} = \frac{1}{2} C_d \sigma_d (\mathbf{v}_{gas} - \mathbf{v}_{dust}) |\mathbf{v}_{gas} - \mathbf{v}_{dust}| \rho_{gas} + \frac{GMm}{r^2} \hat{\mathbf{r}}$$

where  $m$  and  $M$  are the mass of dust grain and Europa,  $\sigma_d$  is the cross section of dust grains,  $C_d$  is the drag coefficient,  $\mathbf{v}_{gas}$  is the velocity of the local gas flow,  $\mathbf{v}_{dust}$  is the velocity of dust grains, and  $\rho_{gas}$  is the mass density of the local gas flow.

#### 2.3 The Three-body Problem

To apply the DSMC method to the gravitational field of Europa and Jupiter system. The equations of motion on a rotating coordinate system can be written as:

$$\begin{aligned} \dot{x} &= 2y + x - \frac{(1-\mu)(x-x_1)}{r_1^3} - \frac{\mu}{r_2^3}(x-x_2) \\ \dot{y} &= -2x + y - \frac{(1-\mu)y}{r_1^3} - \frac{\mu}{r_2^3}y \\ \dot{z} &= -\left(\frac{1-\mu}{r_1^3} + \frac{\mu}{r_2^3}\right)z \end{aligned}$$

where

$$\begin{aligned} \mu &= m_e/(m_e + m_p) \\ x_1 &= \mu, x_2 = 1 - \mu \\ r_1 &= [(x-x_1)^2 + y^2 + z^2]^{1/2} \\ r_2 &= [(x-x_2)^2 + y^2 + z^2]^{1/2} \end{aligned}$$

$m_e$  and  $m_p$  are the mass of Jupiter and Europa. The unit of time is  $2\pi/T_s$  and  $T_s$  is the orbit period of Europa ( $T_s = 85$  hr). The unit of length is normalized to the distance between Jupiter and Europa.

### 3. Result

Figure 1 shows an example of DSMC result of gas plume from Europa. Due to the gravitational effect, the gas stream line shows most of gas can't escape from the gravity of Europa. We assume a gas production rate of 500 kg/s with an initial velocity of 1 km/s and a temperature of 150 K. For the next step, we will tracking the trajectories of dust grains in the gas flow. The deposition of dust also will be modeled. In addition, we will also investigate the gas transfer for Europa to its gas torus by extending the DSMC model.

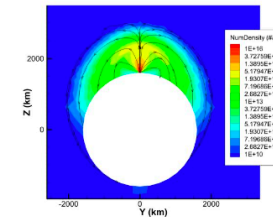
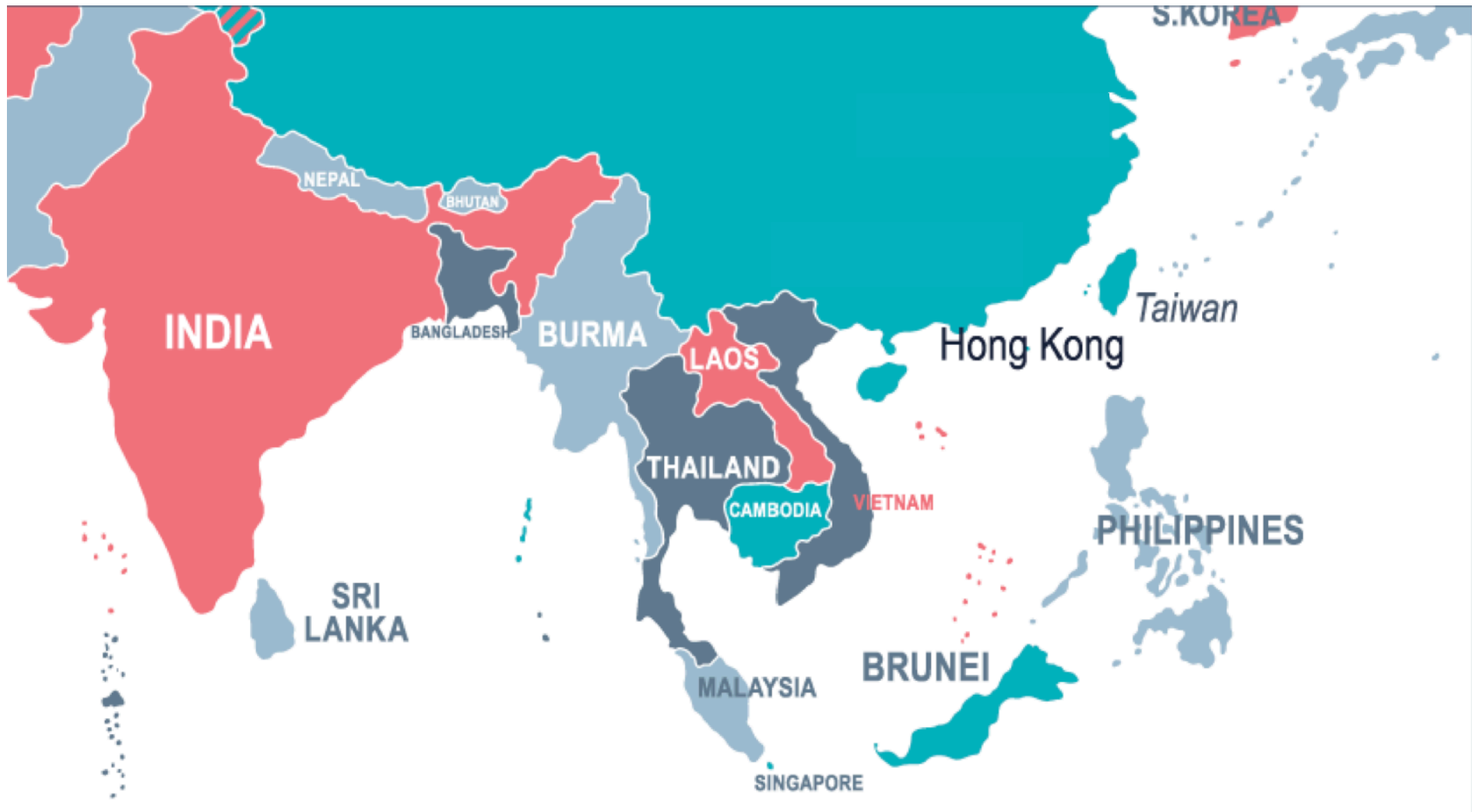


Figure 1 DSMC result of a gas plume on Europa.

### References

- [1] Roth, L., Saur, J., Retherford K. D., Science, 343, 171. (2014)
- [2] Sparks, W. B., Hand, K. P., McGrath, M.A., et al, The Astrophysical Journal, 829, 21. (2016)
- [3] Sparks, W. B., Schmidt, B. E., McGrath, M.A., et al., The Astrophysical Journal, 839, 5. (2017)
- [4] Jia X., Kivelson M. G., Khurana, K., et al., Nature Astronomy, 2, 459. (2018)
- [5] Kivelson, M.G., Khurana, K. K., Joy S., et al., Science 267, pp 1239-1241. (1997)
- [6] Bird, G. A., "Molecular Gas Dynamics and the Direct Simulation of Gas Flows" Oxford: Oxford Univ. Press. (1994)
- [7] Su, C.-C., "Parallel Direct Simulation Monte Carlo (DSMC) Methods for Modeling Rarefied Gas Dynamics", PhD Thesis, Department of Mechanical Engineering, National Chiao Tung University, Hsinchu, Taiwan. (2013)
- [8] Wu, J. S., Tseng, K. C., Wu, F. Y., Comput. Phys. Commun., 162, 166. (2004)
- [9] Su, C.-C., K.-C. Tseng, H.-M. Cave, et al., Computers & Fluids, Vol. 39, pp. 1136-1145. (2010)

# (3) AOGS Satellite Meetings



# (3) AOGS Satellite Meetings

## AOGS Satellite Meeting Proposal Form

Title	<b>Understanding Carbon and Nitrogen Dynamics in Large Rivers and Coastal Oceans</b>
Meeting Venue	Biswa Bangla Convention Centre, Kolkata, India
Meeting Duration	Two days
Time Schedule	From 21/04/2020 to 22/04/2020
AOGS Section(s)	Biogeosciences, Hydrological Sciences,
Main Organizer	(Name) Punyasloke Bhadury (Affiliation) Indian Institute of Science Education and Research Kolkata (e-mail address) pbhadury@iiserkol.ac.in

# (4) Regional Scientific Co-operation Initiatives in Geosciences Webinars



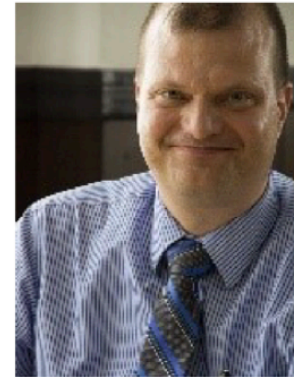
**Chun-Chieh WU**

National Taiwan University



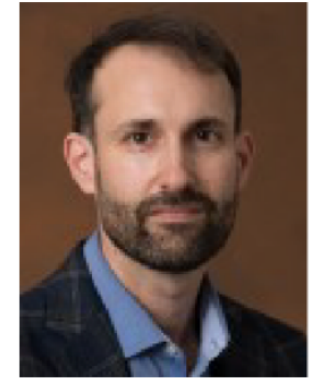
**Wing-Huen IP**

National Central University



**Florian M. SCHWANDNER**

NASA



**Steven D. VANCE**

NASA



**Yoshiharu OMURA**

Kyoto University



**Ping-Yu CHANG**

National Central University



**Young-Oh KIM**

Seoul National University



**Bhoopesh MISHRA**

University of Leeds



# Agenda

- 09:00am AOGS President's Welcome  
**Chun-Chieh WU, National Taiwan University**
- 09:15am Chair's Opening & Introduction to AOGS Regional Advisory Committee  
**Wing-Huen IP, National Central University**
- 09:30am [SE] Solid Earth Sciences Initiatives  
**Florian M. SCHWANDNER, NASA**
- 10:00am [PS] Planetary Sciences Initiatives  
**Steven D. VANCE, NASA**
- 10:30am [ST] Solar & Terrestrial Sciences Initiatives  
**Yoshiharu OMURA, Kyoto University**
- 11:00am [IG] Interdisciplinary Geoscience Initiatives  
**Ping-Yu CHANG, National Central University**
- 11:30am [HS] Hydrological Sciences Initiatives  
**Young-Oh KIM, Seoul National University**
- 12:00pm [BG] Biogeosciences Initiatives  
**Bhoopesh MISHRA, University of Leeds**
- 12:30pm Meeting adjourned

Thanks for Joining.