

*e-ASIA Joint Research Program
Progress Report*

1. Project Title: Monitoring and prediction of extreme weather using lightning detection network and micro-satellites

2. Joint Research Period: August 1, 2016 ~ March 31, 2020

3. Principal Investigators:

■ INDONESIA: Dr. Tri Handoko Seto, Director of National Laboratory for Weather Modification Technology (BB-TMC), Indonesia Agency for the Assessment and Application of Technology (BPPT)

➤ Planned Funding Period: August 1, 2016 ~ March 31, 2020

■ PHILIPPINES: Dr. Joel S. Marciano, Acting Director, Department of Science and Technology(DOST), Advanced Science And Technology Institute (ASTI)

➤ Planned Funding Period: August 1, 2016 ~ March 31, 2020

4. Summary of the Progress of the Joint Research:

Lightning:

- New lightning observation system was developed based on the experience of AVON, which is consisting of several VLF radio wave receivers located in Southeast Asian countries. The new system works with solar battery and 3G connection so that it doesn't need commercial power line or internet connection.

- The algorithm for estimating location using data obtained at AVON and new system based on the heritage in Japan, was developed, optimizing the characteristics of lightning in Southeast Asia.

- We started monitoring the lightning activity with 3 new sites located at Guam, Palau and Manila and succeeded in making the lightning distribution map.

Micro-satellite:

- The method of cloud image analysis with data obtained by DIWATA-1 micro-satellite, which was launched in 2016 and is now under operation by Philippines was developed. We succeeded in making 3-D model of the clouds with the finest resolution made by satellite images in the world.

- The thermal infrared camera to be onboard Indonesian micro-satellite LAPAN A-4 which will be launched in the fiscal year of 2019 was developed. With this camera we could draw the temperature distribution of the top of thundercloud, which provide the

fundamental information of the cloud development.

5. Scientific Achievements and Implemented Activities (Research Exchange, Workshop, Publication, etc. if any):

**For this item, please fill in the attached Excel file.*

6. Future Goals and Plan of Activities within and after the project period:

One of the important social needs about the disaster management related to extreme weather is to realize the real-time monitoring of the torrential rainfall and the activities of causative thunderstorm that leads to the public alert including near future predictions of gusty wind, lightning, precipitation, and resultant flood.

We will establish the methodology of real-time monitoring of lightning discharge that is one of the ideal proxies of thunderstorm activity itself, namely, updraft and/or precipitations. Also typhoon activity causing heavy rainfall and strong wind can be predicted based on lightning activity occurring mostly in the edge area of typhoon. In this project, under international collaboration, we will establish the coordinated lightning observation using observation sites, developing algorithm to calculate lightning location and parameters optimized for the Southeast Asian region.

Micro-satellite is now one of the world's mainstreams of space development. Companies in US and Europe are constructing "constellation" (multi point operation of 10s-1000s of satellites) of micro-satellite and/or to utilize the data of such constellation for various applications. Sharing data and coordinating satellite operation among the participating countries in this project is the cutting edge of the trend in space development, which explore the next-generation application of space use including disaster management.

Making use of the lightning activity data measured by the ground-based VLF network and the 3-dimensional structures of thunderclouds observed by the on-demand operation of remote-sensing micro-satellites is completely new idea in the world in order to obtain very detail semi-real time information of thunderstorm or typhoon, which cannot be achieved only with existing observation methods, such as meteorological radar or surface meteorological data acquisition system. Based on the information, we will establish the methodology to grasp the development of thunderstorms occurring in whole area of Southeast Asia and to predict their near-future activities as well as typhoon intensity.

7. Recommendations and Comments to the Program (if any):

(ex. Any support to request from the Program in order to achieve item 6.)

Lists of Achievements and Implemented Activities

1. Original Publication of Articles etc.

【Notes】
Please fill in **only the achievements of this project** by country in order of publication date. Only “published” is targeted, but please write “in press” too only for Final Report.
Please count Proceedings with peer review as original paper.
The information on this form is only disclosable. Please submit Non-disclosable information in a separate file.

1. 1 Original Publications (Articles co-authored among Research Teams)

All Authors' Names, Title, Journal Name, Volume, Edition, Page, Year of Publication	DOI Code	Publication Status	Remarks (e.g. publication in top level journals etc.)
Taro Kagaku and Jiro Kagaku, Distinct roles of MLCK and ROCK in the regulation of membrane	doi: 10.1083/jcb.201506	in press	
Kubota, H., R. Shirooka, J. Matsumoto, E. O. Cayanan, and F. D. Hilario, Tropical cyclone influence on the long-term variability of Philippine summer monsoon onset, Prog. Earth. Planet. Sci., 2017	DOI: 10.1186/s40645-017-0138-5.	published	

1 Total

1. 2 Original Publications (Articles by Single Team only)

All Authors' Names, Title, Journal Name, Volume, Edition, Page, Year of Publication	DOI Code	Publication Status	Remarks (e.g. publication in top level journals etc.)	Country name of the team
Taro Kagaku and Jiro Kagaku, Distinct roles of MLCK and ROCK in the regulation of membrane	doi: 10.1083/jcb.201506	in press		Thailand

0 Total

ents and Implemented Activities

2. presentations at Academic Conferences etc. (Seminars, Workshops, Symposia)

【Notes】

Please fill in **only the achievements of this project** by country in order of presentation date.
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2. 1 Conference Presentations (Joint Presentations among Research Teams)

Date	Type of Presentation	Speaker, "Title", Conference Name, Location, etc.
March 4, 2018	Guest/Invited Speaker	Taro Kagaku, "xxx", yyy, Tokyo,
0	Total	

2. 2 Conference Presentations (by Single Team)

Date	Type of Presentation	Speaker, "Title", Conference Name, Location etc.	Country name of the team
March 4, 2018	Guest/Invited Speaker	Taro Kagaku, "xxx", yyy, Tokyo,	Thailand
April 28, 2017	Oral Presentation	Mitsuteru Sato et al., "Operation of lightning detection network and micro-satellites for nowcast of thunderstorm and tropical cyclone", EGU General Assembly, April 2017.	Austria
May 2017	Oral Presentation	Ellison Castro, Joel Marciano, Gay Perez, Kaye Vergel, Yukihiro Takahashi, "Readiness in DOST-ASTI for SATREPS project for development of extreme weather monitoring and alert system in the Philippines", 2017 JpGU Meeting, Makuhari, Japan, May 2017.	Japan

May 2017	Poster Session	Kaye Kristine Vergel, Yukihiro Takahashi, "Readiness in DOST-ASTI for SATREPS project for development of extreme weather monitoring and alert system in the Philippines", 2017 JpGU Meeting, Makuhari, Japan, May 2017.	Japan
May 2017	Poster Session	Yukihiro Takahashi, Hisayuki Kubota, Mitsuteru Sato, Jun Matsumoto, Kozo Yamashita, Kazuya Yoshida, "Development of extreme weather monitoring and information sharing system in the Philippine by the lightning detection network and micro-satellites", the Meteorological Society of Japan, May 2017	Japan
June 15, 2017	Guest/Invited Speaker	Yukihiro Takahashi, "Next-generation Earth Monitoring System with Micro-satellites and Ground-based Networks", 17th Conference of the Science Council of Asia, Manila, Philippines, June 15, 2017.	Philippines
July 7, 2017	Guest/Invited Speaker	Yukihiro Takahashi, "Extreme weather and ocean observation using micro-satellites", Institute for Space-Earth Environmental Research, Nagoya University, July 7, 2017	Japan
August 23, 2017	Guest/Invited Speaker	Yukihiro Takahashi, "Next-generation remote sensing and applications realized by micro-satellite and its international collaboration", 1st IAA North-East Asia Symposium on Small Satellites, Ulaanbaatar, Mongolia, Aug 23, 2017.	Mongolia
November 26, 2017	Guest/Invited Speaker	Yukihiro Takahashi, "Next-generation disaster information obtained by micro-satellite observation", National tournament of Disaster Prevention, Sendai, Japan, November 26, 2017	Japan
December 12, 2017	Poster Session	Yukihiro Takahashi, Mitsuteru Sato, Ellison C Castro, Tetsuro Ishida, Joel Joseph Marciano, Hisayuki Kubota and Kozo Yamashita, "Extreme weather monitoring system with combination of micro-satellites and ground-based", American Geophysical Union Fall Meeting, NEW ORLEANS, US, Dec 12, 2017.	US
February 2018	Oral Presentation	Mitsuteru SATO, Hisayuki KUBOTA, Kozo YAMASHITA, Jun-Ichi HAMADA, Jun MATSUMOTO, Joel MARCIANO, Gay Jane PEREZ, Ellison CASTRO, Yukihiro TAKAHASHI, "SATREPS Project, ULAT, for Development of Extreme Weather Monitoring and Alert System in the Philippines", New Dimension for Natural Hazard in Asia, An AOGS-EGU Joint Conference, Tagaytay, Philippines, Feb 2018.	Philippines
February 2018	Oral Presentation	HISAYUKI KUBOTA1, YUKIHIRO TAKAHASHI1, MITSUTERU SATO, JUN-ICHI HAMADA, "Heavy rainfall in Metro Manila, Philippines during the summer monsoon associated with tropical cyclone", New Dimension for Natural Hazard in Asia, An AOGS-EGU Joint Conference, Tagaytay, Philippines, Feb 2018.	Philippines
March 15, 2018	Oral Presentation	Yukihiro Takahashi, "Status of ULAT and related projects in Asia", The International Post-MAHASRI Planning Workshop, Akihabara, Japan, March 15, 2018.	Japan

Lists of Achievements and Implemented Activities

3. Workshops, Seminars, Symposia and Other Events (Organized by the Project)

【Notes】
Please fill in **only the achievements of this project** in order of event date.
The information on this form is only disclosable. Please submit Non-disclosable information in a separate file.

Event duration	Name of Organizer	Title of the Event	Location (Country, City, Venue)	Number of Participants (Including Team Members)	Overview
Mar 4-16, 2018	Taro Yamada	○○○○	Germany, Hamburg, ○○○○	10	

0|Total

Lists of Achievements and Implemented Activities

4. Record of Research Exchanges

【Notes】
Please fill in the record of **research exchange only of this project**.
“Duration of exchange” is not the number of days stayed on the site, but the number of days from departure to return home.
The information on this form is only disclosable. Please submit Non-disclosable information in a separate file.

Date of Departure	Date of Return	Last Name & First Name	Country of Affiliation	Affiliation	Position	Exchange Destination (Country, City, Research Organization etc.)	Description of Exchange Content/Purpose	Duration of Exchange (autocompleted)
January 6, 2016	January 16, 2016	Taro Yamada	Japan	Yamada University	Professor	NANOTEC,NECTEC, Bangkok	〇〇	11
June 6, 2017	June 9, 2017	Yukihiro Takahashi	Japan	Hokkaido University	Professor	BPPT&LAPAN, Jakarta, Indonesia	Meeting on the thermal infrared camera and the Collaborative Research Agreement(CRA)	4
September 3, 2017	September 7, 2017	Yukihiro Takahashi	Japan	Hokkaido University	Professor	BPPT&LAPAN, Jakarta, Indonesia	Meeting on the thermal infrared camera and the Collaborative Research Agreement(CRA)	5
								0
								0
								0

Total (Person)

2

Total (Person-day)

9

Lists of Achievements and Implemented Activities

5. Patent Applications

[Notes]
Please fill in **only the achievements of this project** by country in order of presentation date.
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5. 1 Independent Applications by Single Team

Application Number	Name of Patent/Patent Name	Application Date	Patent Applicants (Fill in All Members)	Publication Number (leave blank if unpublished)	Inventor	Country of Application	Registration Number (leave blank if unregistered)	Country Name of the Team
WO20xx-xxxxxx		January 21, 2016	○○ Univ、Univ.of xx	WO/2016/xxxxxx	○○○○、○○・○○	PCT	WO20xx-xxxxxx (20xx.xx.xx)	Thailand

0 Total (Number of Application)

0 Total (Number of Registration)

5. 2 Joint Applications

Application Number	Name of Patent/Patent Name	Application Date	Patent Applicants (Fill in All Members)	Publication Number (leave blank if unpublished)	Inventor	Country of Application	Registration Number (leave blank if unregistered)
WO20xx-xxxxxx		January 21, 2016	○○ Univ、Univ.of xx	WO/2016/xxxxxx	○○○○、○○・○○	PCT	WO20xx-xxxxxx (20xx.xx.xx)

0 Total (Number of Application)

0 Total (Number of Registration)

Lists of Achievements and Implemented Activities

6. Awards

【Notes】

Please fill in **only the achievements of this project** by country in order of date of Award.
The information on this form is only disclosable. Please submit Non-disclosable information in a separate file.

Date of Award	Name of Award	Recipient	Remarks	Country Name of the Team
December 24, 2015	〇〇 Prize	Taro Yamada		Thailand

0

Total