

YMC-BSM (Boreal Summer Monsoon) study in 2018 campaign

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In collaboration with

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Mukri Halimurrahman (LAPAN)
Nguyen Vinh Thu (VMHA)

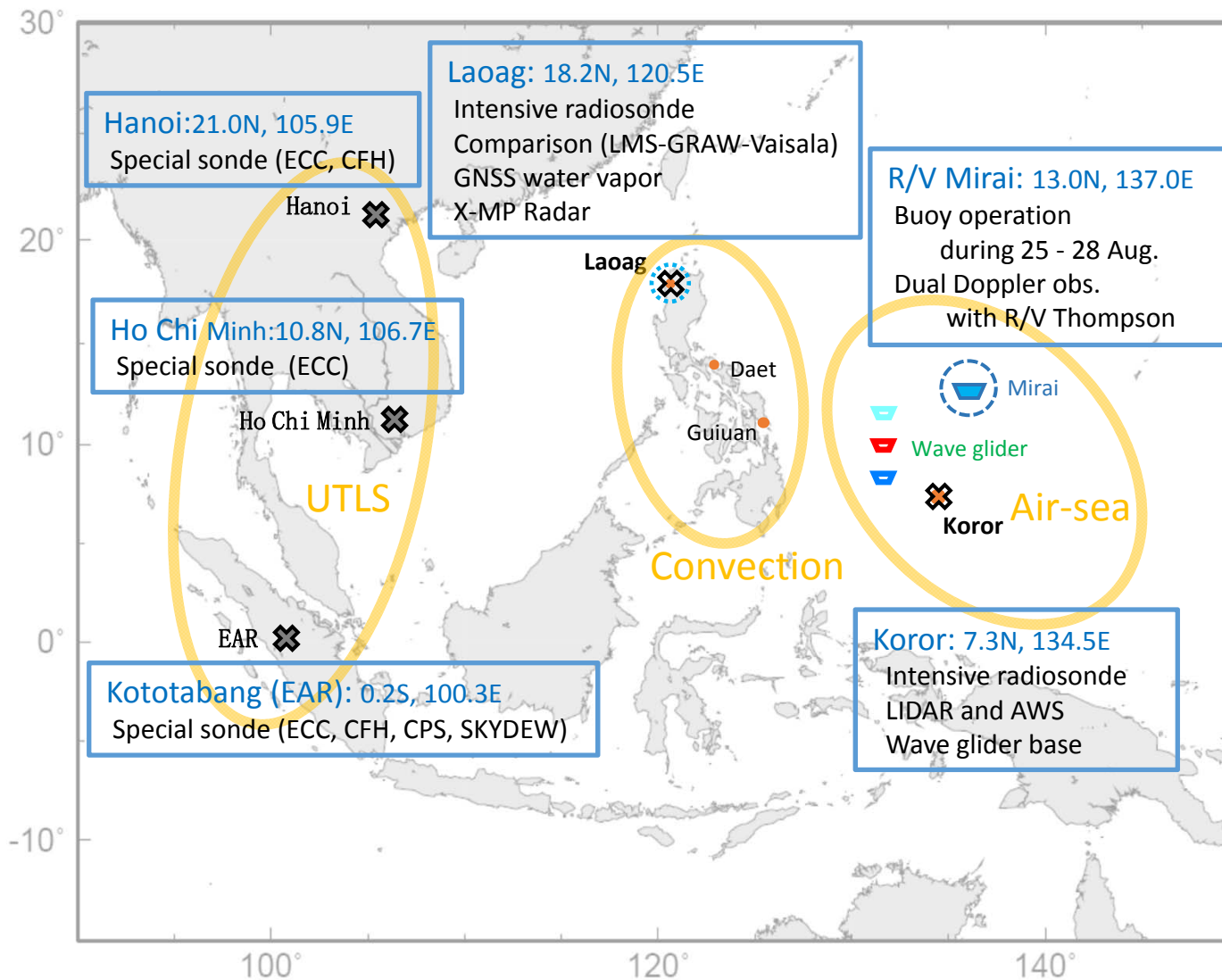
YMC BSM2018 (Years of the Maritime Continent -- Boreal Summer Monsoon study in 2018)

Atmospheric convection caused by diurnal change and BSISO

Air-sea interaction over warm pool

Boreal Summer Intra-Seasonal Oscillation

Interaction between UTLS (Upper Troposphere and Lower Stratosphere)



YMC-BSM2018

Period:

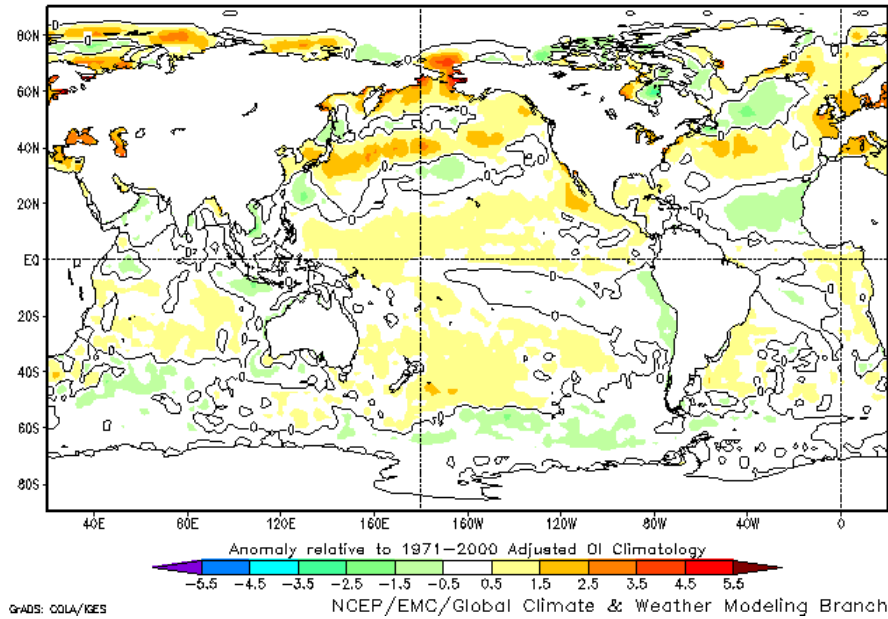
1 July - 31 August, 2018

Participants:

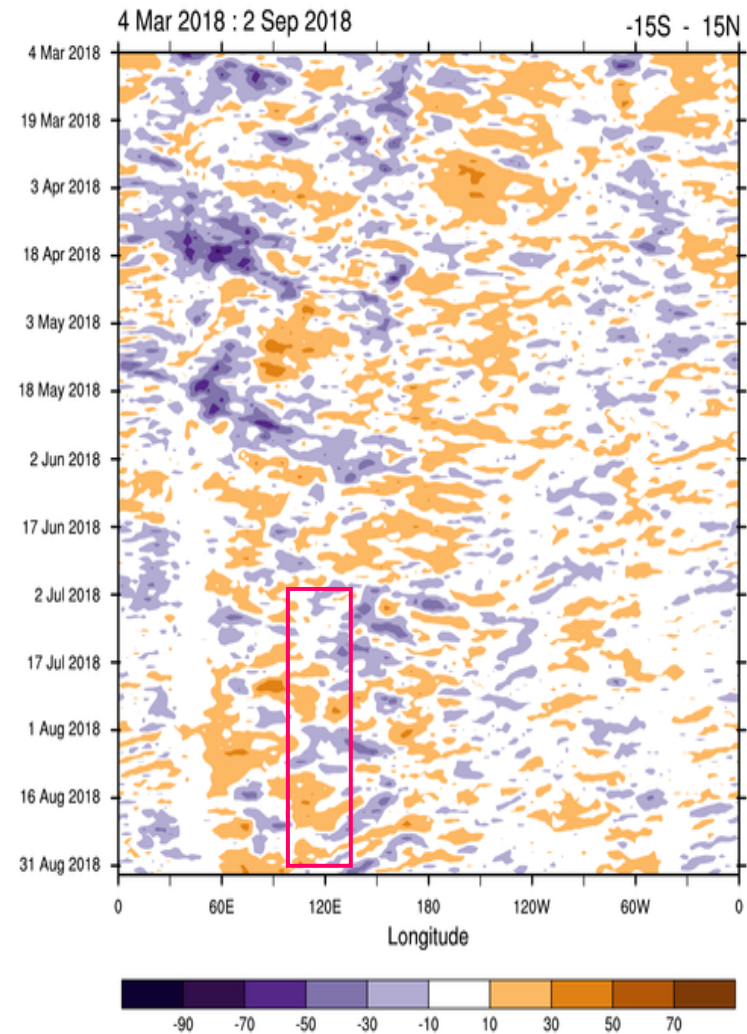
Japan (JAMSTEC, NME, Kyoto Univ.), Palau (NWS),
Philippine (PAGASA, UP),
Indonesia (LAPAN, BMKG),
Vietnam (VMHA)

Large Scale Overview (SST, SOI, OLR)

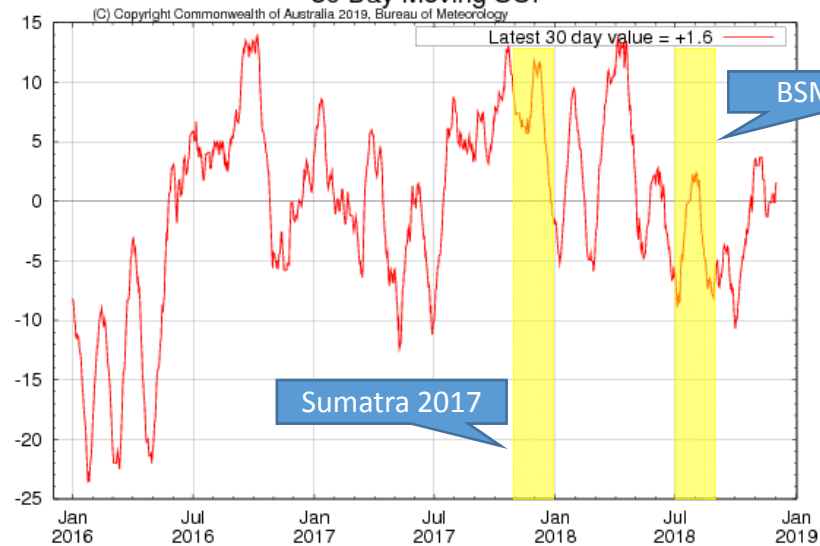
Olv2 Sea Surface Temperature Anomaly (°C)
July 2018



OLR Anomalies : W/m²



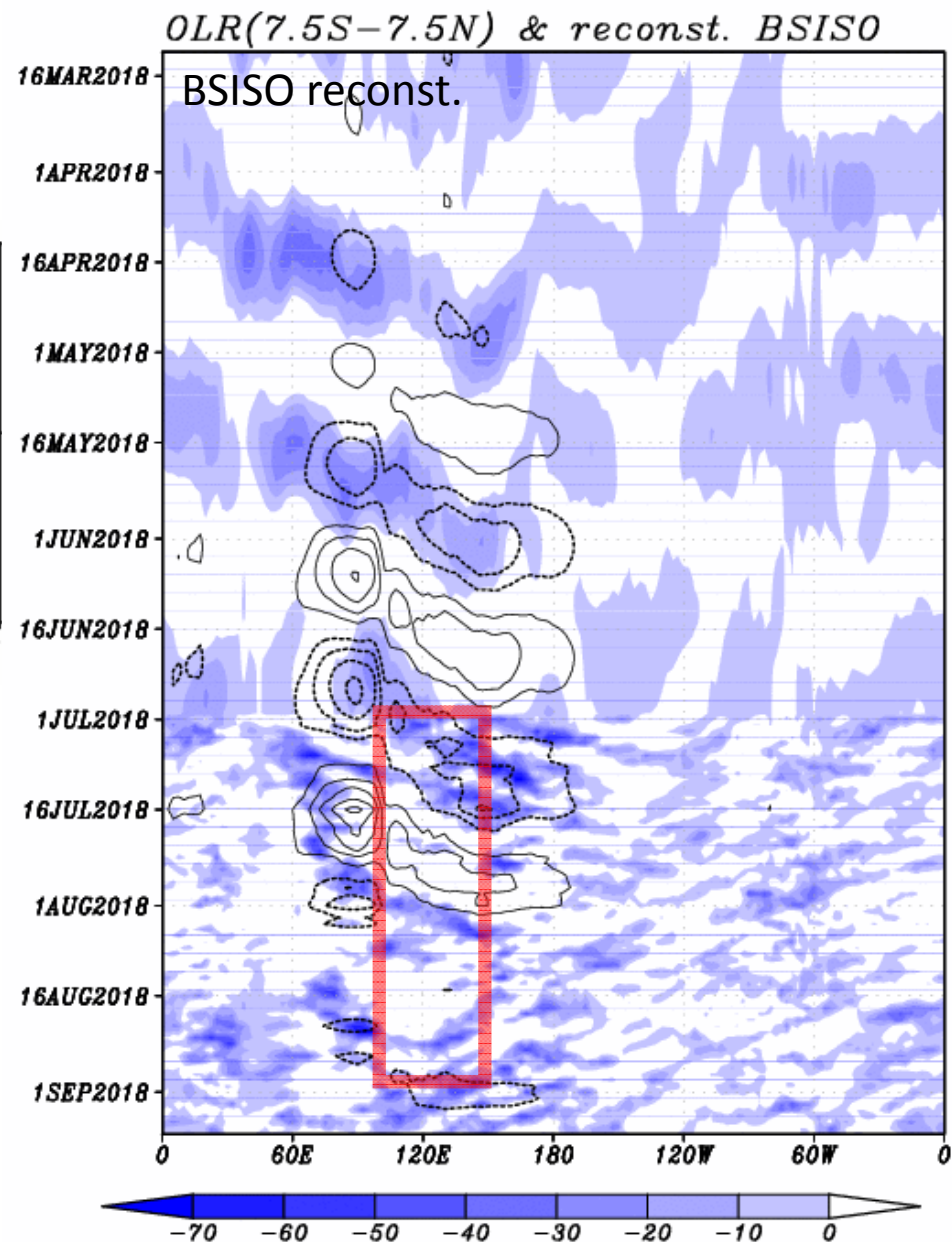
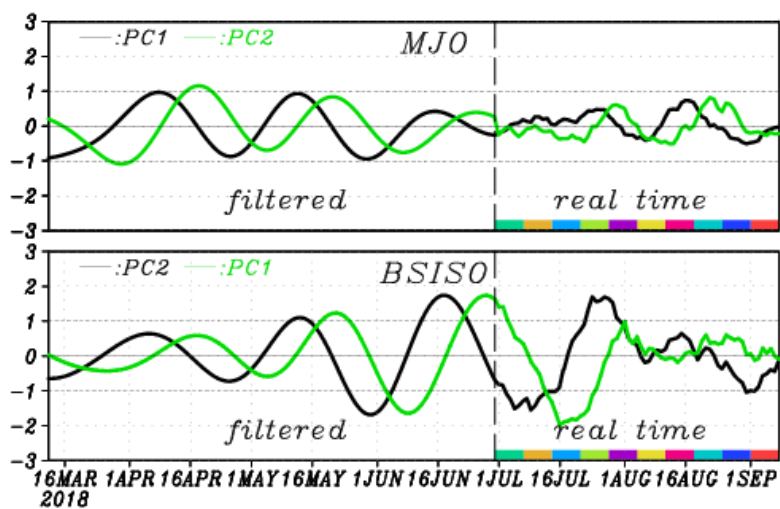
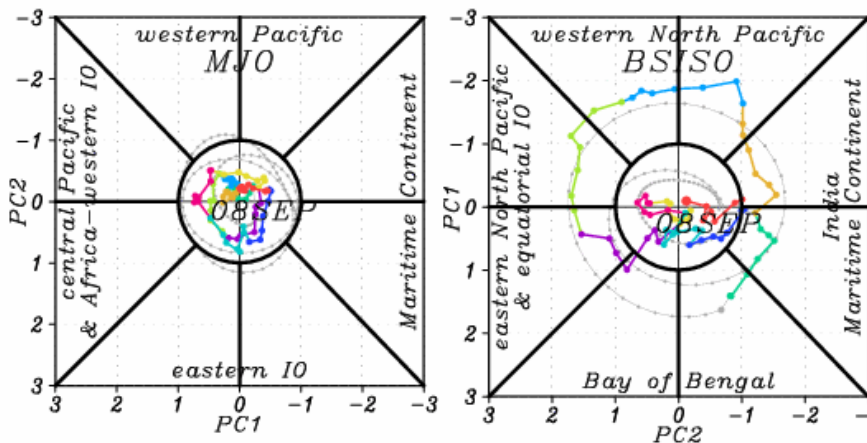
30 Day Moving SOI



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BSISO (Boreal Summer Intra-Seasonal Oscillation) index during the IOP

- Active BSISO in early July
- BSISO is neutral in August (Monsoon is Active in August)



YMC BSM 2018 numerical model study

NICAM (Nonhydrostatic Icosahedral Atmospheric Model) forecast

Start from 11 July 2018 ...

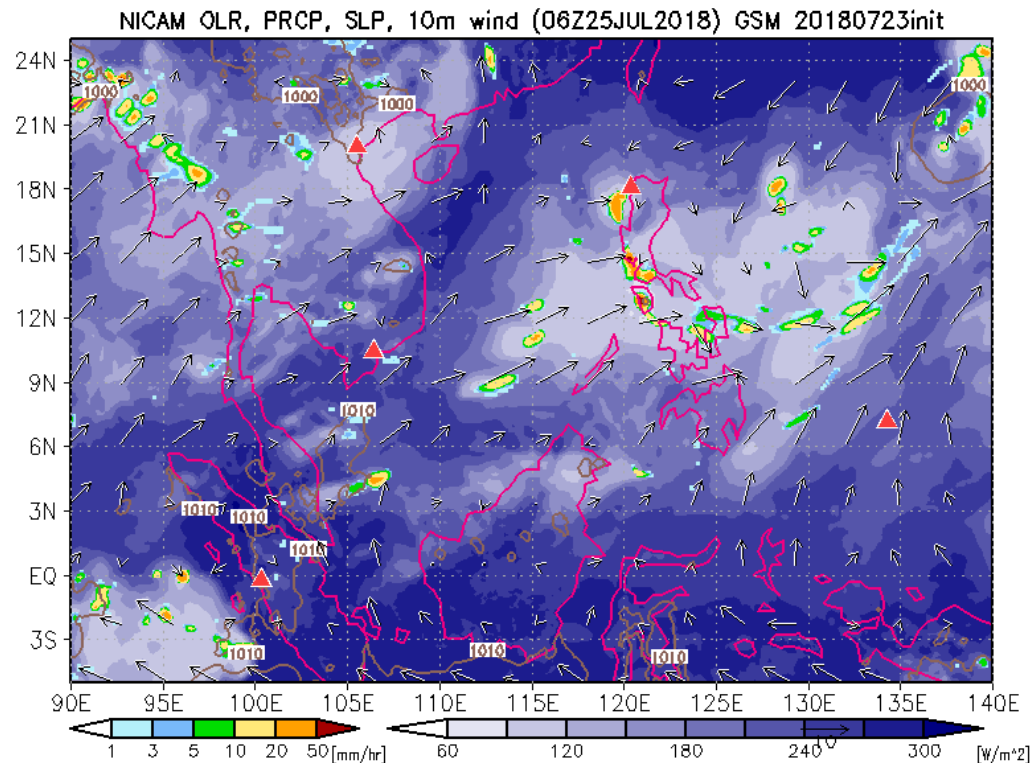
with Global 14km horizontal resolution (38 V-Level, Top ~40km)

1) 5 days forecast every day Init.: GSM, NEXRA ensemble mean

2) 30days forecast



Init.: NCEP_FNL, ECMWF_YOPP



Results are delivered
to observation sites on time

▪ 15 - 26 July ... for EAR obs.

Inactive phase around EAR
(is good for CFH/ECC obs.)

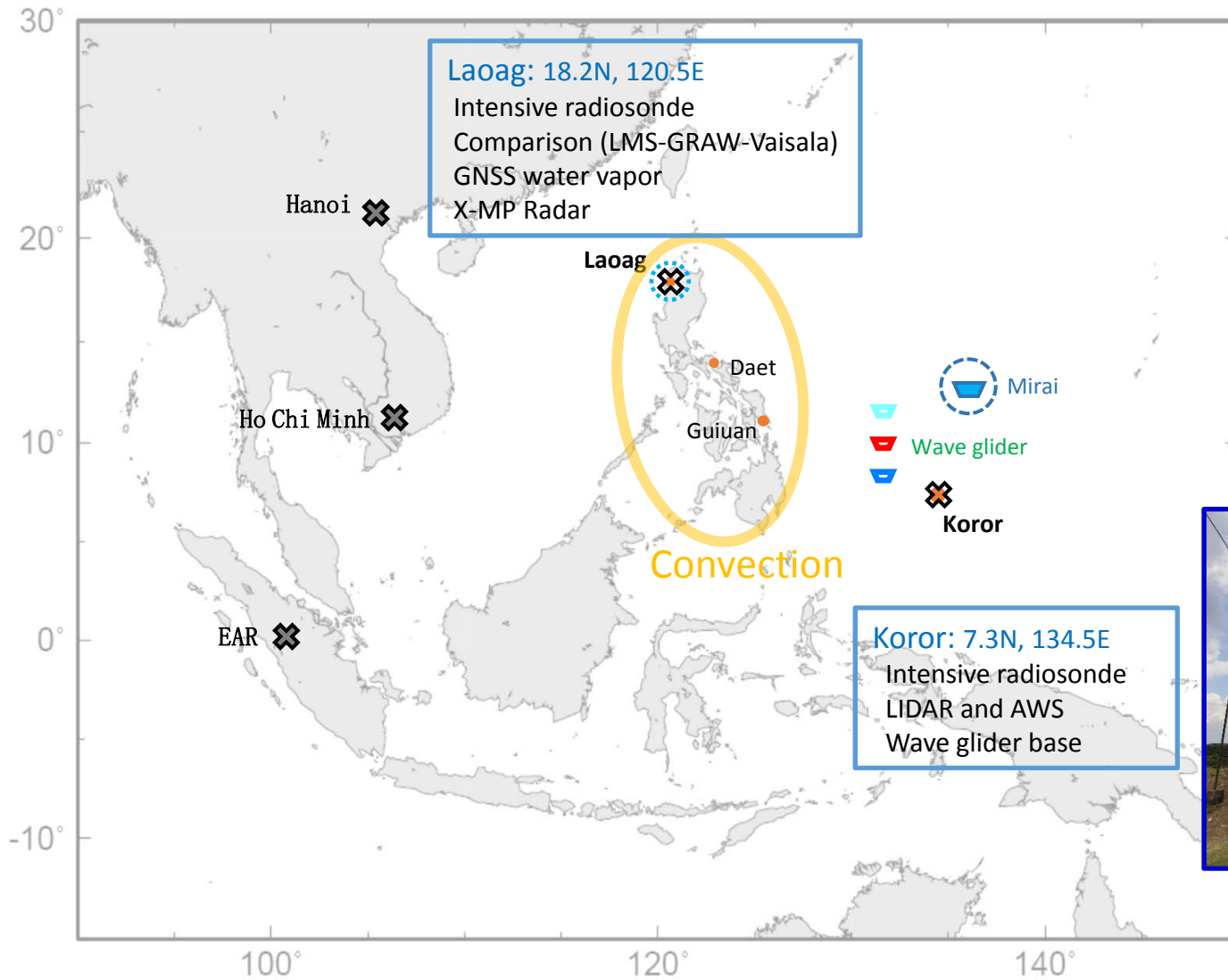
▪ 20 - 27 Aug. ... for MIRAI

Active convection phase
in Western Pacific

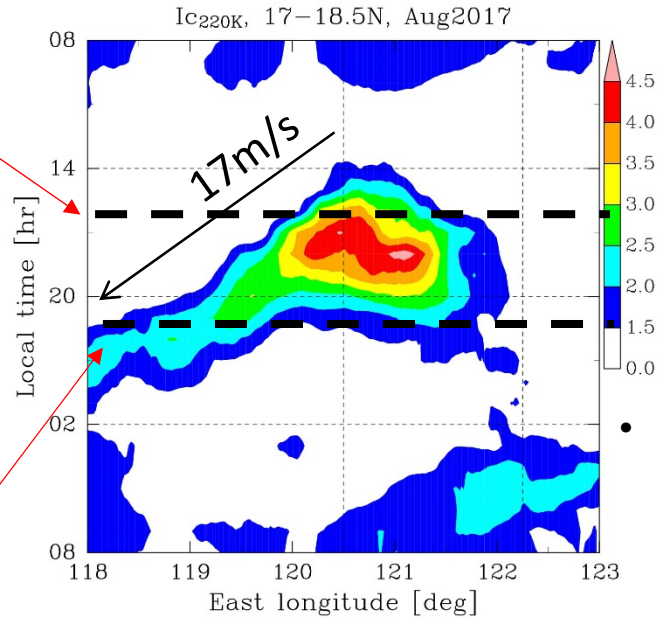
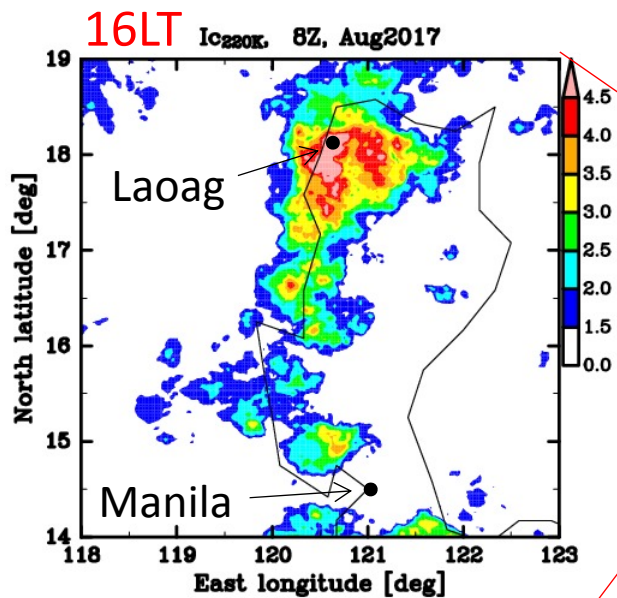
Atmospheric convection caused by diurnal change and BSISO

Air-sea interaction over warm pool

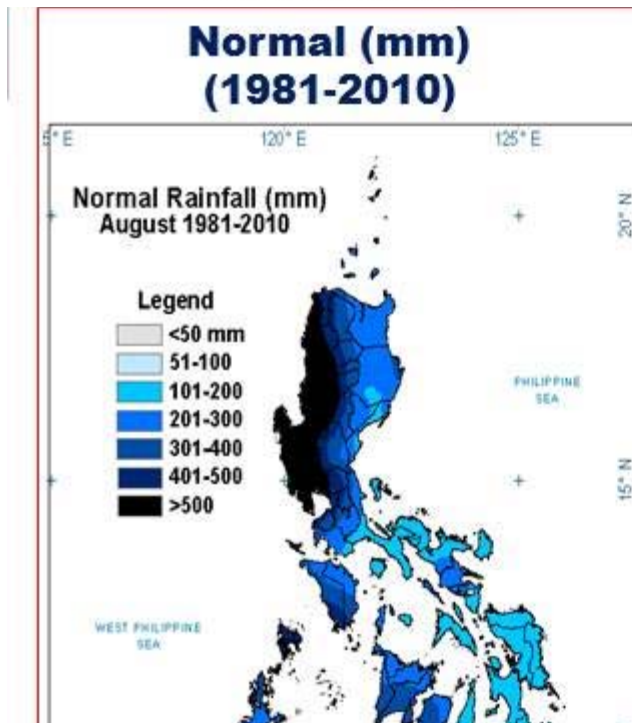
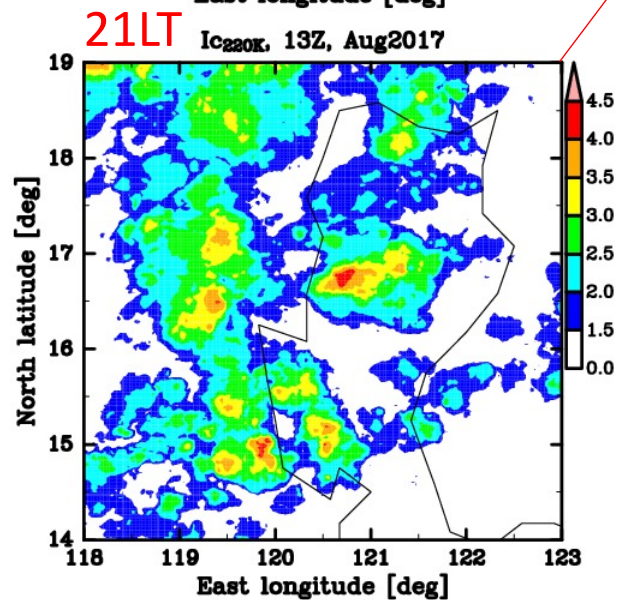
Interaction between UTLS (Upper Troposphere and Lower Stratosphere)



Diurnal cycle of deep-cloud activity around Laoag in August 2017

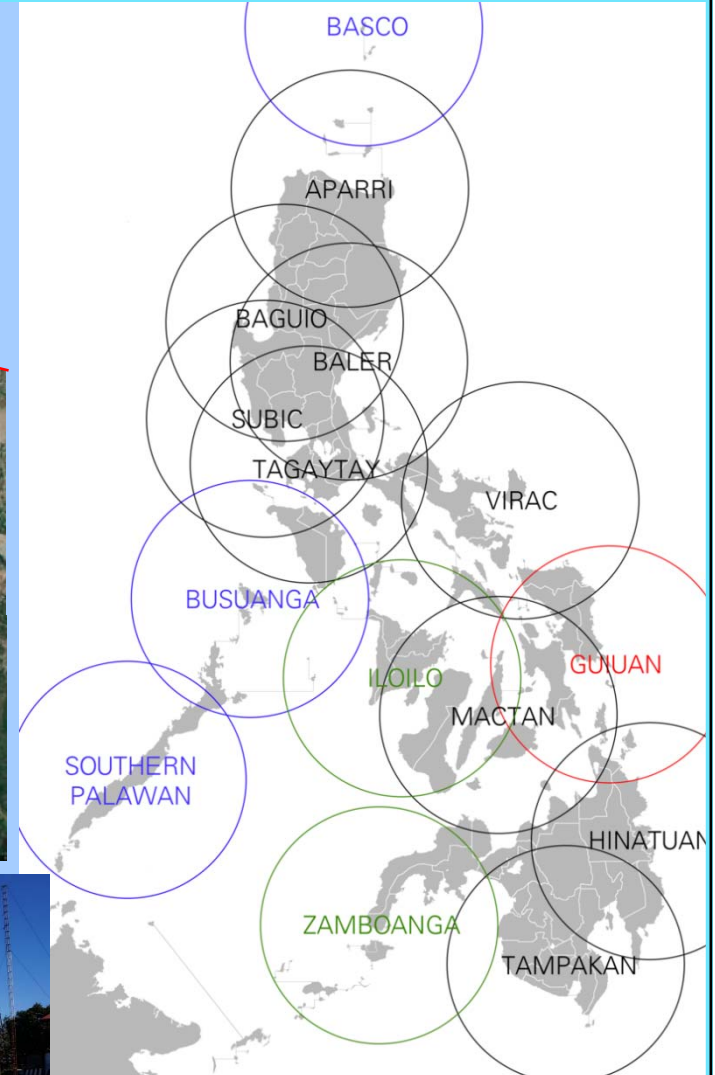
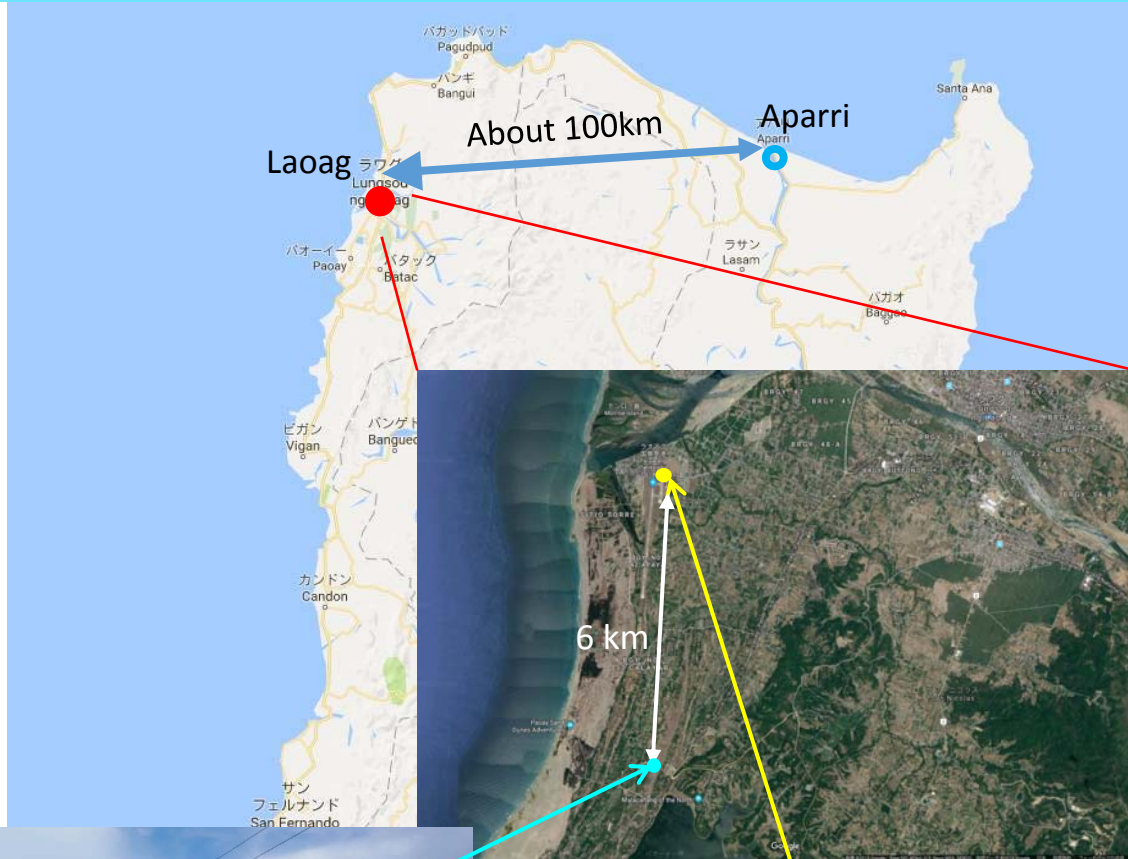


$$I_c = \begin{cases} 220 - T_{BB} & (T_{BB} < 220 [K]) \\ 0 & (\text{otherwise}) \end{cases}$$



Climatological averaged rainfall amount at Laoag in August: 583.9mm

Location of observation sites around Laoag



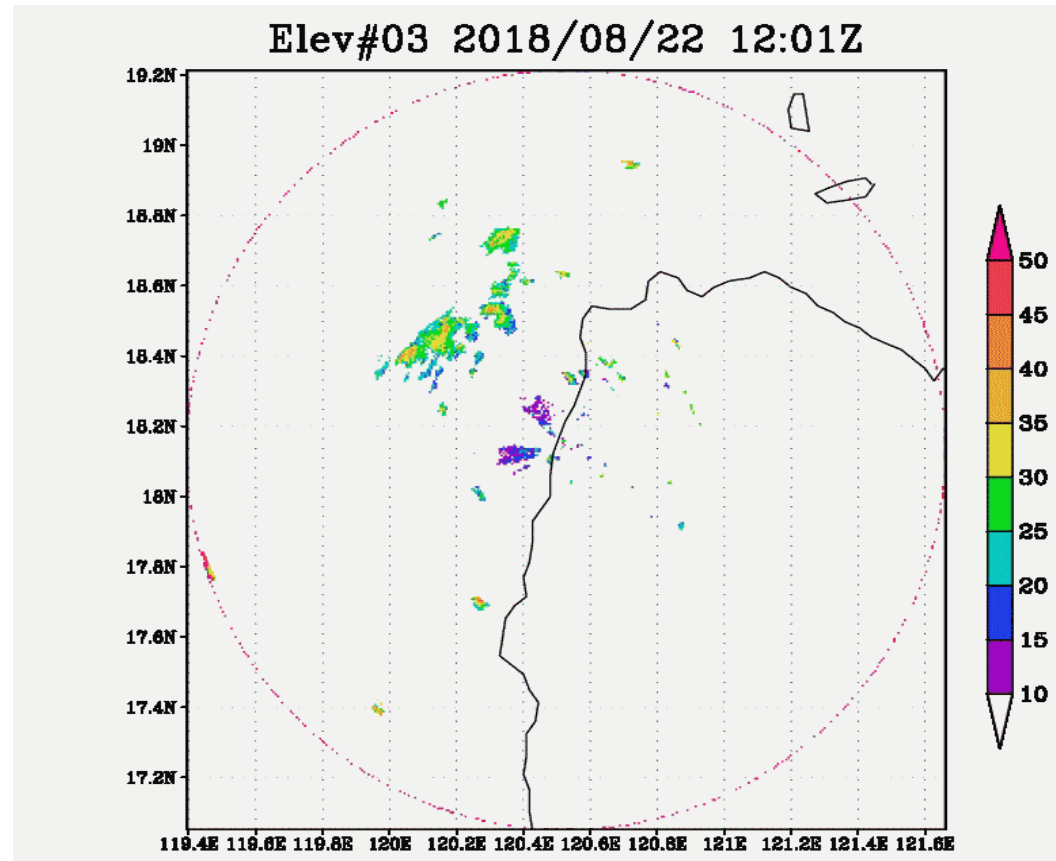
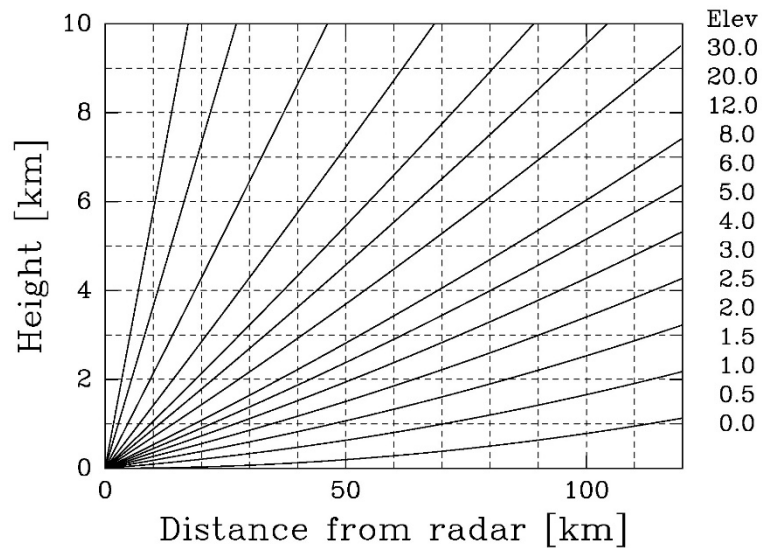
Operational radars by PAGASA

Aparri radar ($r=200\text{km}$) can not cover the Laoag area due to the blockage of mountains between Laoag and Aparri.

Therefore, we installed an X-band Multi-Parameter transportable Doppler radar near Laoag.

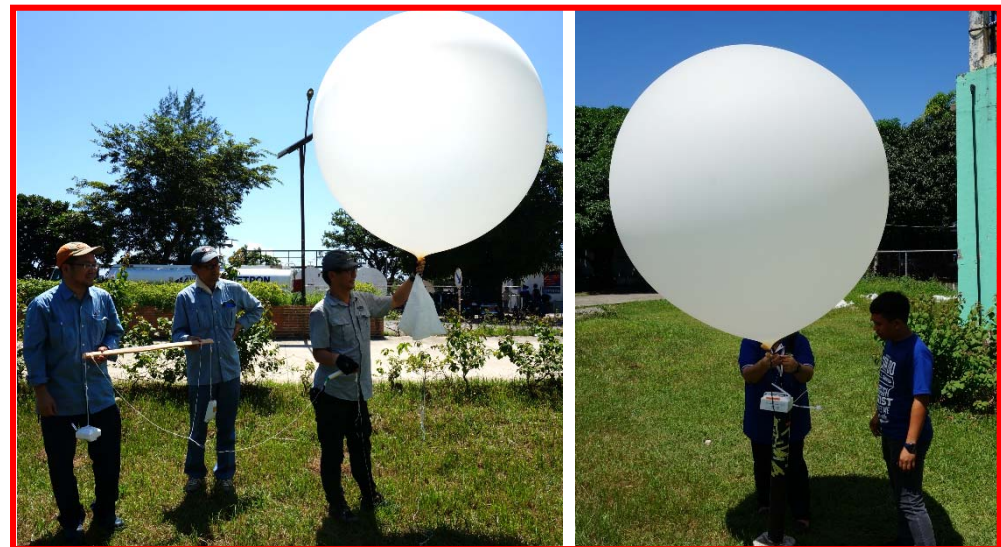
Transportable X-band radar observation around Laoag

- “Rain watcher” manufactured by JRC
- X-band, Dual-pol, Doppler
- Volume scans with 17 elevation angles, every 10 min, 120-km range.
- Period: whole August 2018



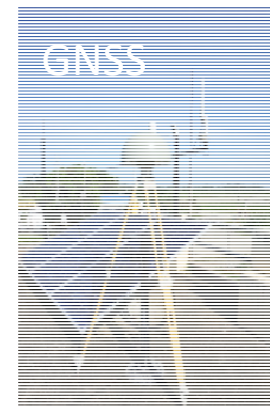
Radiosonde inter-comparison at Laoag

- Intensive radiosonde observation (2/day → 4/day: 1 July – 31 Aug.)
- Comparison of LMS6, Graw DFM-06, and Vaisala RS41-SGP transmitters through simultaneous launches. (27 July – 3 Aug.)
- 20 times: 08LT (1), 11LT (7), 14LT (6), 17LT (5), 20LT (1) LT=UT+8



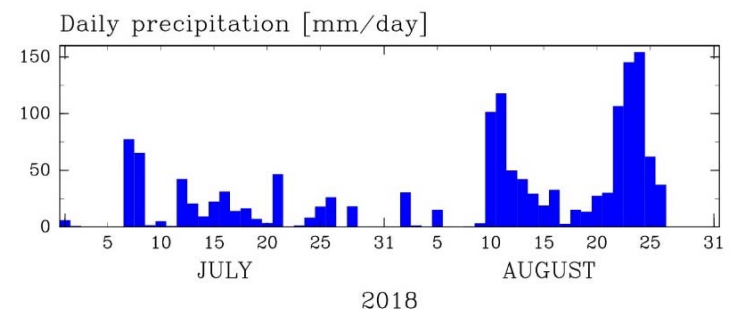
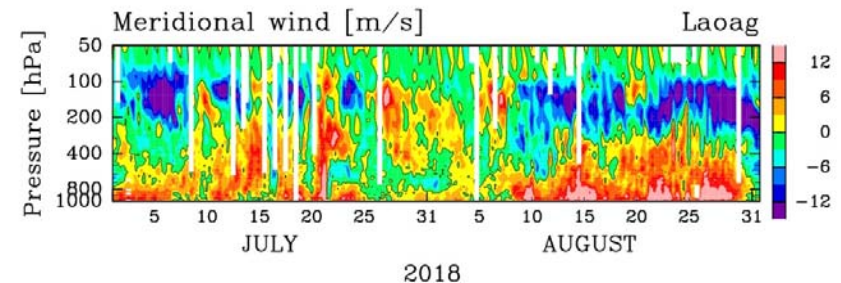
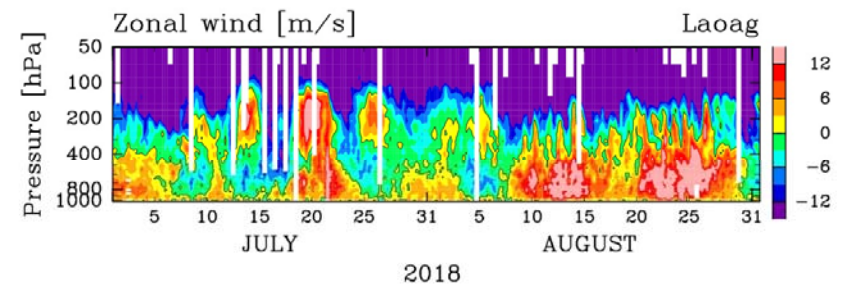
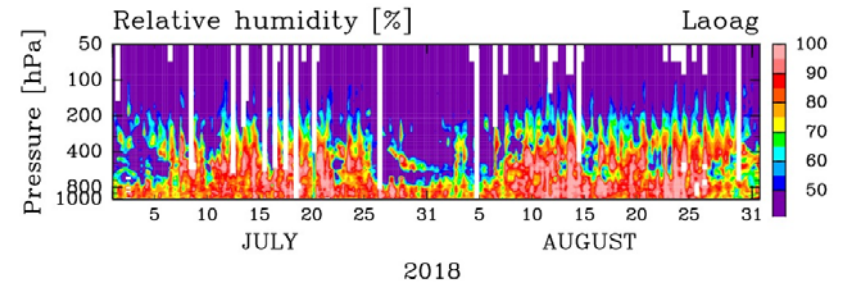
DFM-06 RS41

LSM6



Time series (RH, U, V, rain) at Laoag from July to August 2018

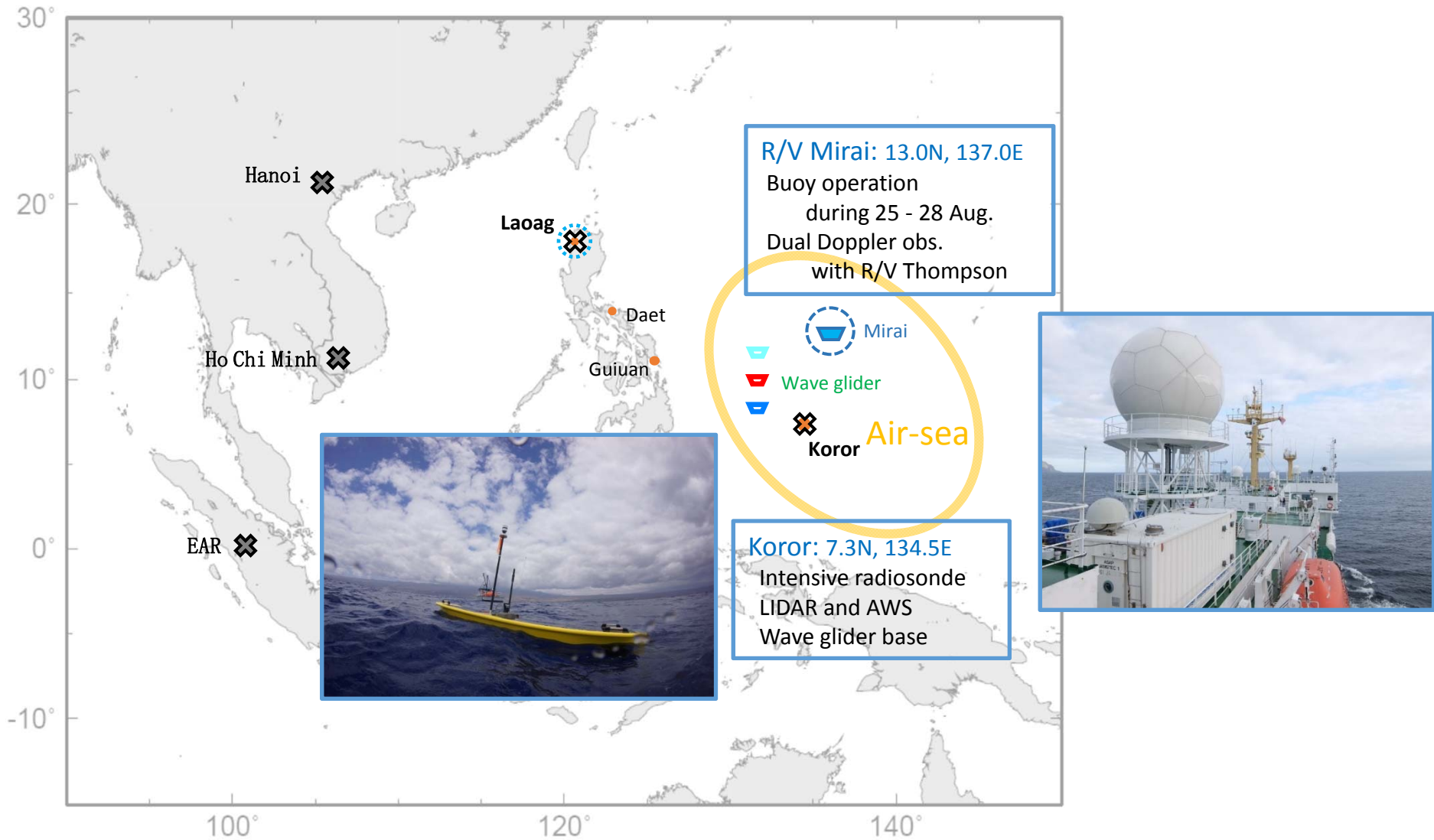
- Intra-seasonal scale fluctuation of humidity.
- Two events of strong south-westerly monsoon winds with lots of rainfall in August.
- Monthly total precipitation in August exceeded 1,000 mm.
- Sonde inter-comparison was conducted during relatively dry period.



Atmospheric convection caused by diurnal change and BSISO

Air-sea interaction over warm pool

Interaction between UTLS (Upper Troposphere and Lower Stratosphere)



Air-sea interaction over warm pool

▪ Wave gliders are launching from Palau for pilot study of future study (in 2020)

WG-075 (12N 132E)

▪ 25 June Install

WG-240 (10N 132E)

▪ 26 June Install

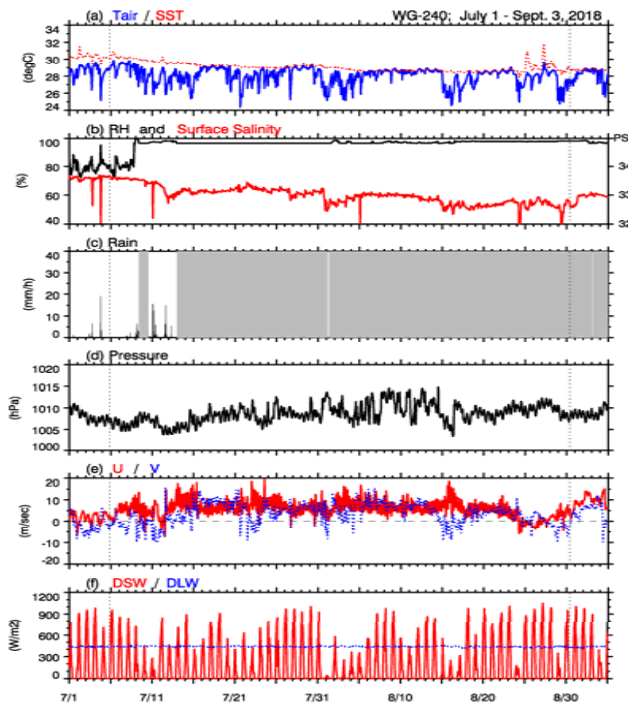
▪ 11 Sept. Recover

WG-196 (8N 132E)

▪ 2 July Recover

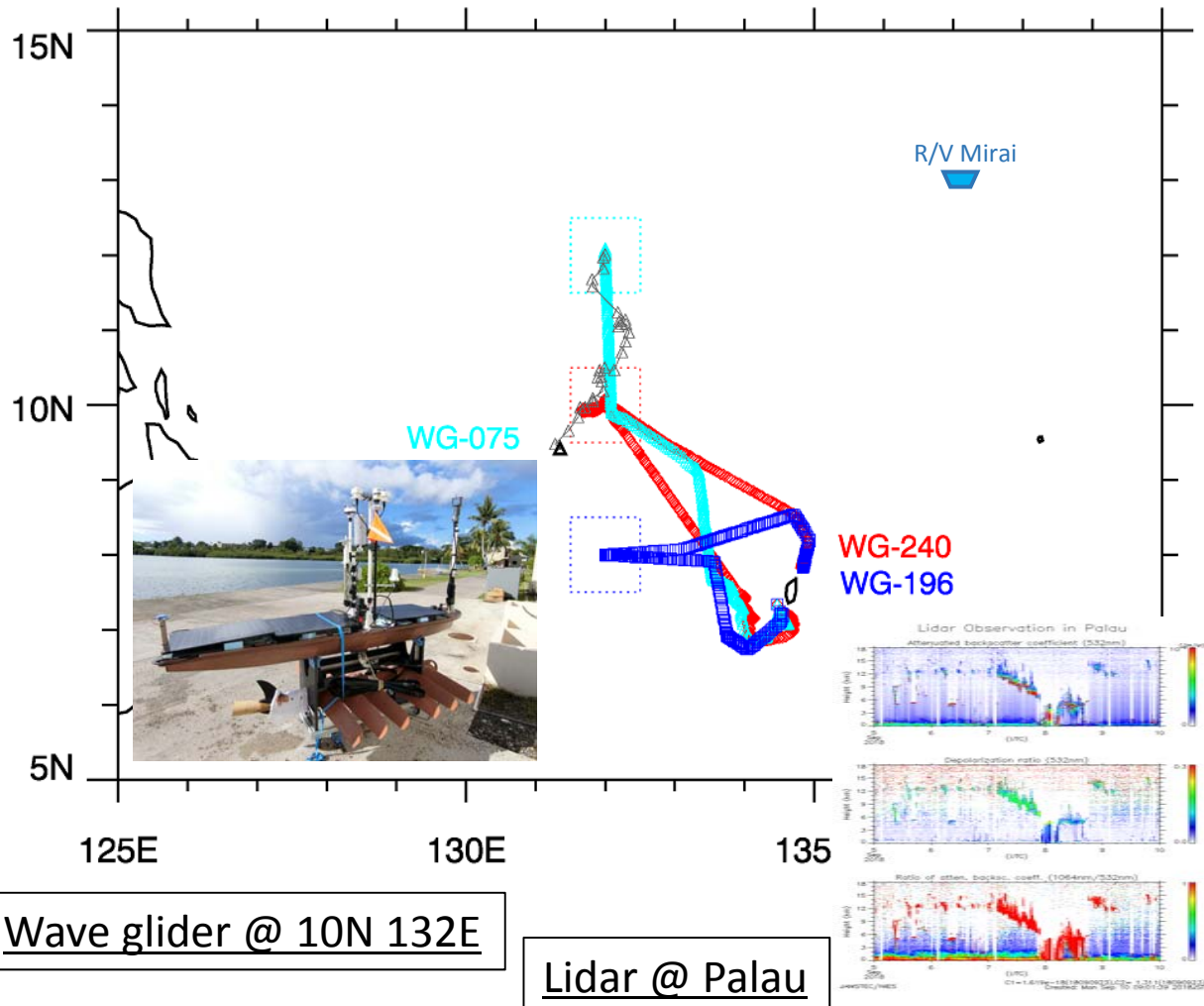
▪ 4 July Install

▪ 12 Sept. Recover



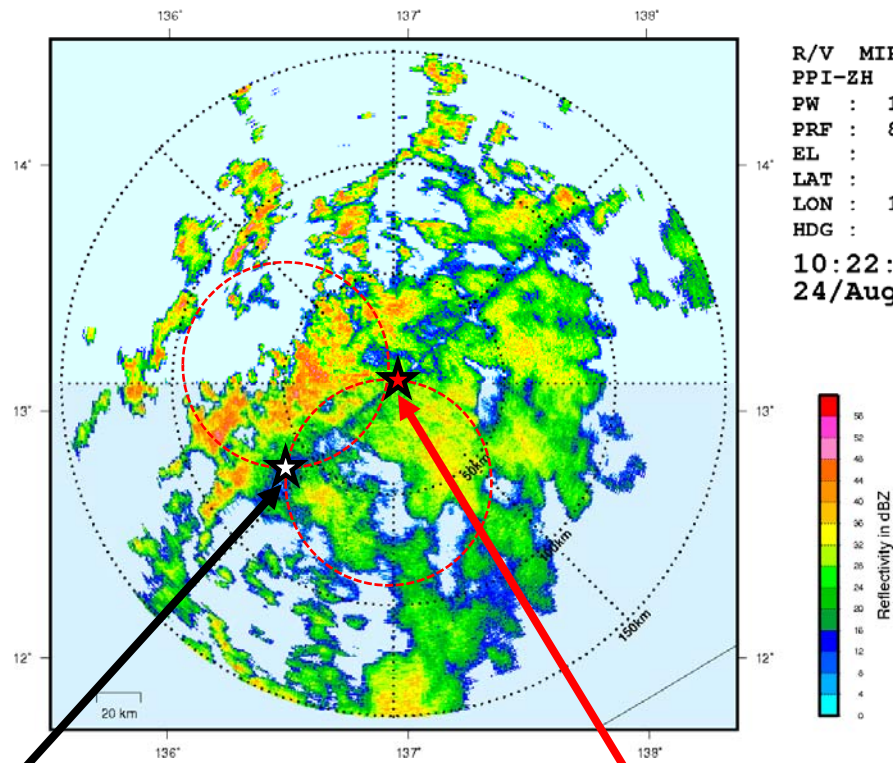
▪ R/V Mirai at 13N 137E for buoy operation and stay during 24 – 28 Aug.

Dual Doppler radar observation with R/V T.G. Thompson (PISTON)



R/V Mirai observation

C-POL @ Mirai



R/V MIRAI
PPI-ZH
PW : 1.0/64.0 (us)
PRF : 833/ 667 (pps)
EL : 0.5 (deg)
LAT : 13.117000 (deg)
LON : 136.939000 (deg)
HDG : 49.3 (deg)
10:22:30
24/Aug/2018 UTC

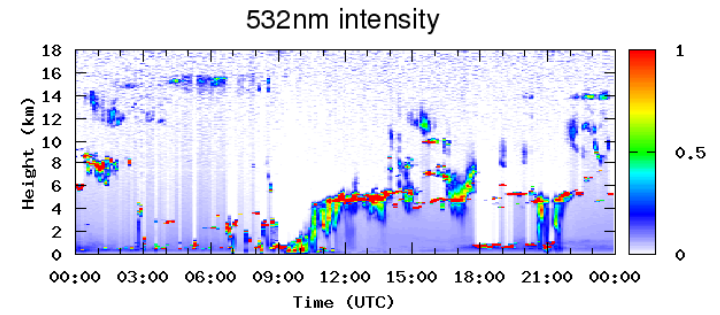
R/V Thomas G. Thompson

R/V Mirai

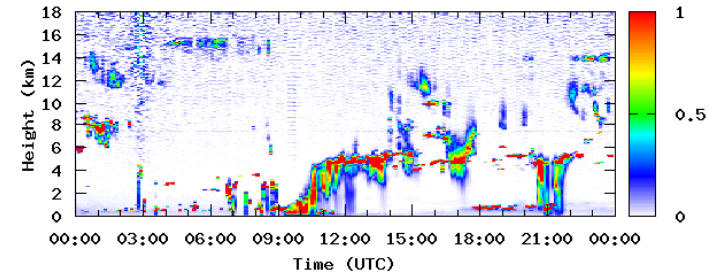
- Scan coordination: modify interval to 7.5-min
- Location coordination: TGT arrange good position by following Mirai action
- 4 days data (10UTC/24 - 12UTC/28/Aug.)
- Several events available

Lidar @ Mirai

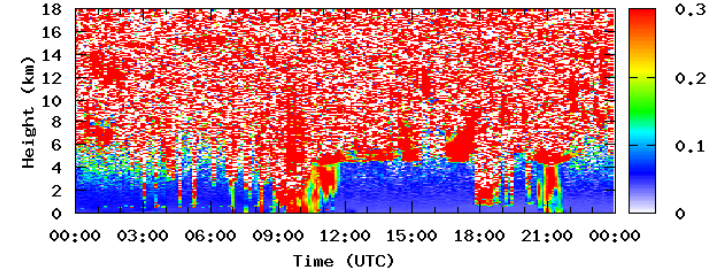
Mirai lidar 180824



1064nm intensity



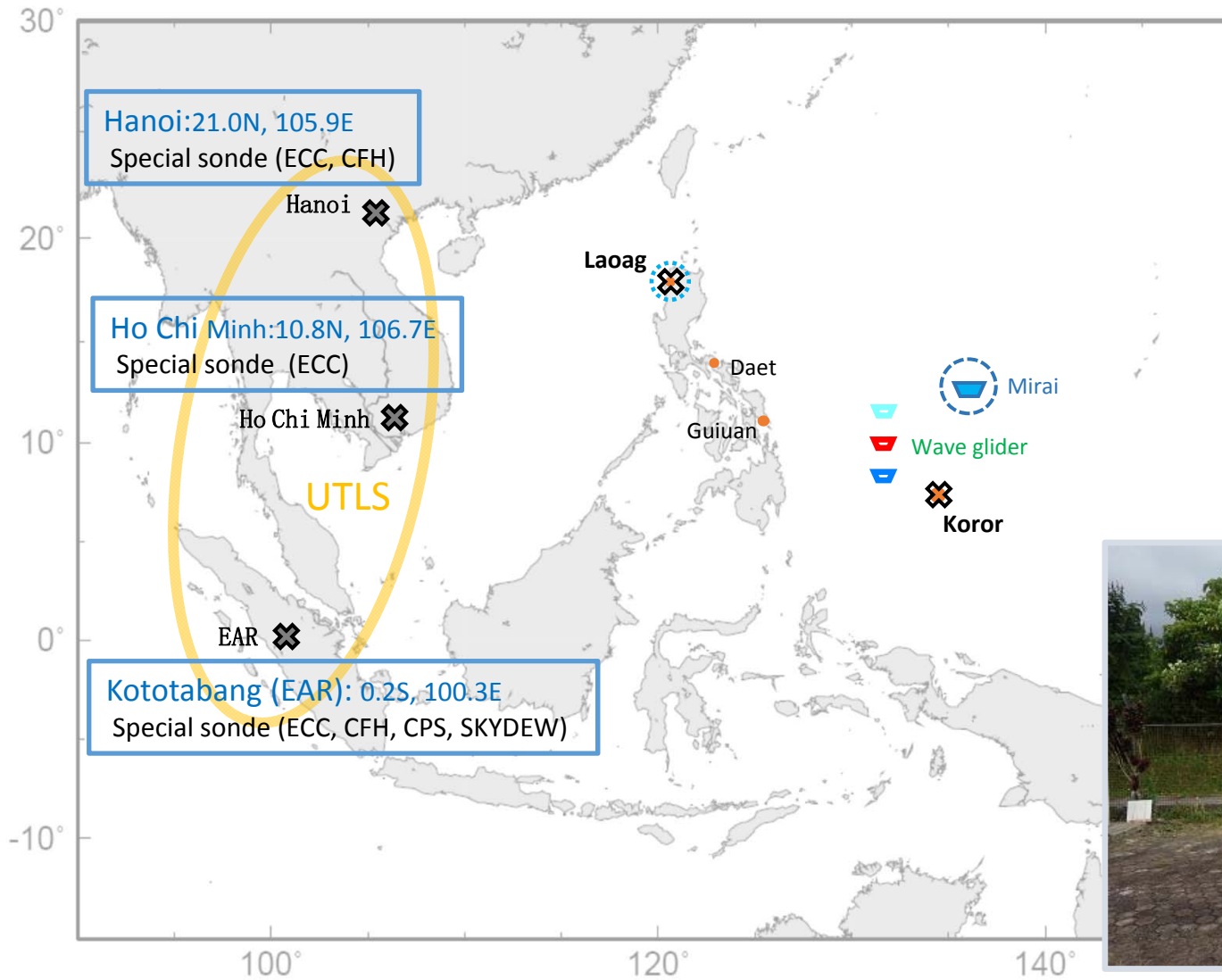
532nm depolarization ratio



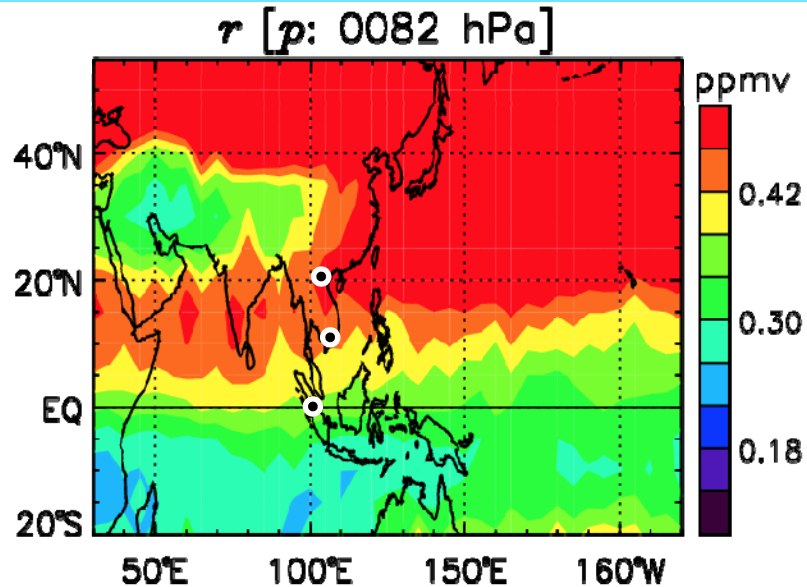
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Long range transport of ozone focusing UTLS



O_3 mixing ratio around Lower stratosphere in July 2018 (Aura MLS)

Special sonde observation

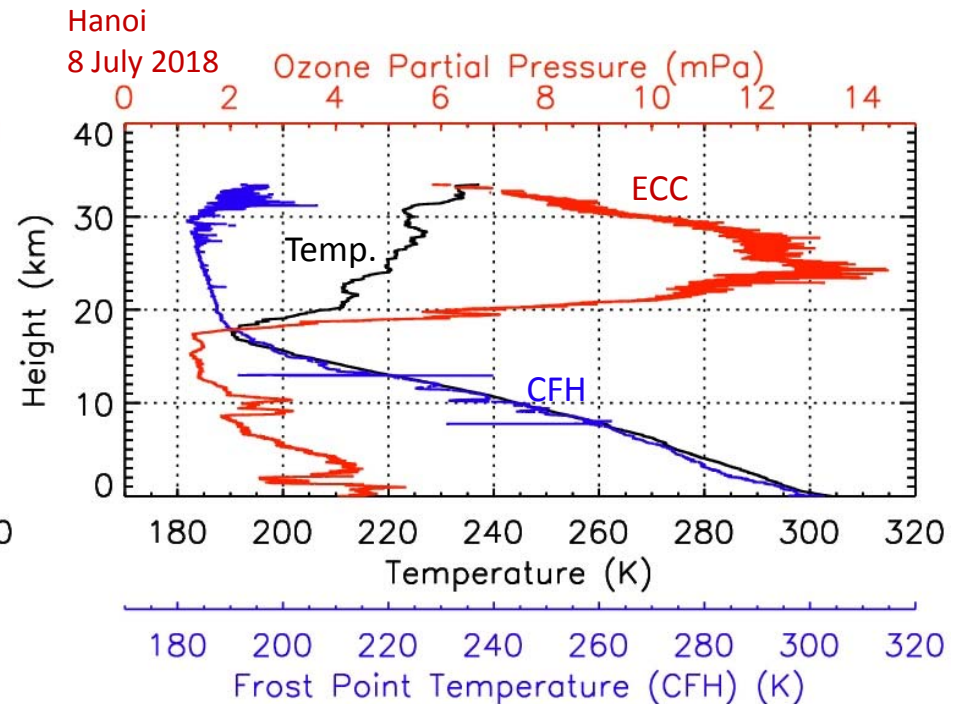
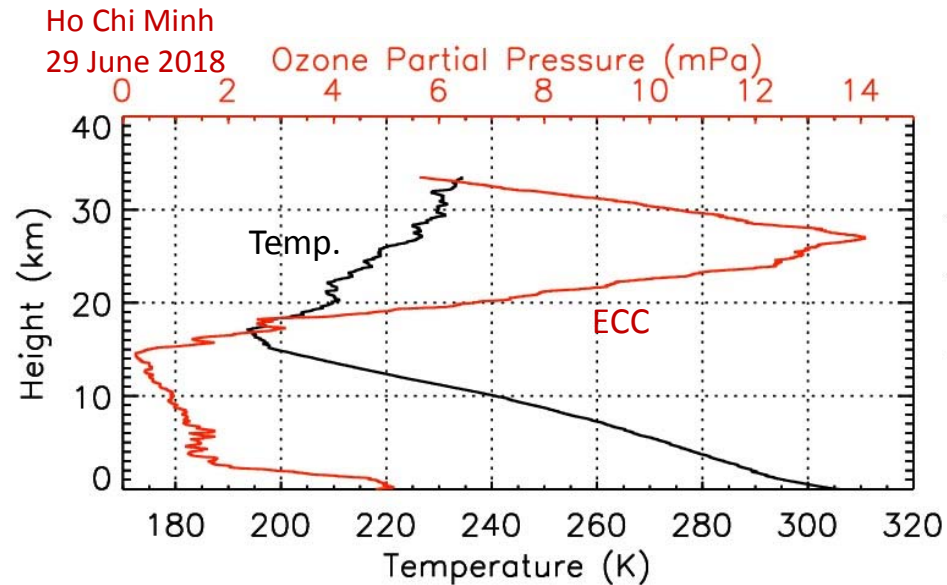
Hanoi : 2 July to 9 Aug

ECC (ozone) x 9

CFH (water vapor) + ECC x 9

Ho Chi Minh: 29 June to 4 Aug

ECC x 18



Special sonde observation at Kototabang, EAR (Equatorial Atmosphere Radar)

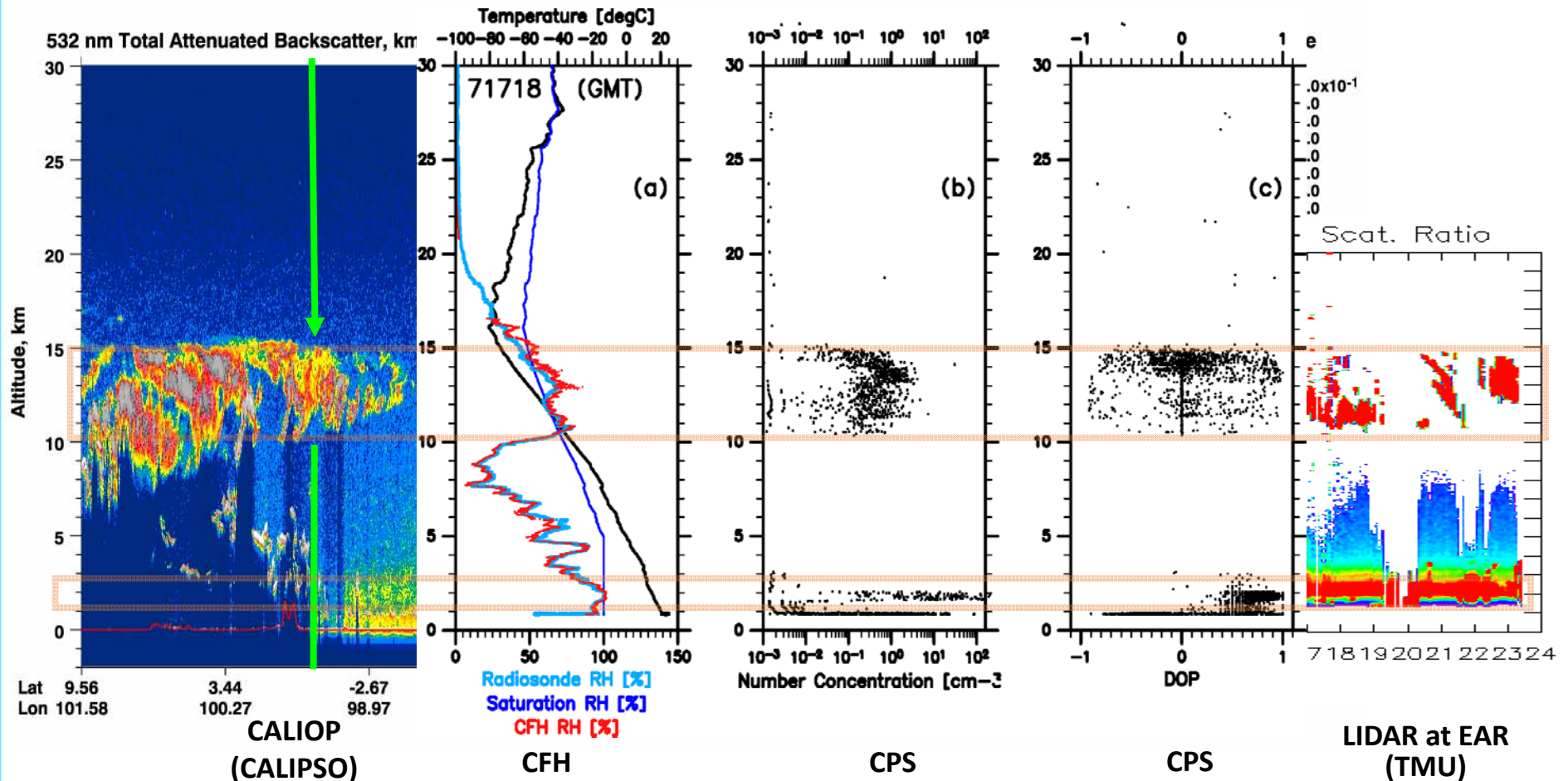
Kototabang (EAR) : 10 times launch during 15 to 27 July

CFH + ECC x 3,

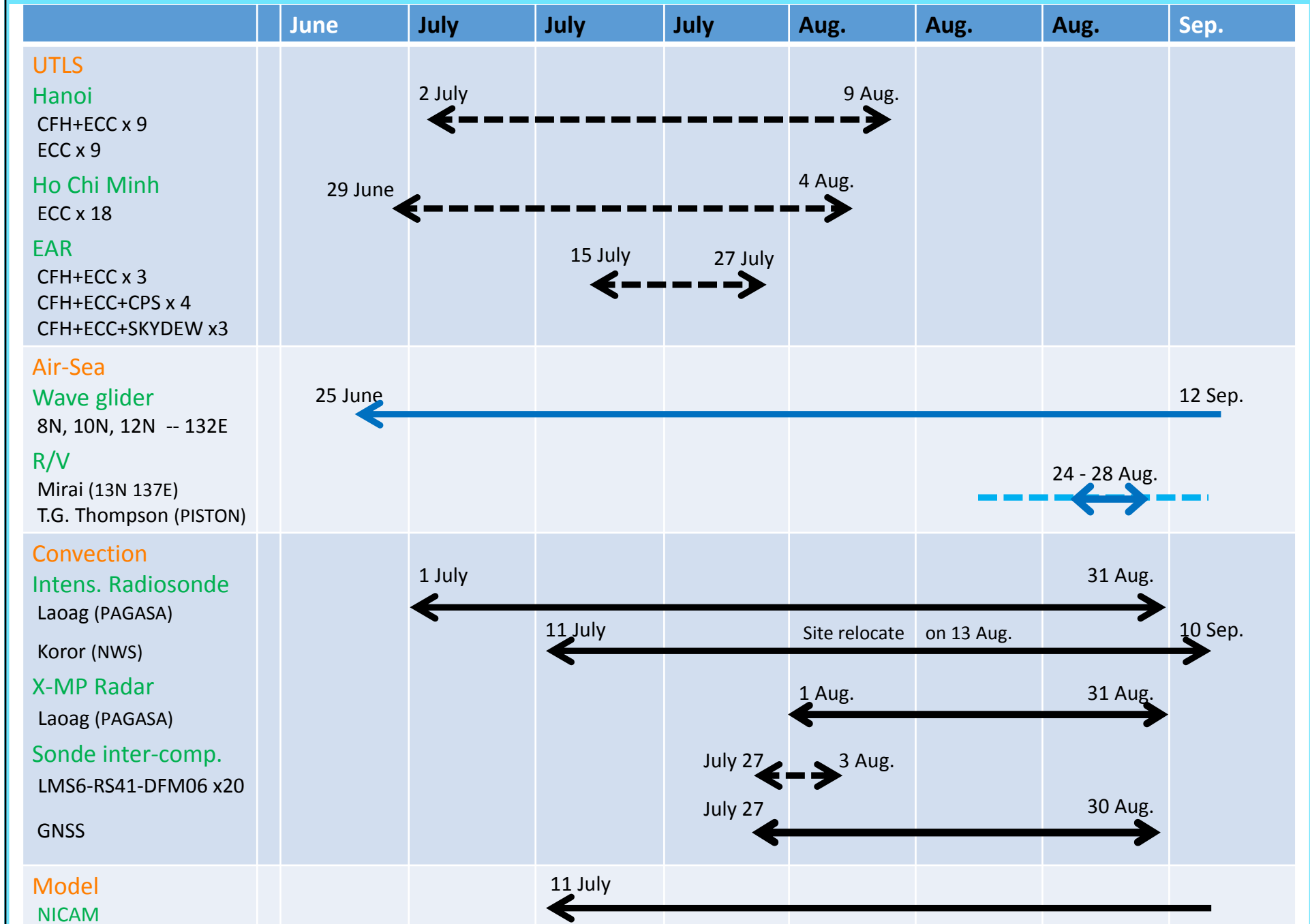
CFH + ECC + CPS (Cloud Particle Sonde) x 4,

CFH + ECC + SKYDEW (Water vapor) x 3

CFH + ECC + CPS observation at EAR: 18UTC, 17 July 2018



YMC Boreal Summer Monsoon study in 2018 campaign



Conclusion

- YMC-BSM 2018 was conducted from 1st July to 31st August 2018, in cooperation with operating agencies of the Maritime Continent countries. The main target phenomena were atmospheric convective activity, air-sea interaction, and UTLS; and the target areas were Philippine, Western Tropical Pacific, and Indochina, respectively.
- Convective activity around Laoag in northern Luzon was strongly affected by BSISO (in July) and Asian monsoon (in August), and showed a significant diurnal change.
- In order to understand air-sea interaction from a new viewpoint, we need to proceed with the improvement of autonomous unmanned surface vehicles.
- Transport of stratospheric ozone is closely related to Asian monsoon activity. The dynamical structure of UTLS should also be noticed.

A night sky filled with stars, with a utility pole and trees in the foreground. The sky is dark and filled with numerous small, bright stars. A utility pole with cross-arms is visible on the left side. In the foreground, there are silhouettes of trees and a fence. The overall scene is a serene night landscape.

Thank you.

Aimeliik, PALAU

Abstract

As a part of the YMC (Years of the Maritime Continent) campaign, Intensive Observation Period (IOP) of the YMC-Boreal Summer Monsoon study in 2018 (YMC-BSM 2018) was set during July 1 to August 31, 2018. The YMC-BSM 2018 is designed to study boreal summer monsoon by conducting various observations at selected sites, where local unique phenomena are often observed.

One key topic of the YMC-BSM 2018 is atmospheric convection associated with northward propagating BSISO (Boreal Summer Intra-Seasonal Oscillation). To study offshore propagation of diurnal cycle of rain and its relation to BSISO, a Doppler radar was deployed in the west coast of the northern Luzon, Laoag area, in Philippines, while radiosonde soundings were enhanced both at Laoag and at Koror, in Palau.

In addition, to study air-sea interaction around the Philippine Sea, three autonomous unmanned surface vehicles equipped with surface meteorological station, ADCP, and GNSS receiver were launched from Palau to occupy 8/10/12N along 132E.

On the other hand, interaction between UTLS (upper troposphere and lower stratosphere) was intensively studied by launching special sondes equipped with ozone-sensor (ECC) and high accurate hygrometer (CFH) at Hanoi and Ho Chi Minh in Vietnam, and at Kototabang, in Indonesia.

During the IOP, near real-time prediction using NICAM (Nonhydrostatic ICosahedral Atmospheric Model) were also performed.