

Post-MAHASRI RHP planning in monsoon Asia

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and Jun Matsumoto

Overview of MAHASRI

**Monsoon Asian Hydro-Atmosphere
Scientific Research and Prediction
Initiative(2006-2015)**



<http://mahasri.cr.chibau.ac.jp/>

"To establish hydro-meteorological prediction system, particularly up to seasonal time-scale, through better scientific understanding of Asian monsoon variability".

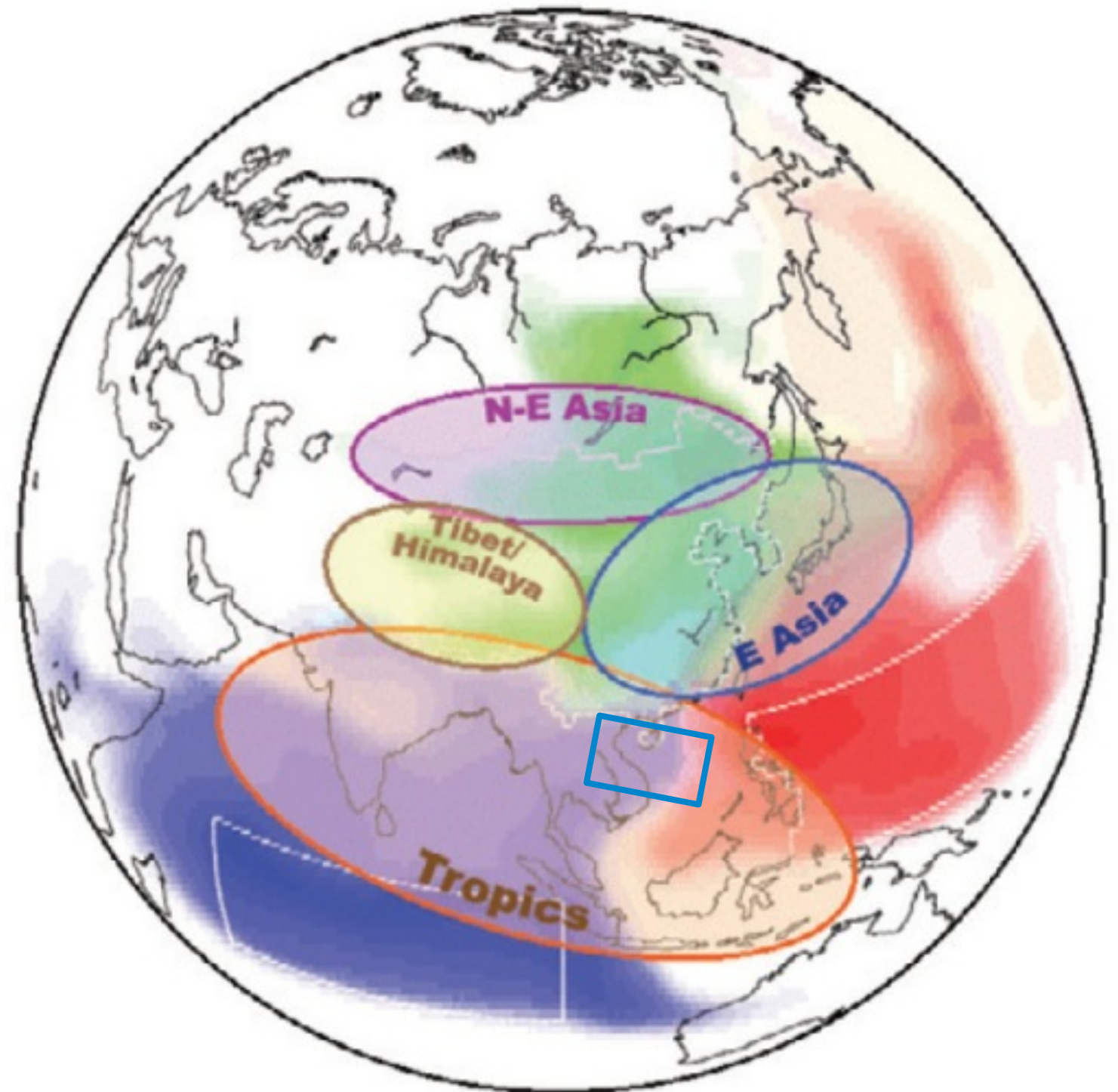
Jun Matsumoto

**Department of Geography, Tokyo Metropolitan University, JAMSTEC/ DCOP
International Science Conference on MAHASRI , March 2, 2016
at Tokyo Metropolitan University, Japan**

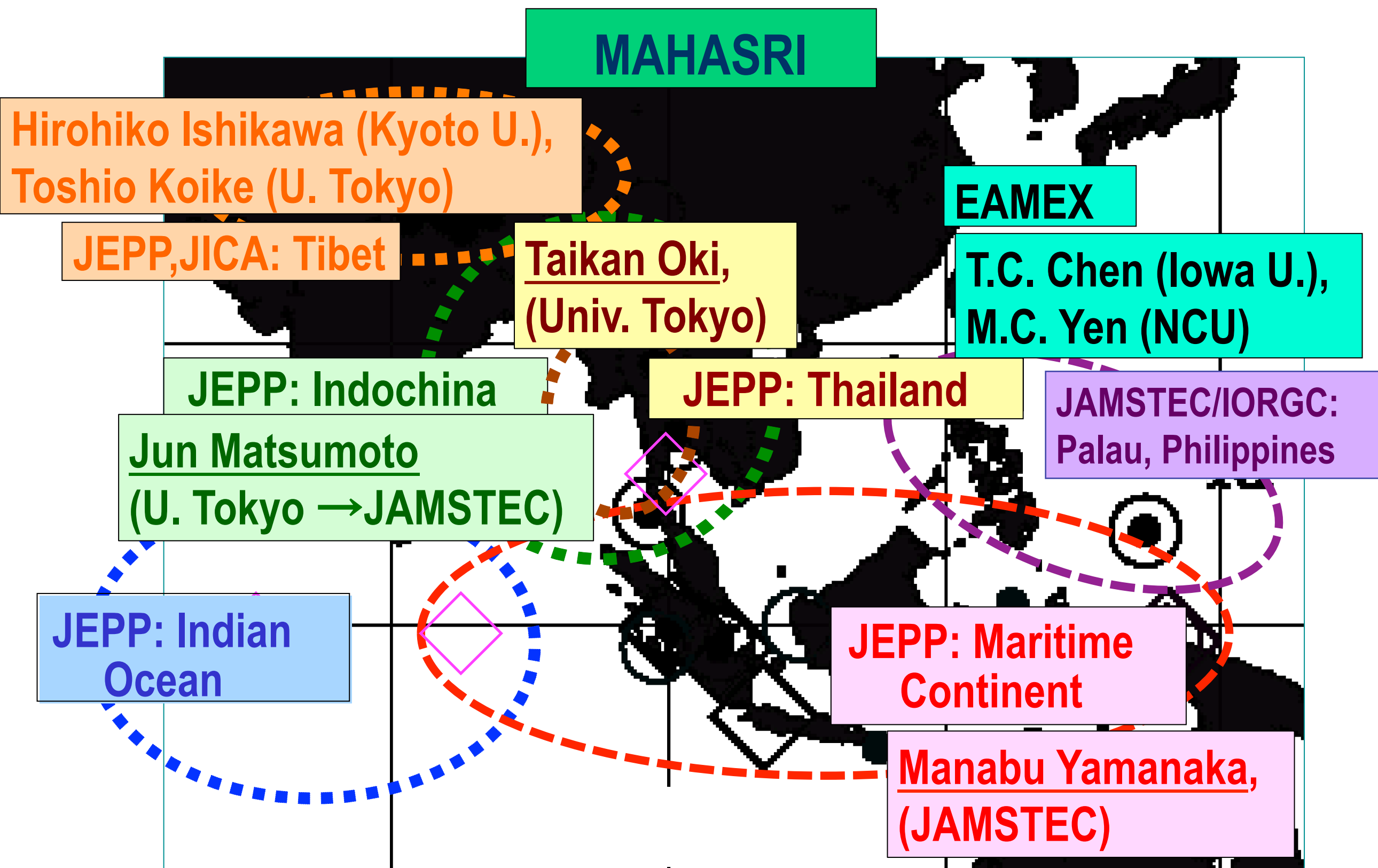
Objectives:

- Determining the predictability and key components of Asian monsoon variability with a time scale up to a season for the development of **a hydro-meteorological prediction system**.
- Developing **a real-time monitoring** capability for hydro-meteorological observations.
- Developing an integrated hydro-meteorological **database** including data rescue.
- Examining and improving the hydro-meteorological **models** in some specific river basins.

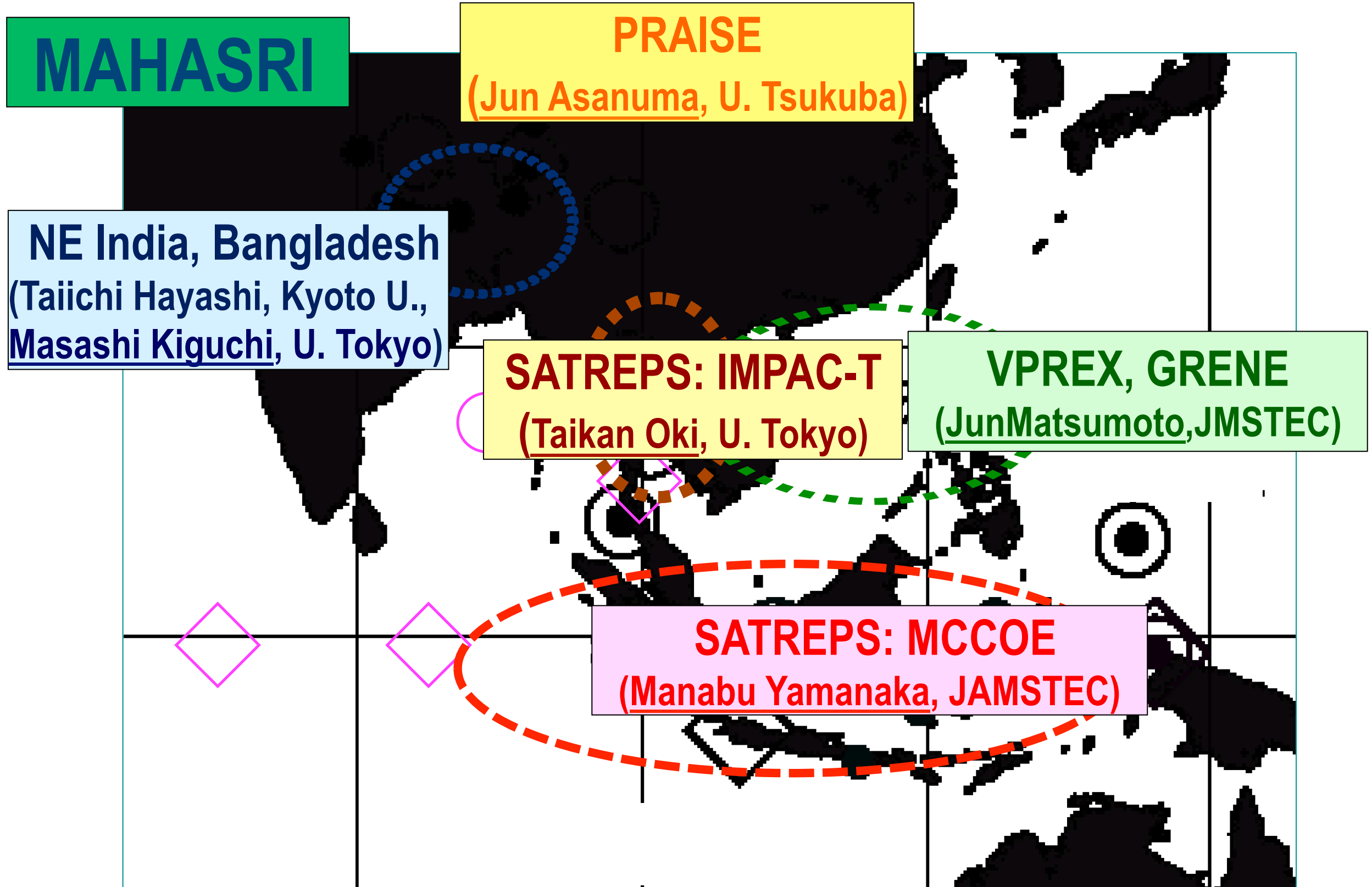
Study area of MAHASRI



MAHASRI related Projects (JEPP, EAMEX, JAMSTEC) 2006-2010



MAHASRI related Projects for the JPFY2009-2013



Outcomes / impacts of MAHASRI (1)

- Continuous research collaborations with monsoon Asian operational agencies and research communities since the GAME period strongly stimulate research activities in monsoon Asia.
 - Thailand (TMD, RID, RFD, KU..., IMPAC-T/Univ. Tokyo, TIT, Kyoto U....)
 - Indonesia (BPPT, BMKG, HARIMAU/JAMSTEC)
 - Vietnam (NHMS, HUS, JEPP/JAMSTEC, TMU)
 - Philippines (PAGASA, Ateneo U., JAMSTEC, TMU)
 - Bangladesh, NE India (BMD, IMD, IIT, NEHU..., Kyoto U., Kagawa U, Kochi U....)
 - Mongolia (IMH, Tsukuba Univ., Hokkaido Univ. JAMSTEC....)

Outcomes / impacts of MAHASRI (2)

- After the huge flood damages in 2011, real-time monitoring system and flood prediction system have been developed in the Chao Phraya River Basin in Thailand.
- Dynamics of autumn/winter extreme rainfalls in Indochina have been extensively investigated, but application to operational weather forecast has to be developed in future.

Outcomes / impacts of MAHASRI (3)

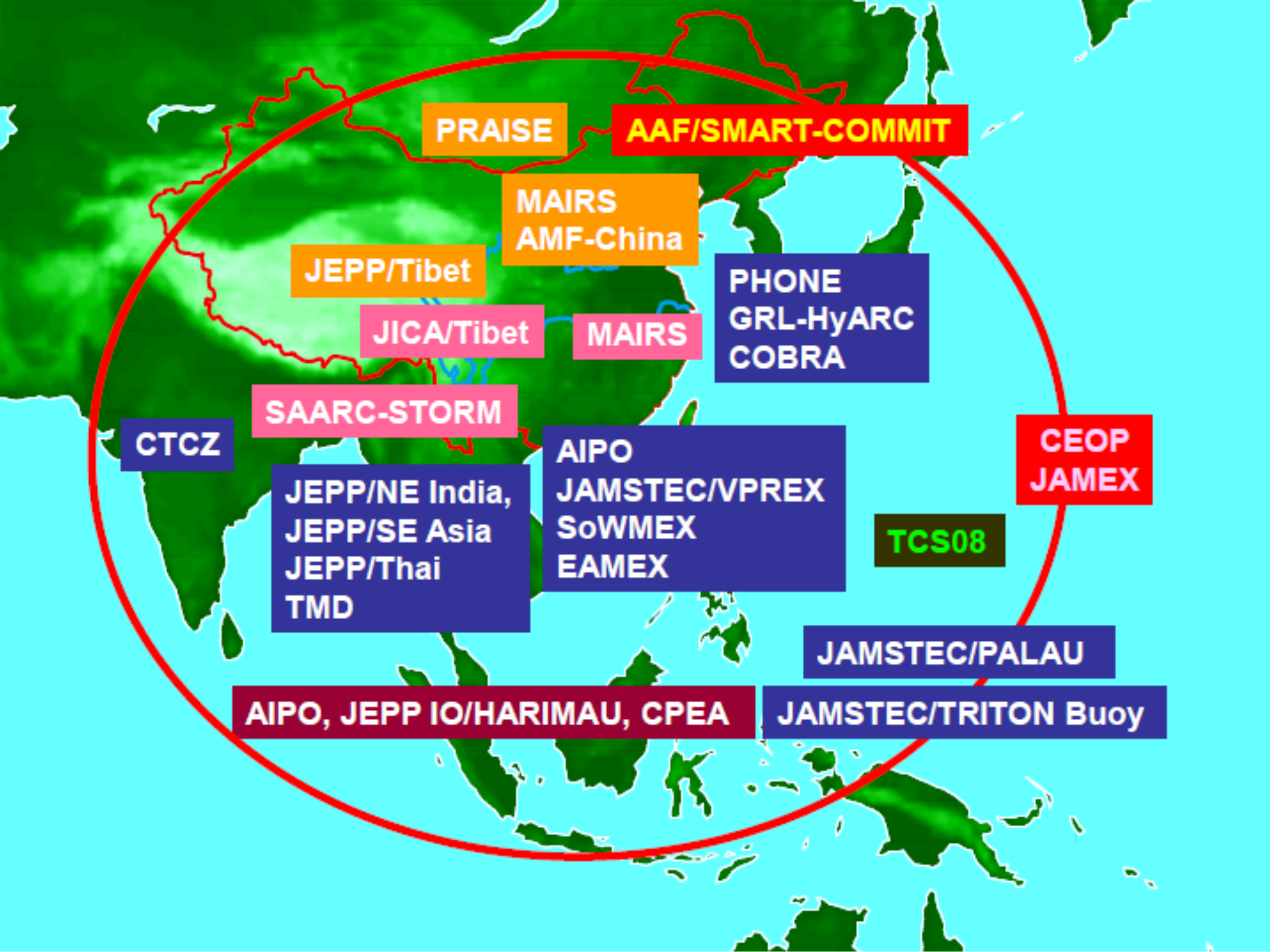
- Collaboration with AMY community:
 - In-situ observation datasets in DIAS (Data Integration and Analysis System) in the Univ. Tokyo
 - AMY Re-analysis by MRI (Meteorological Research Institute)

AMY (Asian Monsoon Years 2007-2012)

Overarching Goal:
“To improve Asian Monsoon prediction for societal benefits through improving understanding of the variability and predictability of the Asian-Australian monsoon system”



<http://www.wcrp-amy.org/>



PRAISE

AAF/SMART-COMMIT

MAIRS
AMF-China

JEPP/Tibet

JICA/Tibet

MAIRS

PHONE
GRL-HyARC
COBRA

SAARC-STORM

AIPO
JAMSTEC/VPREX
SoWMEX
EAMEX

CEOP
JAMEX

TCS08

JAMSTEC/PALAU

AIPO, JEPP IO/HARIMAU, CPEA

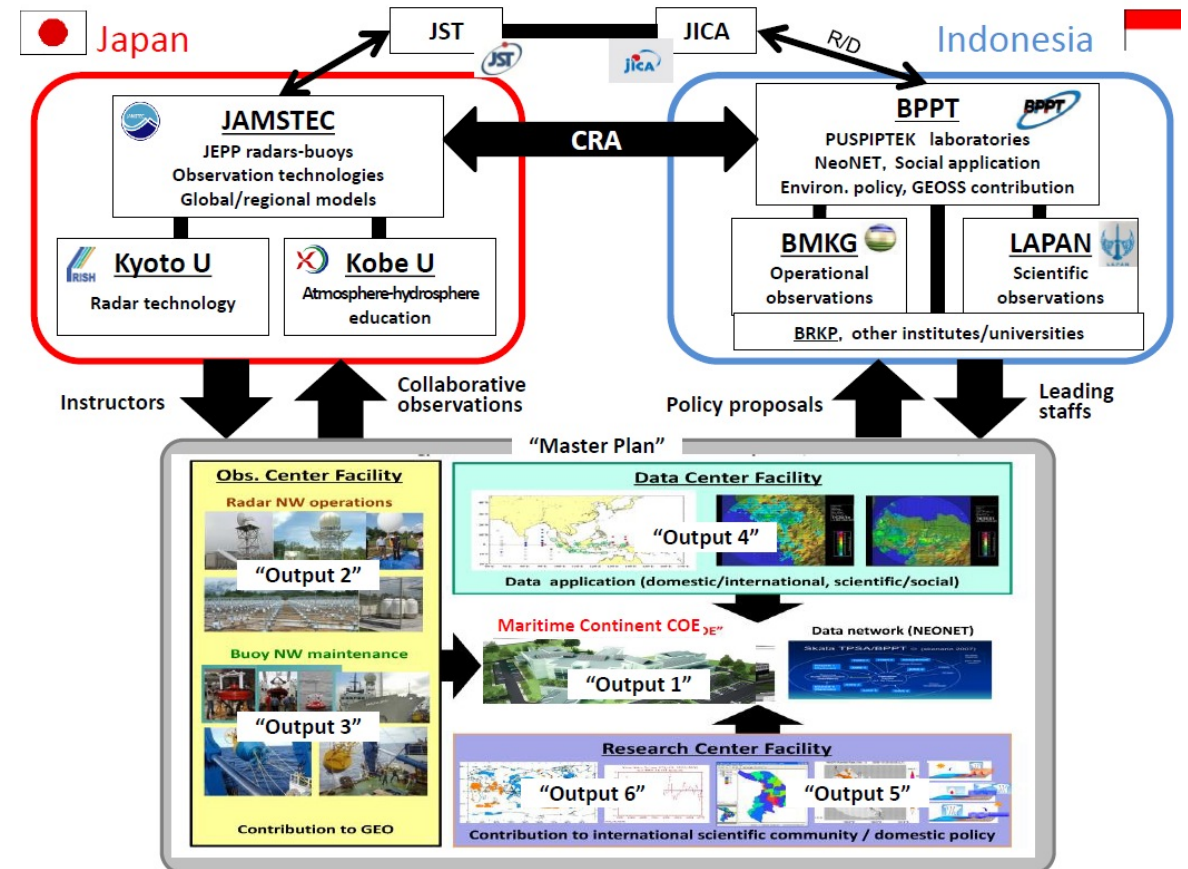
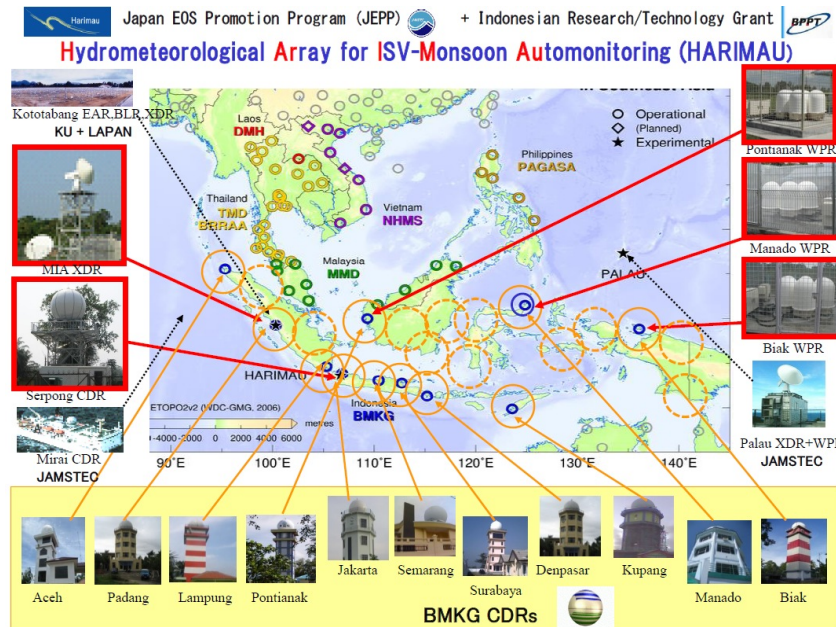
JAMSTEC/TRITON Buoy

JEPP/NE India,
JEPP/SE Asia
JEPP/Thai
TMD

CTCZ

Outcomes / impacts of MAHASRI (4)

- Local research developing efforts:
 - MCCOE, NEO-NET (Indonesia)



- Education / capacity building:
 - Co-authored papers with Asian scientists (Prof. Jun Matsumoto)
 - 1996-2005 (GAME): 5 / 22 (23%)
 - 2006-2015 (MAHASRI): 26 / 60 (43%) 4 PhD students in TMU

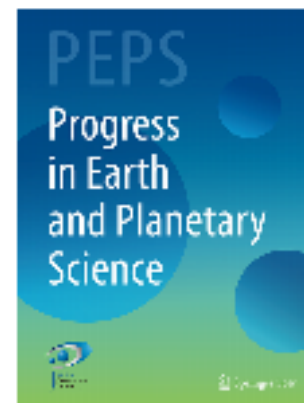
SPEPS of JpGU are now in edition. More than 30 papers will be submitted.


What is Progress in Earth and Planetary Science (PEPS)?

- ⦿ Full open access peer-review e-journal
- ⦿ Covering all fields of Earth and Planetary Science

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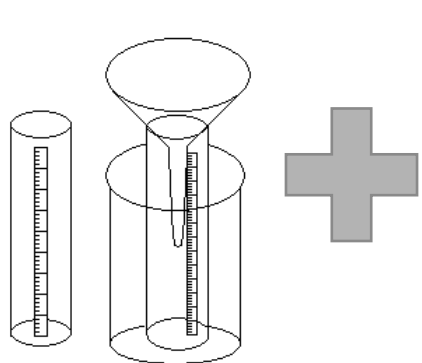


Future targets of MAHASRI

- Diurnal-cycle / Synoptic / ISO / Seasonal changes
- Local / Regional / Global
 - Multi-scale interactions
- Land – ocean – atmosphere interactions
- Changes and attribution of extreme
- Decadal variations of Asian monsoon
- Human effect on hydrological cycle
- Adaptation strategy for climate changes

Better estimation of precipitation in *less-gauged* areas of Asia and its application

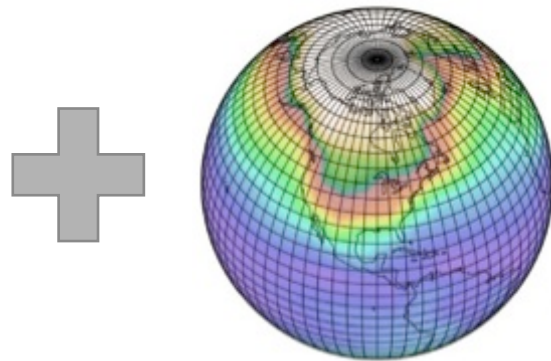
© Better estimation of precipitation



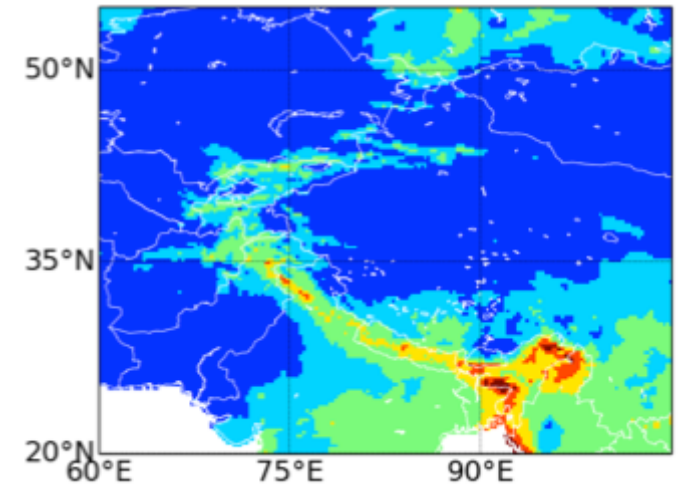
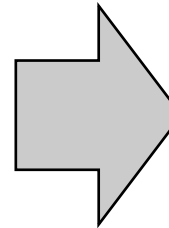
Gauge
in-situ



Satellite
(e.g., TRMM/PR;
GPM/DPR)



Reanalysis
(e.g., JRA)

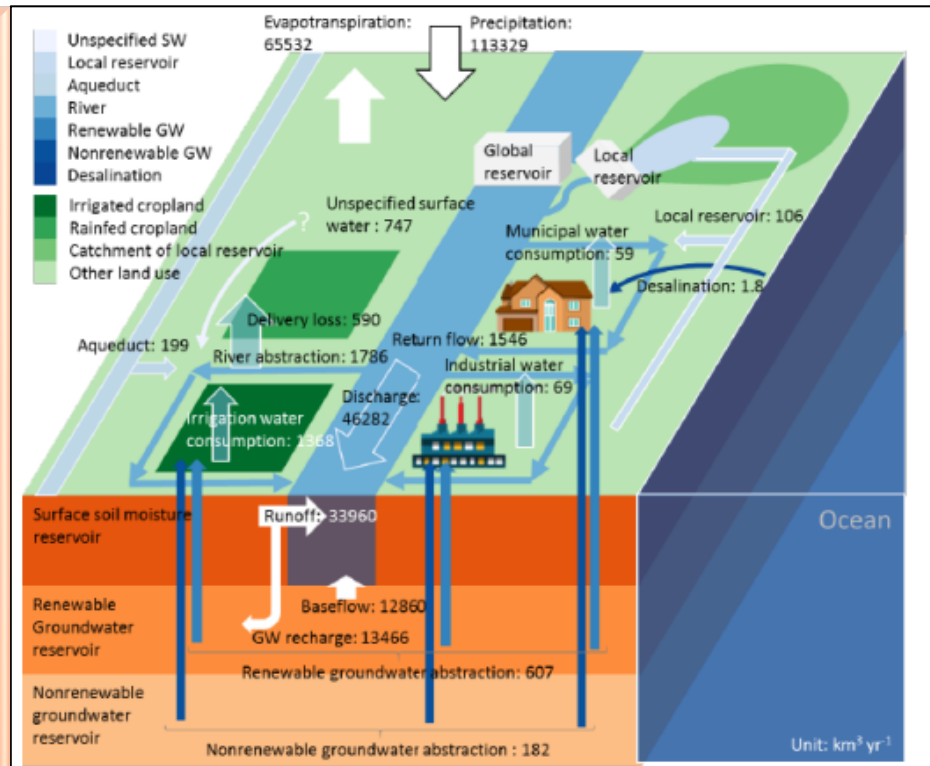


Validation,
Calibration,
Better estimation

© Application in high mountain Asia (e.g., glacier melting simulation)

Validation and improvement of hydrological model which incorporates human water withdrawal.

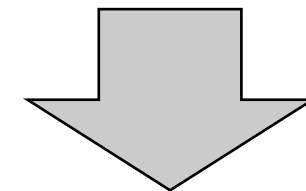
1. Groundwater recharge
2. Groundwater abstraction
3. Aqueduct water transfer
4. Local reservoirs
5. Seawater desalination
6. Return flow and delivery loss
7. Surface water balance



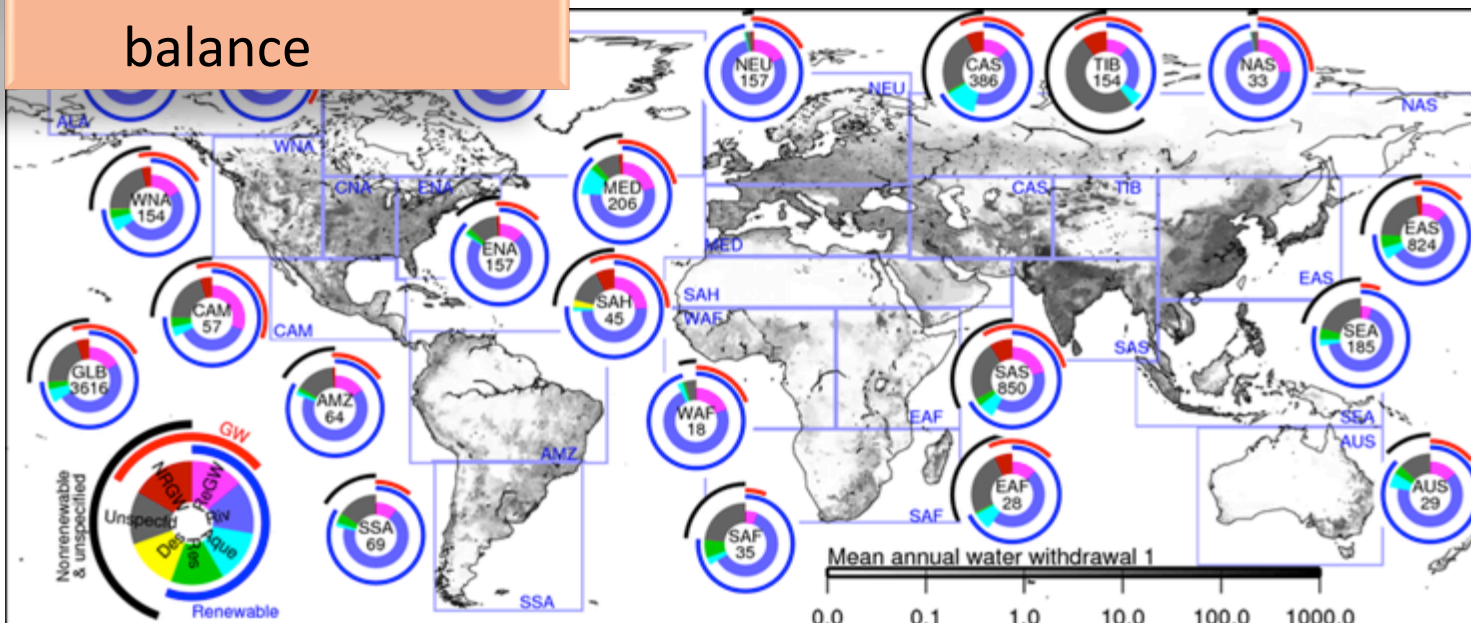
(Hanasaki et al. 2017, HESSD)

There is still 21% 'Unspecified sources' in global water use.

Major part of unspecified is in Asia, probably from irrigation.



Validation and improvement by using various sources of information in Asia (e.g., satellite data, local data, assimilation?).

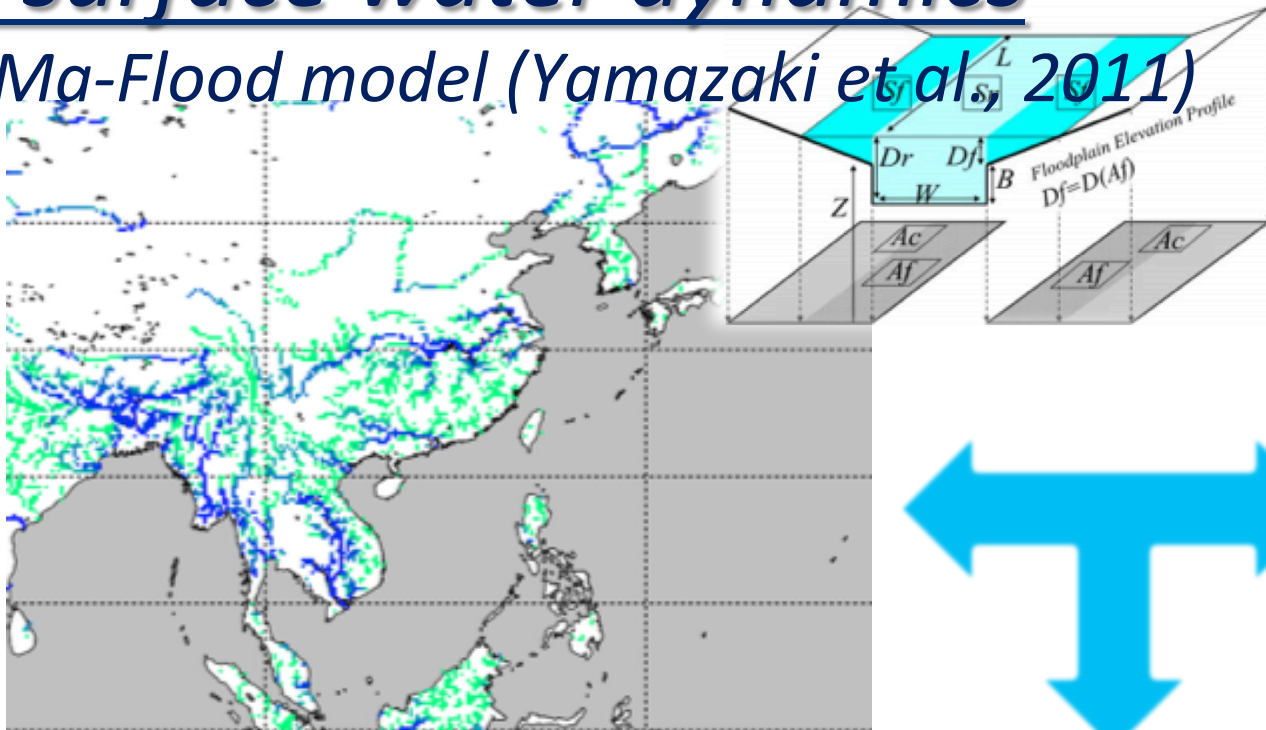


Water sources by region (Hanasaki et al., 2017)

Integration of satellite observations and model simulations for exploring surface water dynamics

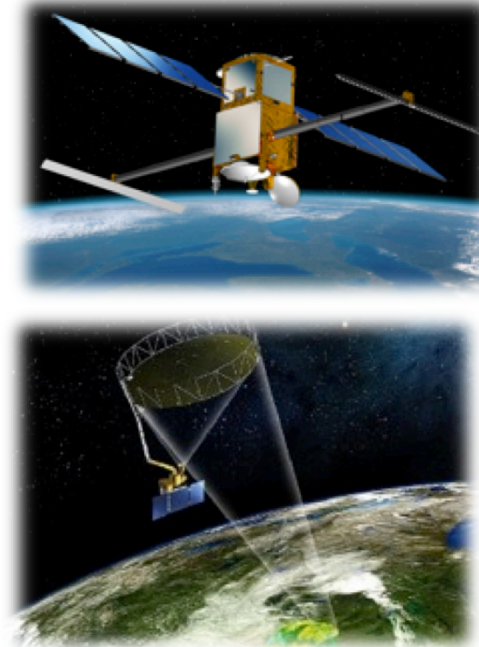
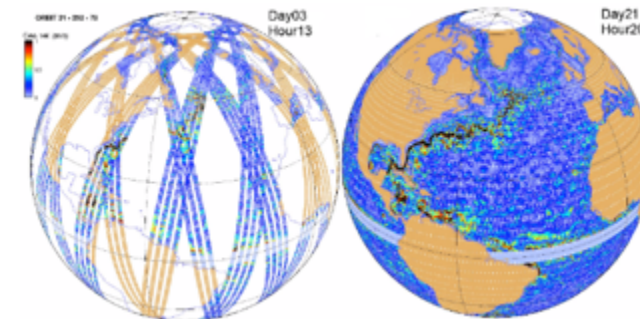
Very high resolution modeling of surface water dynamics

CaMa-Flood model (Yamazaki et al., 2011)

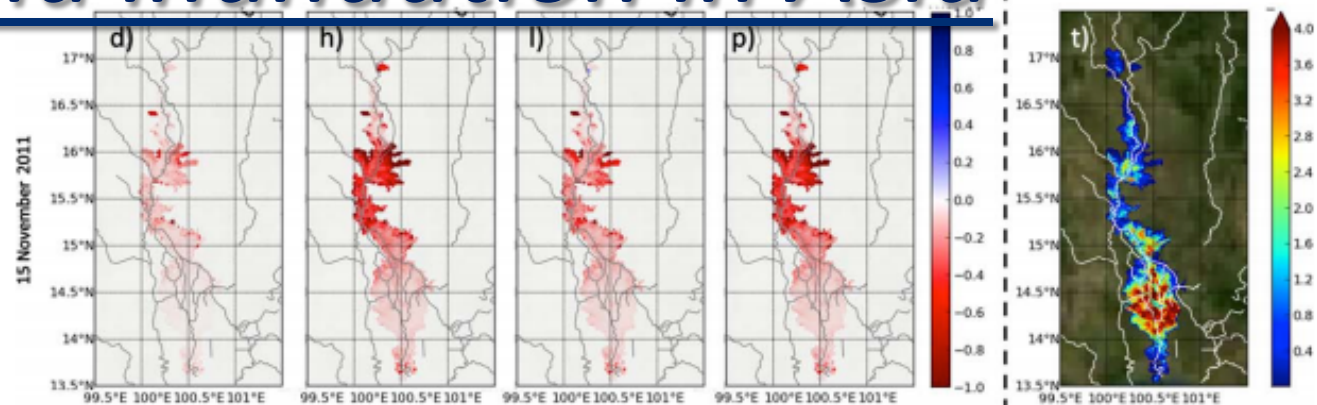


Altimeter, Microwave

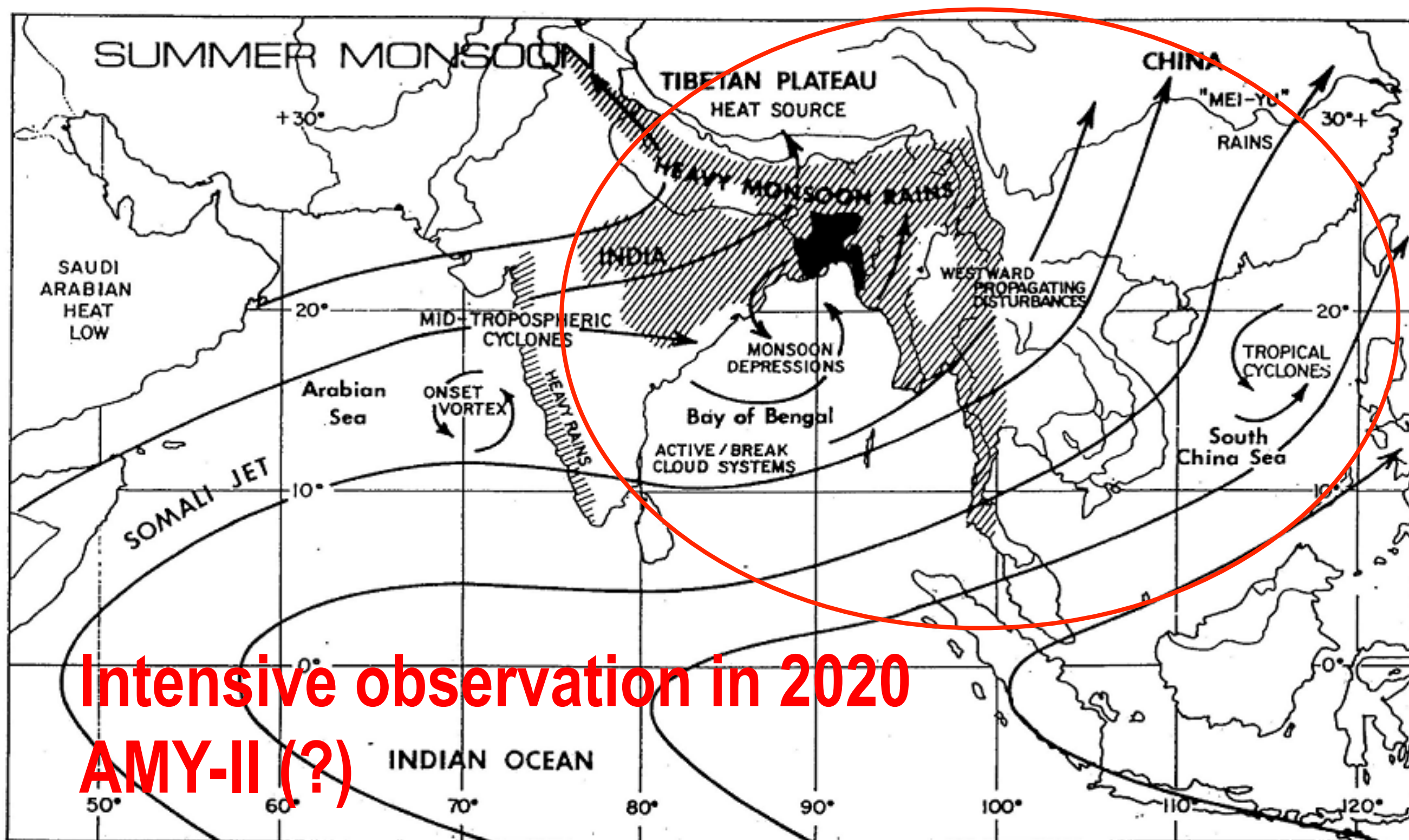
SWOT, SMAP, GCOM etc.



Assimilation and Prediction of flooding and inundation in Asia



Summer monsoon system in Asia



**Intensive observation in 2020
AMY-II (?)**