

The HARIMAU radar-Profiler netwok as a maritime-continent subproject of MAHASRI

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<http://www.jamstec.go.jp/iorgc/harimau/HARIMAU.htm>
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PMO
CSTP



MEXT
SAC
EOSC

**Japanese EOS
Promotion
Program (JEPP)**



Theme 1:
**Global Warming
& Carbon Cycle**
(2005-)

- Marine atmos. CO₂ (Watanabe/JAMSTEC)
- Western Pacific O₂ budget (Mukai/NIES)
- CO₂-profiling (Nagasawa/Tokyo Metro. U)
- Bio-geochemical C cycle (Uematsu/U Tokyo)
- Oceanic CO₂ Tech. development (Uji/AESTO)

Theme 2:
**Asian
Monsoon &
Climate
Variability**
(2005-)

- Maritime continent radars (Yamanaka/JAMSTEC)
- Indian Ocean buoy (Mizuno/JAMSTEC)
- Thailand/Water management (Oki/U Tokyo)
- SE-Asian rainfall (Matsumoto/U Tokyo)
- GPS temperature-humidity (Tsuda/Kyoto U)
- Tibetan energy-water cycle (Ishikawa/Kyoto U)

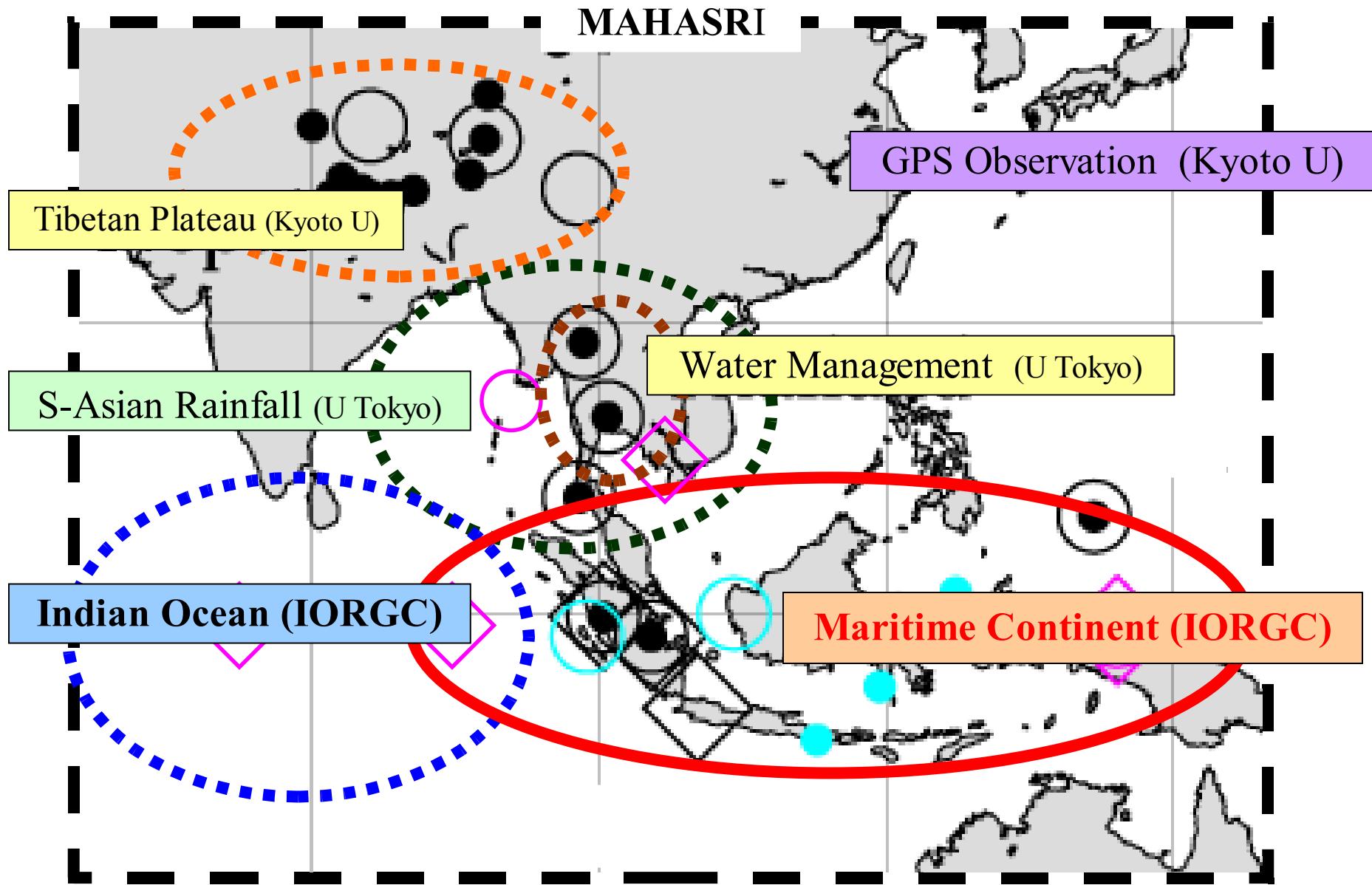
Theme 3:
Informatics (2005-)

- Informatics for GEOSS (Takahashi/MRI Inc)
- Existing obs. systems (Ito/AESTO)

Theme 4: **Tropospheric
Chemistry** (2006-)

- Aerosol monitoring (Takamura/Chiba U)
- Ground-based optics (Akimoto/JAMSTEC)

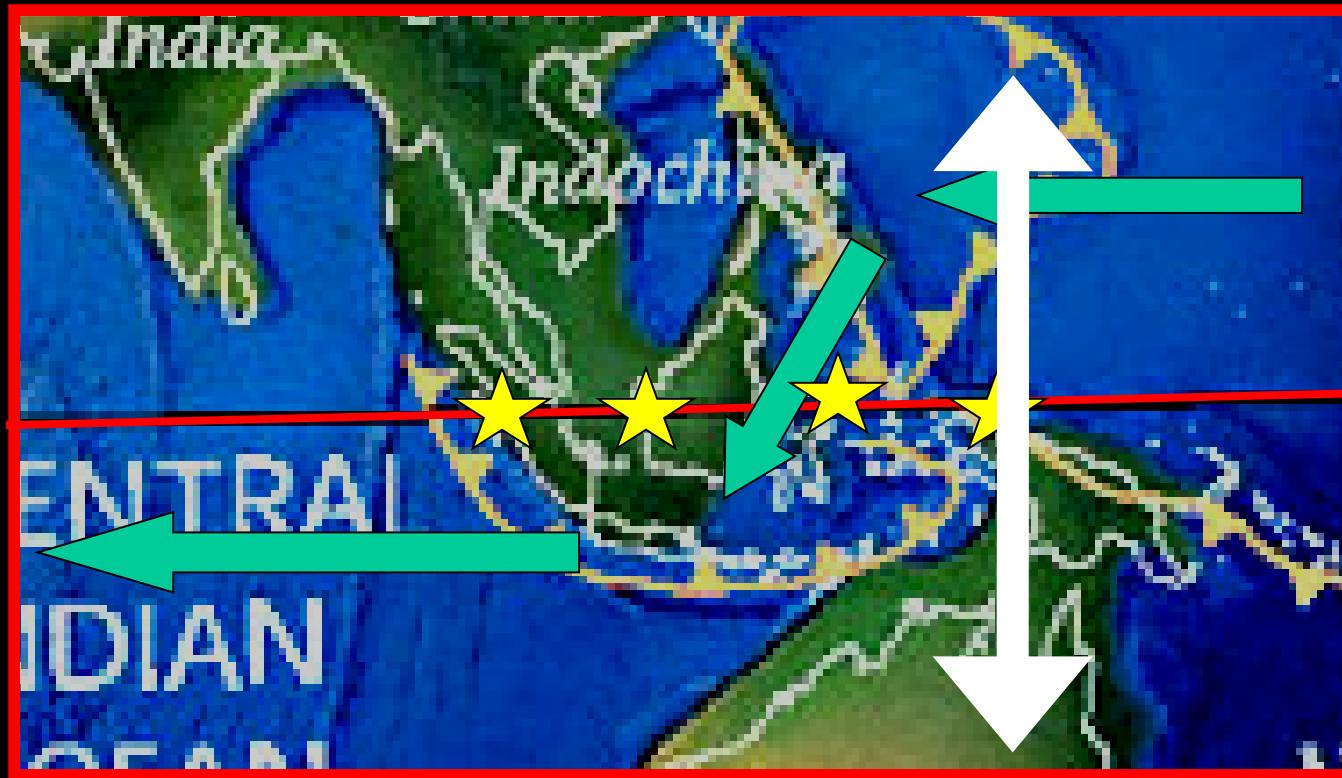
JEPPs and MAHASRI/GEWEX/WCRP



Japanese EOS Promotion Program (JEPP)
**Hydrometeorological Array for ISV-Monsoon Automonitoring
(HARIMAU)**

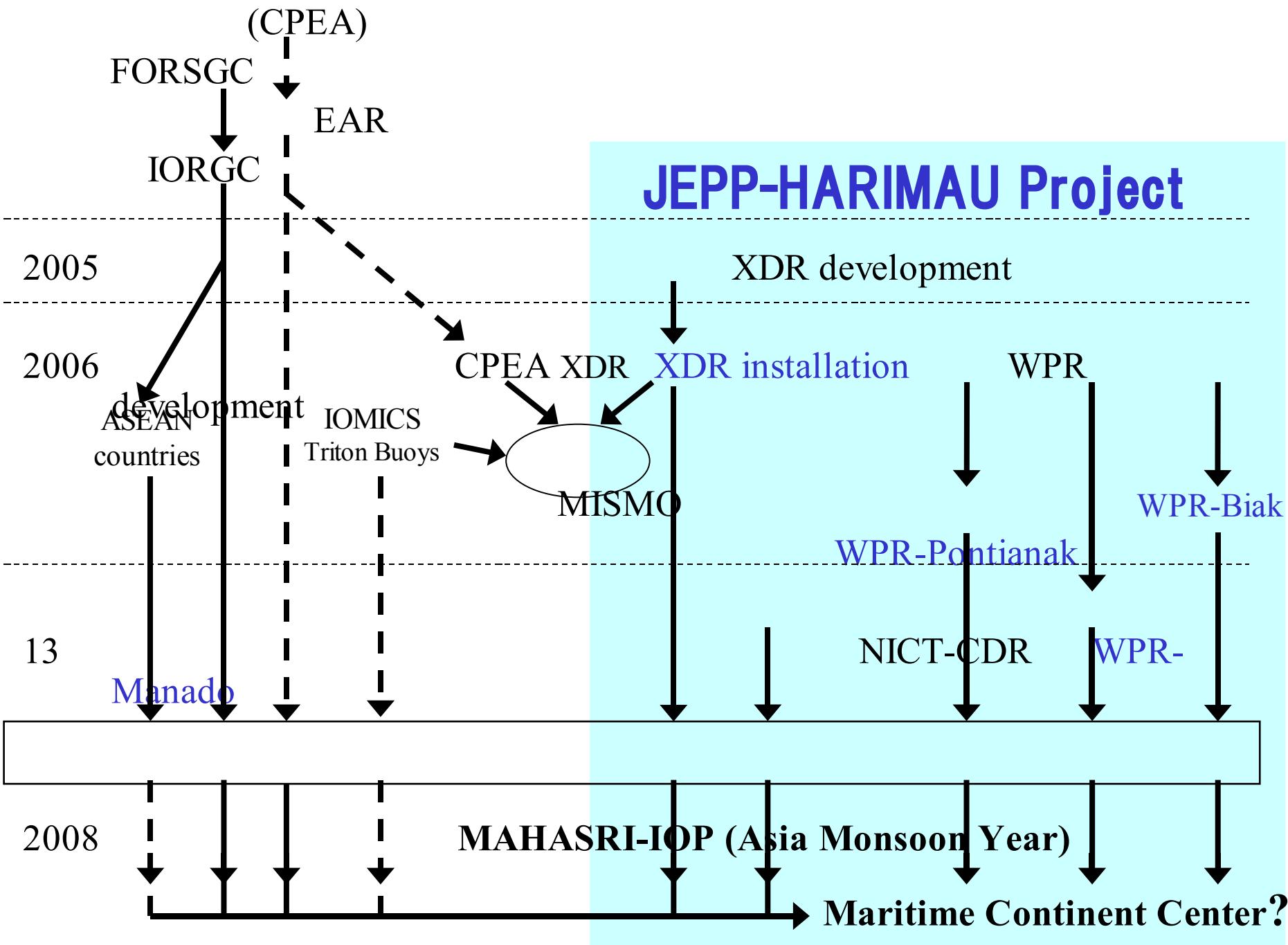
IORG/JAMSTEC

TISDA/BPPT

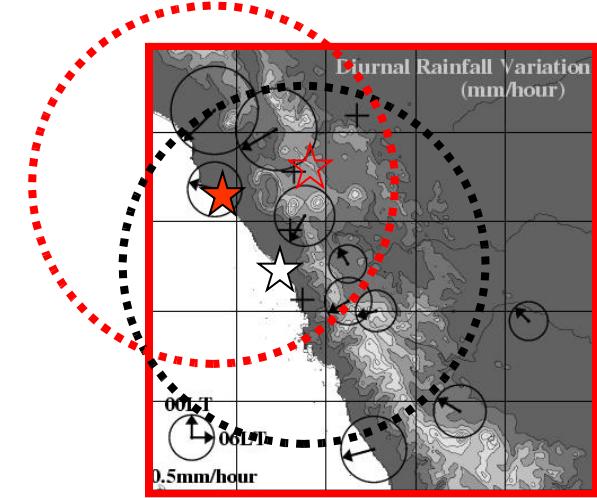


Objectives

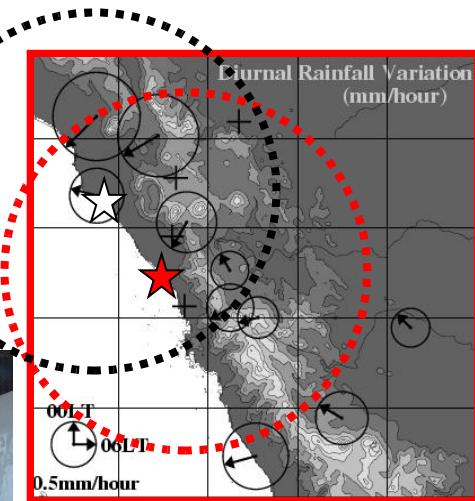
- Construction of Radar-profiler network over Indonesian Maritime Continent



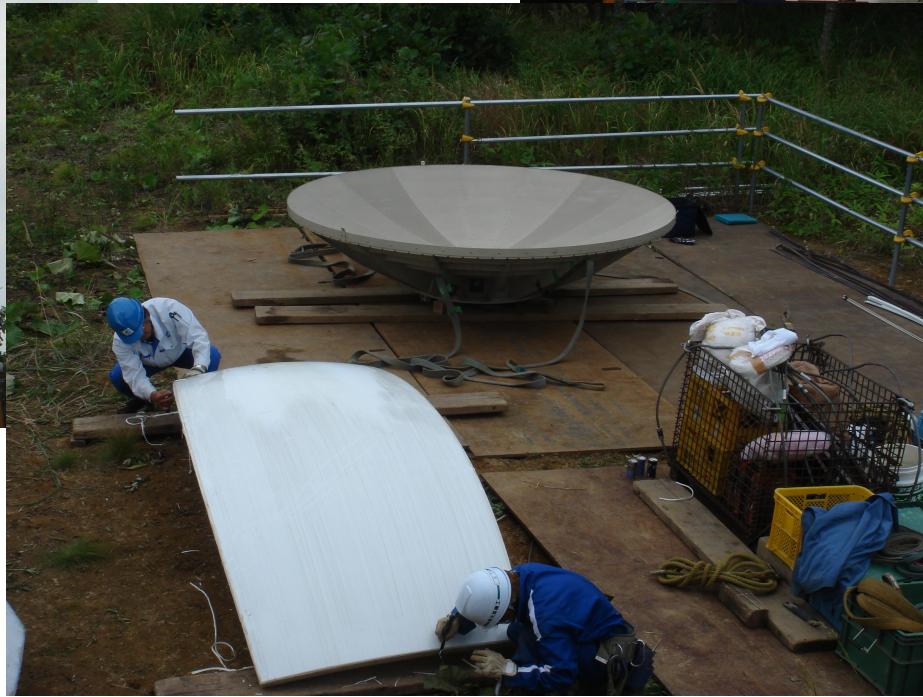
Tiku XDR Station (Hokkaido U-JAMSTEC)



MIA XDR Station, Sumatera



CDR transferred from NICT Hokkaido





JEPP-HARIMAU instruments



C-band Doppler Radar
(5,300 MHz)

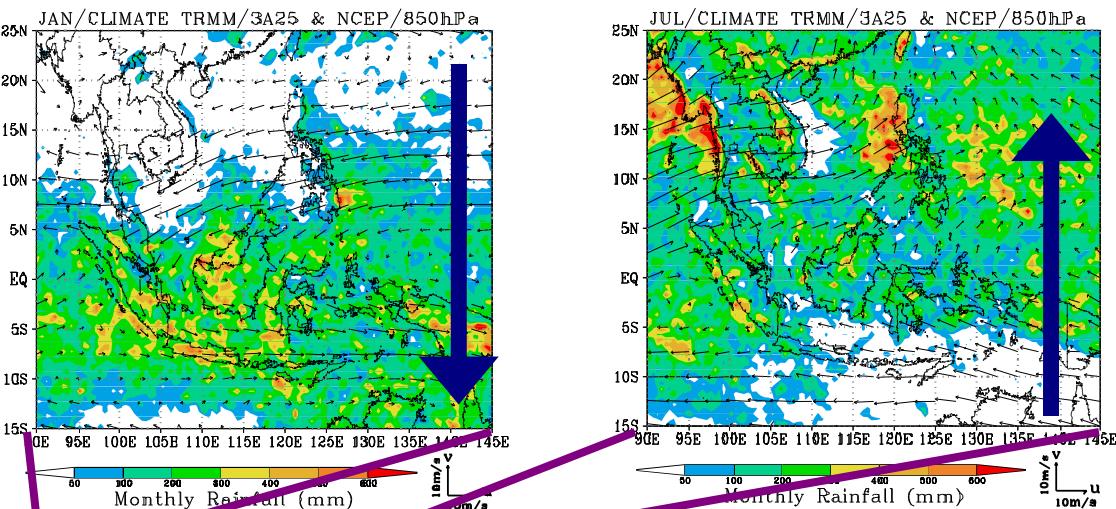


X-band Doppler radar
(9,770 MHz)
Padang (Sumatera Barat)
Dual observation for MISMO
with CPEA XDR

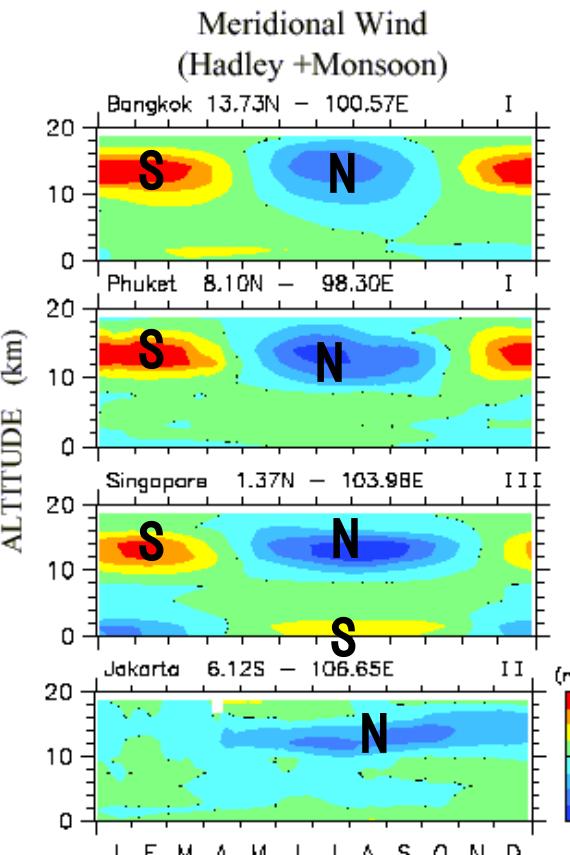
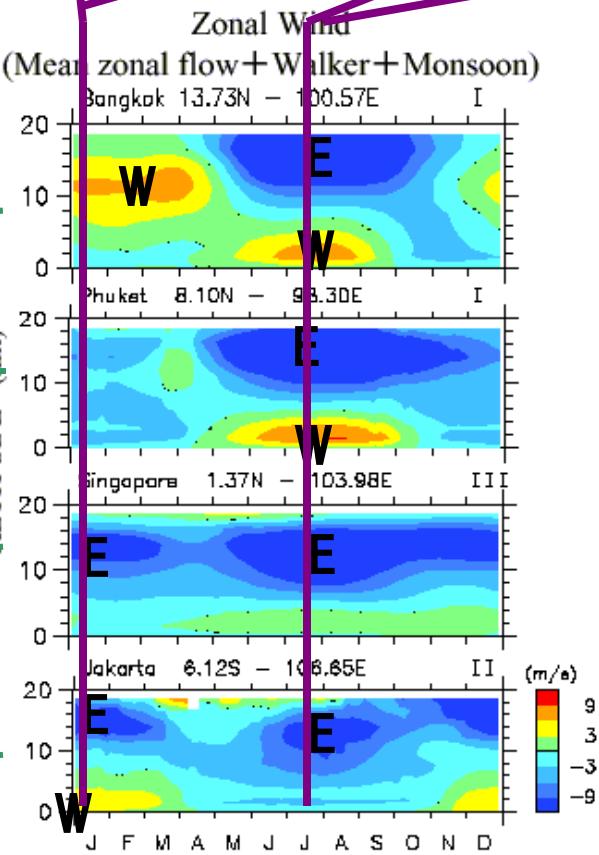
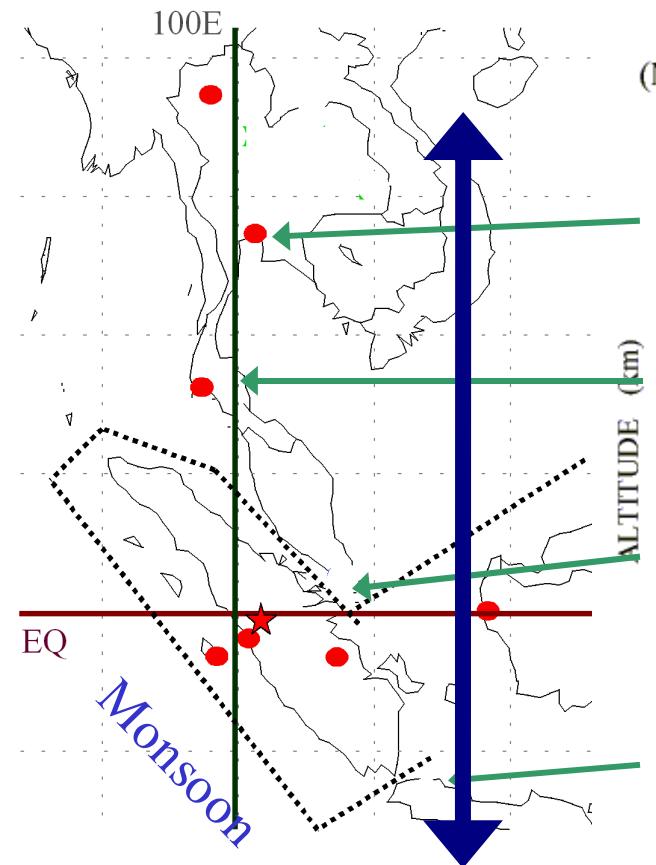


L-band Wind Profiler
(1,357.5 MHz)
Pontianak (Kalimantan Barat)
Manado (Sulawesi Utala)
Biak (Papua)

TRMM mean monthly rainfall
and NCEP 850 hPa wind
(Mori et al., 2004)



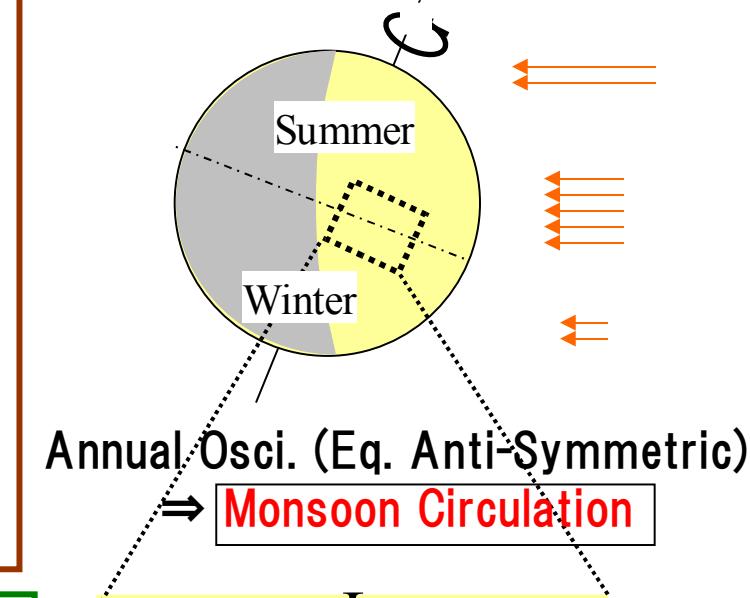
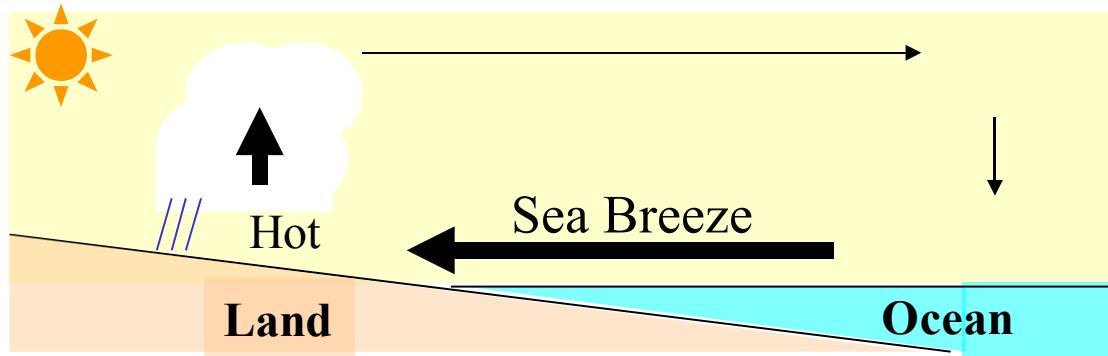
Seasonal/vertical variations
of wind along 100E
(Okamoto et al., 2003a)



“Planetological” Monsoon

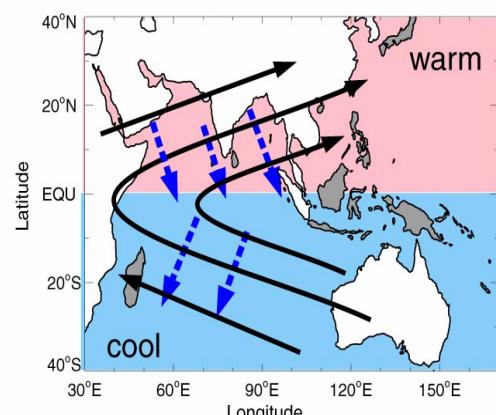
Axi-Symmetric Meridional Circulation due to Differential Solar Heating

“Terrestrial” Monsoon Sea-Land Breeze Analogue

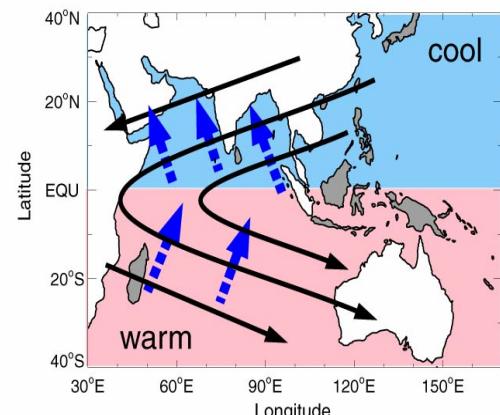


Monsoon-driven Seasonal Ocean Current

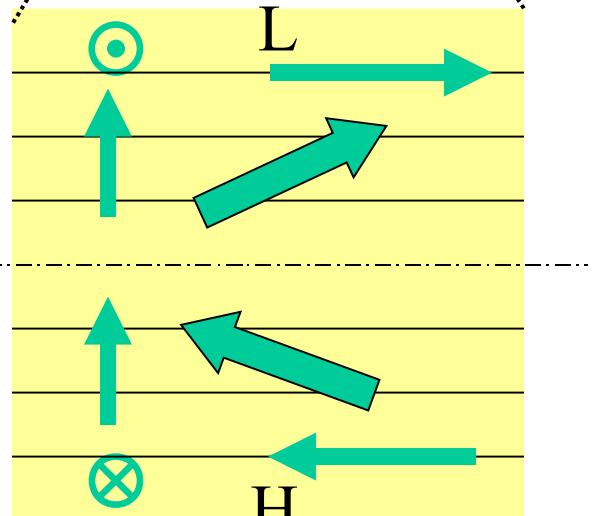
Boreal Summer



Boreal Winter

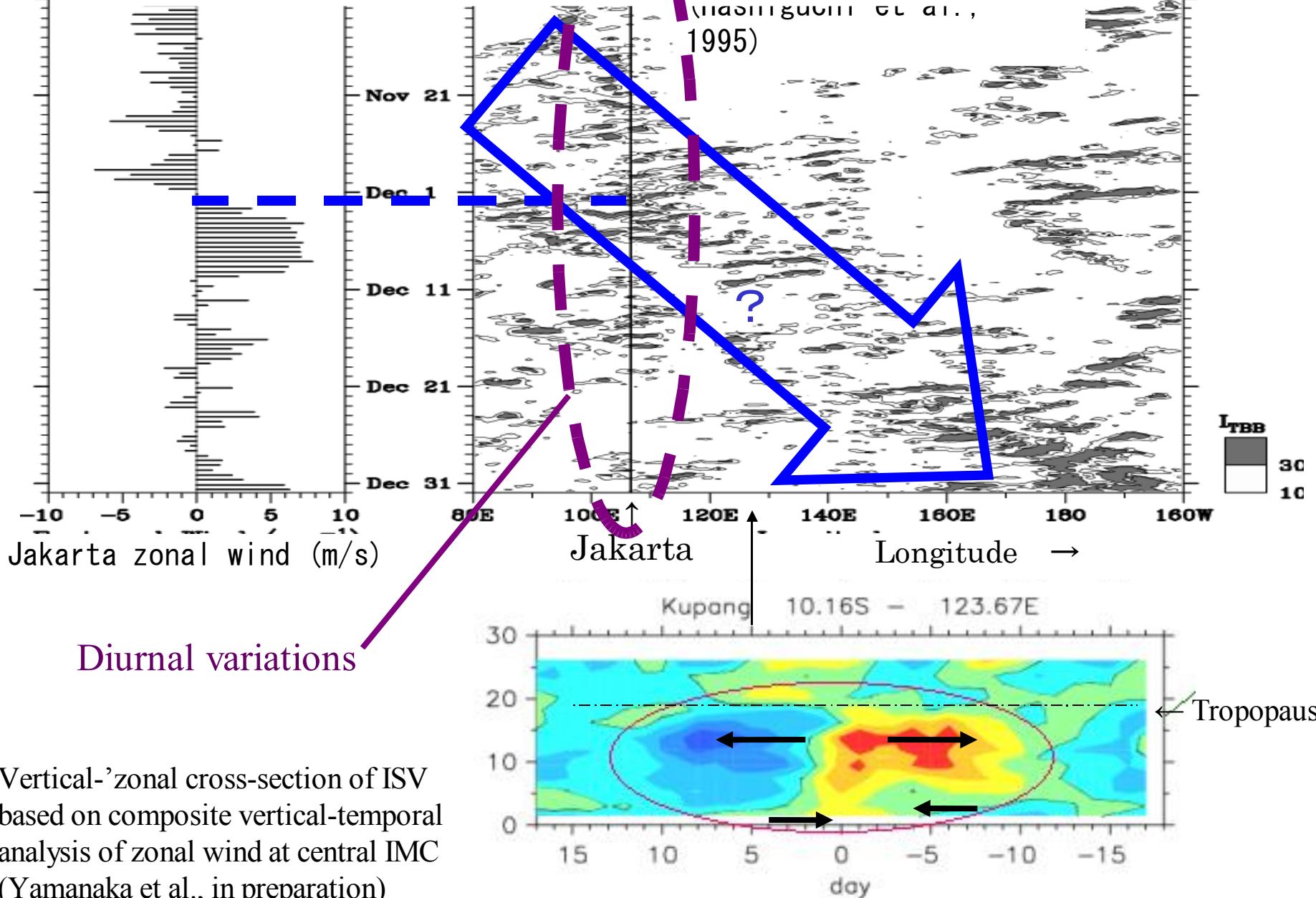


(Webster, 1999)



(cf. Mesosphere, Mars)

Intra-Seasonal Variation and Monsoon Onset



Interaction of diurnal, intra-seasonal and seasonal variations

- Monsoon “Onset” is in itself a multiple-component event (Laplace transform).
 - Seasonal variation: Meridional circulation, North-Southward oscillating

- Intraseasonal variation: Zonal circulation, Eastward traveling
- Diurnal variation: Cross-coastal cieulation, Trapped along coastlines

Superimposition of appropriate phases can produce the “onset”.

- Even in the rainy season, over the land,

Clear sky in the morning,

Maximum solar heating



Active convective clouds in the afternoon,

Sea-breeze-like circulation,

bringing water vapor from sea to land

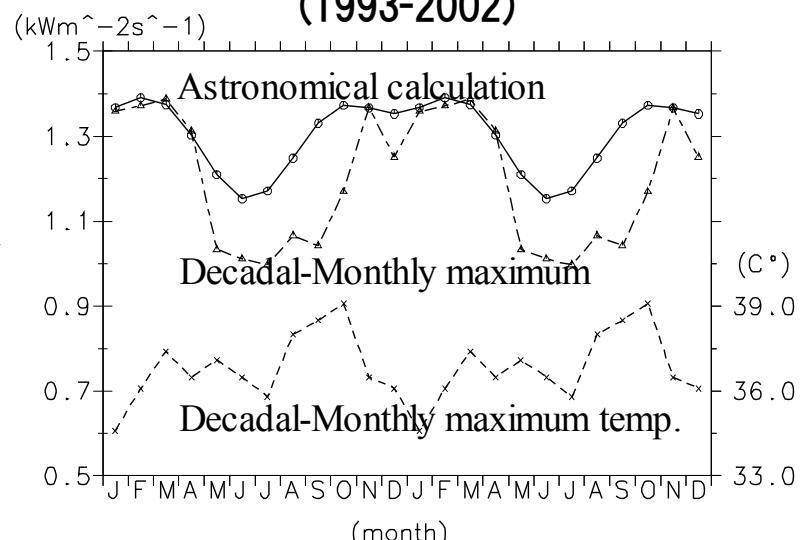


Strong rainfall in the evening,

Washing out aerosols,

resetting atmospheric transparency

11-13LT Solar radiation
at Serpong, West Java
(1993-2002)



(Araki et al., 2006, to be submitted)

Seasonal Variation

Latitudinal/hemispheric
Continent-Ocean

Monsoon



Rainy season

Summer + IMC, etc.

Year-to-year
Interannual

Differential
Solar heating

Wind



Cloud

Variety

Variability

Diurnal Variation

(Mountain-Valley)
Land-Sea

Local circulation



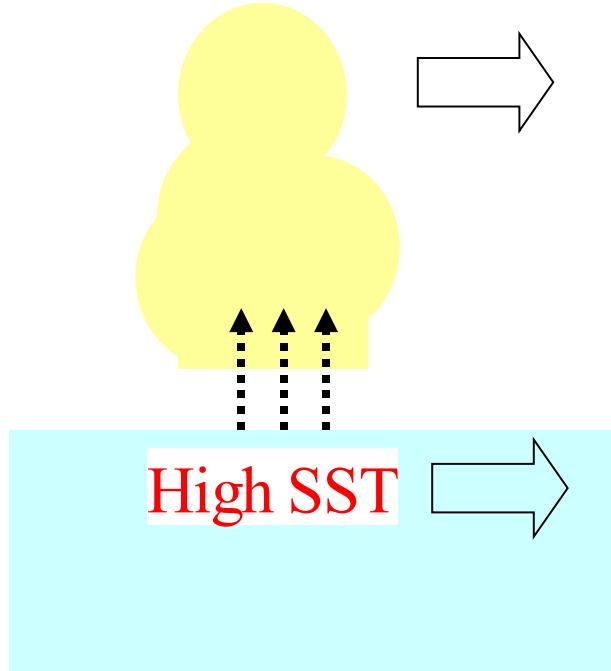
Evening shower

Sea-wind only, etc.

Day-to-day
Intraseasonal

Intra-Seasonal Variations

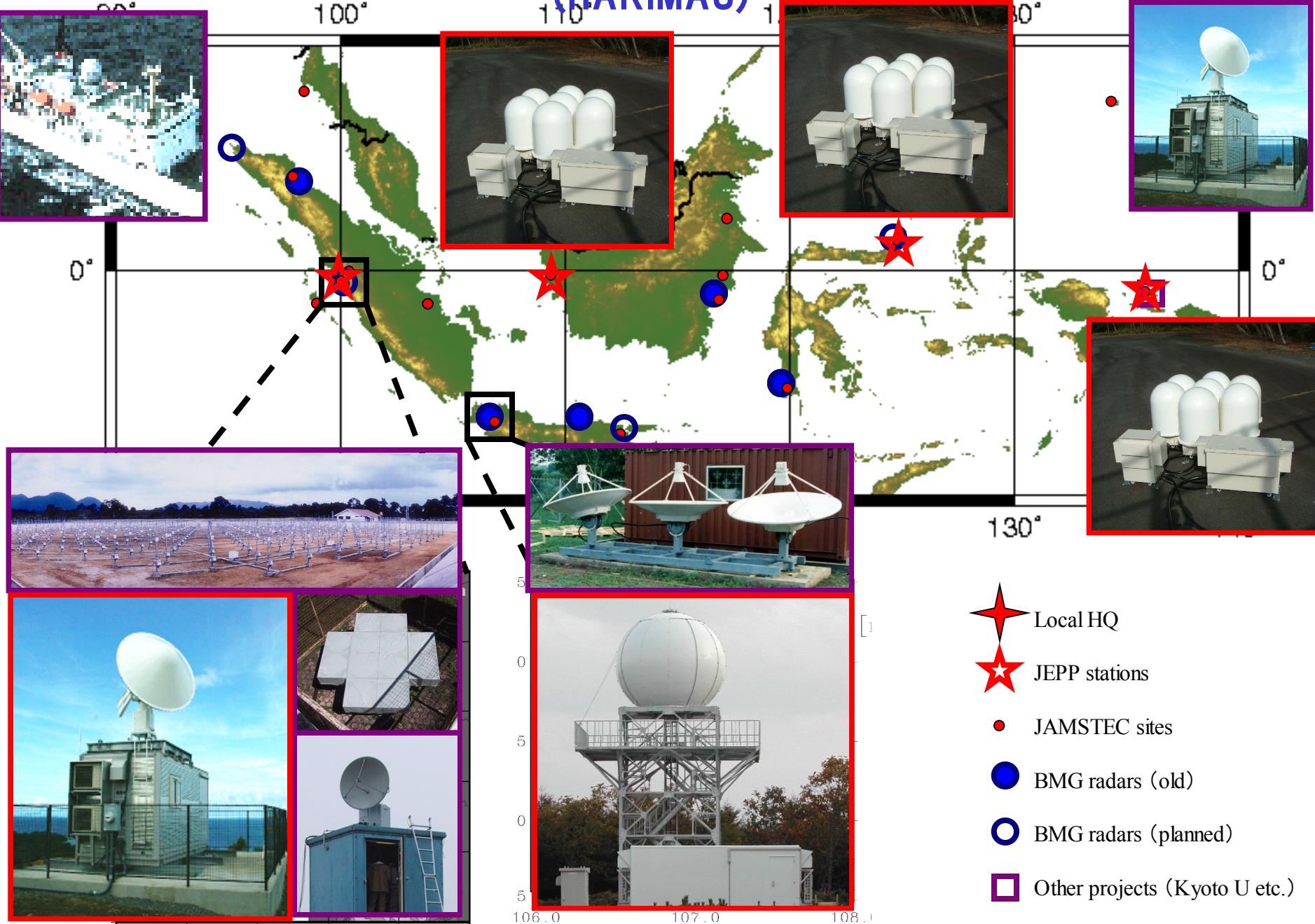
Indian Ocean



Atmos.-Ocean
coupled

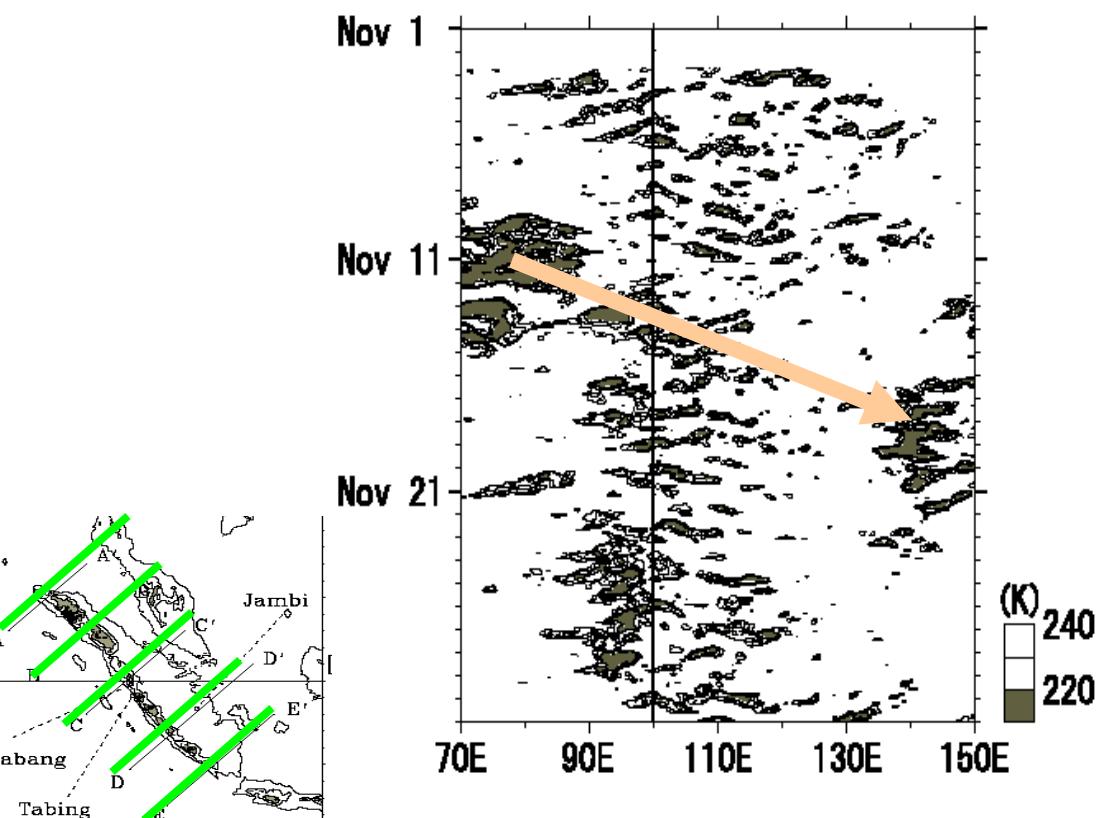
Latent heating

Hydrometeorological Array for ISV-Monsoon Automonitoring (HARIMAU)



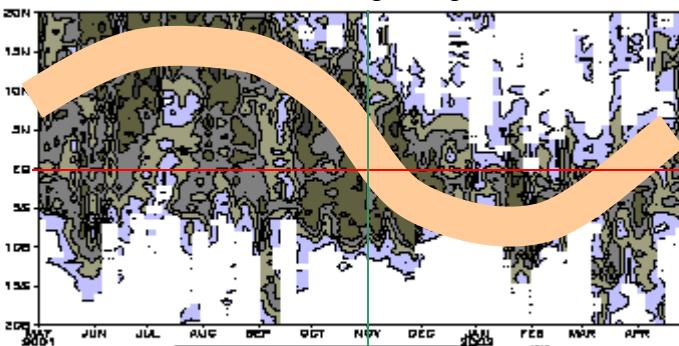
Diurnal, Intraseasonal and Seasonal variations over Sumatera

(Sakurai et al., 2005: *JMSJ*)

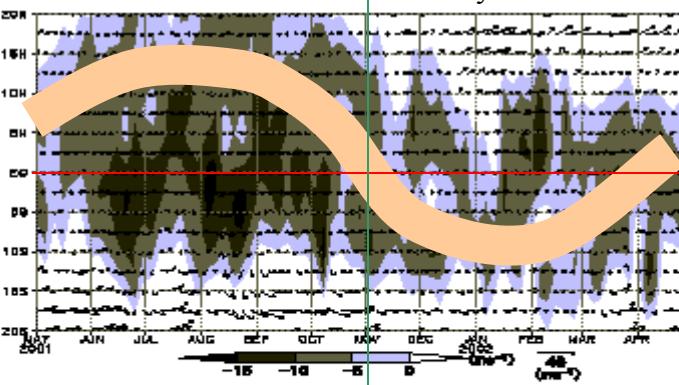


		Westward migration						Eastward migration						
		01			02			01			02			
		M	J	J	A	S	O	N	D	M	J	F	M	A
N	AA'	○	○	○	○	○	○	○	○	○	○	○	○	○
↑	BB'	○	○	○	○	○	○	○	○	○	○	○	○	○
EQ	CC'	○	○	○	○	○	○	○	○	○	○	○	○	○
↓	DD'	○	○	○	○	○	○	○	○	○	○	△	△	△
S	EE'	○	○	○		○	○	○	○	○	○	○	○	○

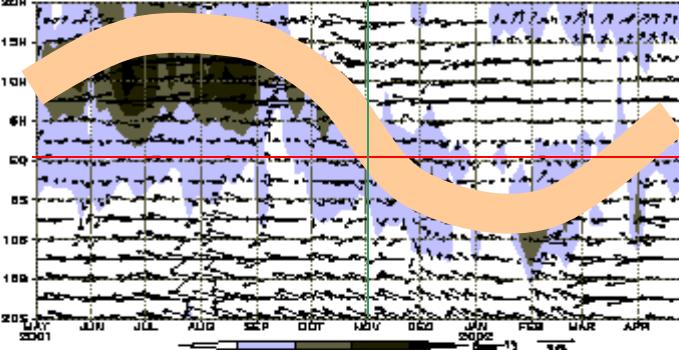
GMS Cloud Top Temperature



300 hPa Eassterly



850 hPa Westerly



Intraseasonal / diurnal variations of convection

(Hamada et al., 2003)

