BMKG PROPOSAL FOR YMC

YMC IMPLEMENTATION PLAN WORKSHOP
JAKARTA, 24-26 NOVEMBER 2015

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OUTLINE

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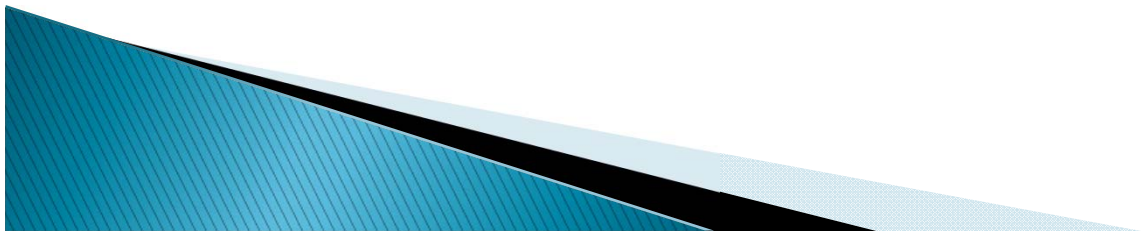
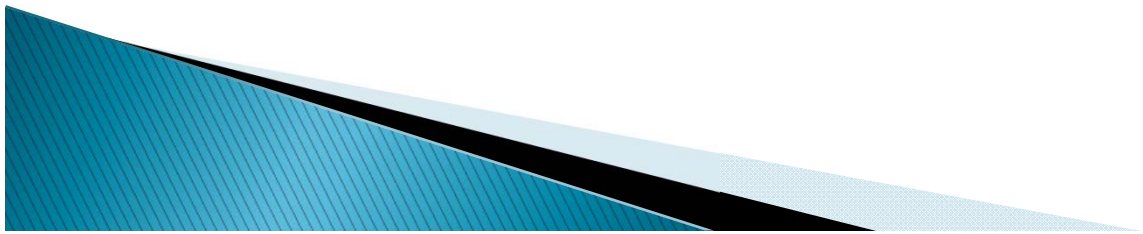
- BMKG Proposal
  - ✓ Objectives
  - ✓ Outcomes
  - ✓ Research Details
  - ✓ Observations / Field Campaign
  - ✓ Instruments
  - ✓ Current instruments on R&D Center



INTRODUCTION

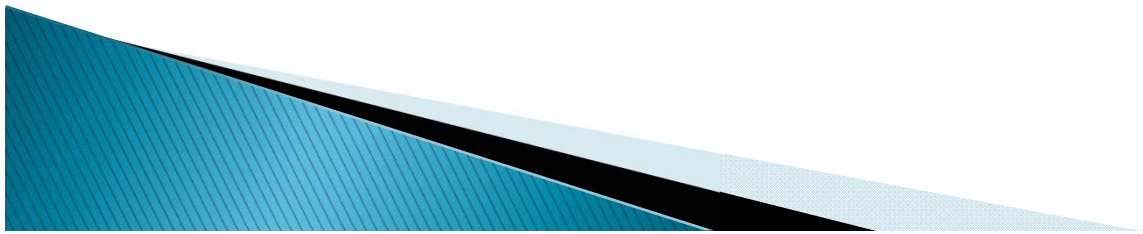


YEARS OF THE MARITIME CONTINENT

It is an international framework for international collaboration on field observations and modelling

The aim of YMC:

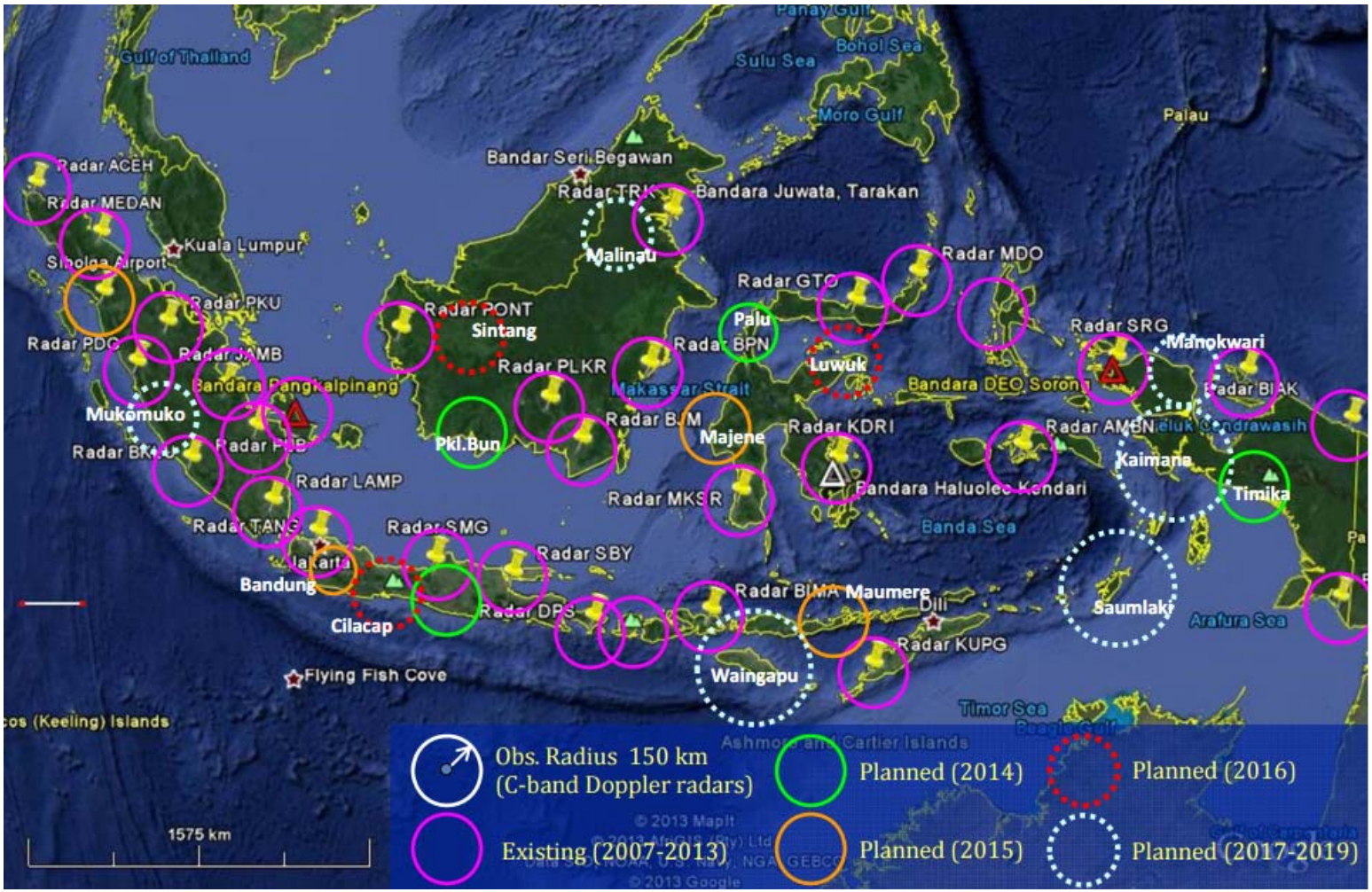
To understand the role of the Maritime Continent (MC) in the global weather-climate continuum



KEY PROCESSED

- Ocean-Atmosphere-Land interactions over the coastal upwelling & inland regions
- Modulation of MJO propagation
- Effect of ITF and mixing onto SST distribution
- Diurnal cycle of convective activity
- Aerosol and their interaction with clouds
- Monsoons
- Troposphere-stratosphere interaction and dehydration process in the tropical tropopause layer (TTL)

BMKG RADAR NETWORK



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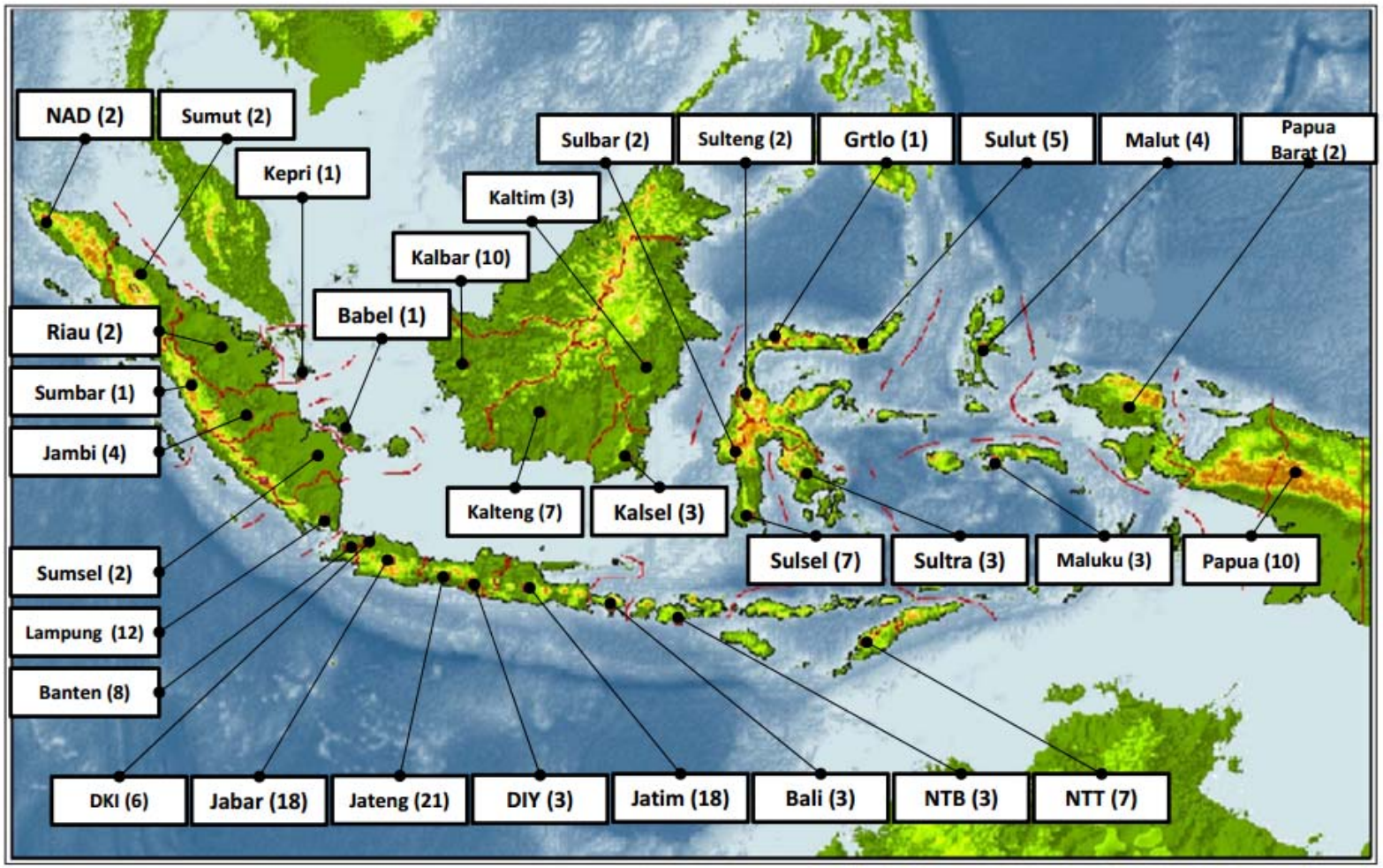
BMKG AWS NETWORK (176 LOCATIONS)



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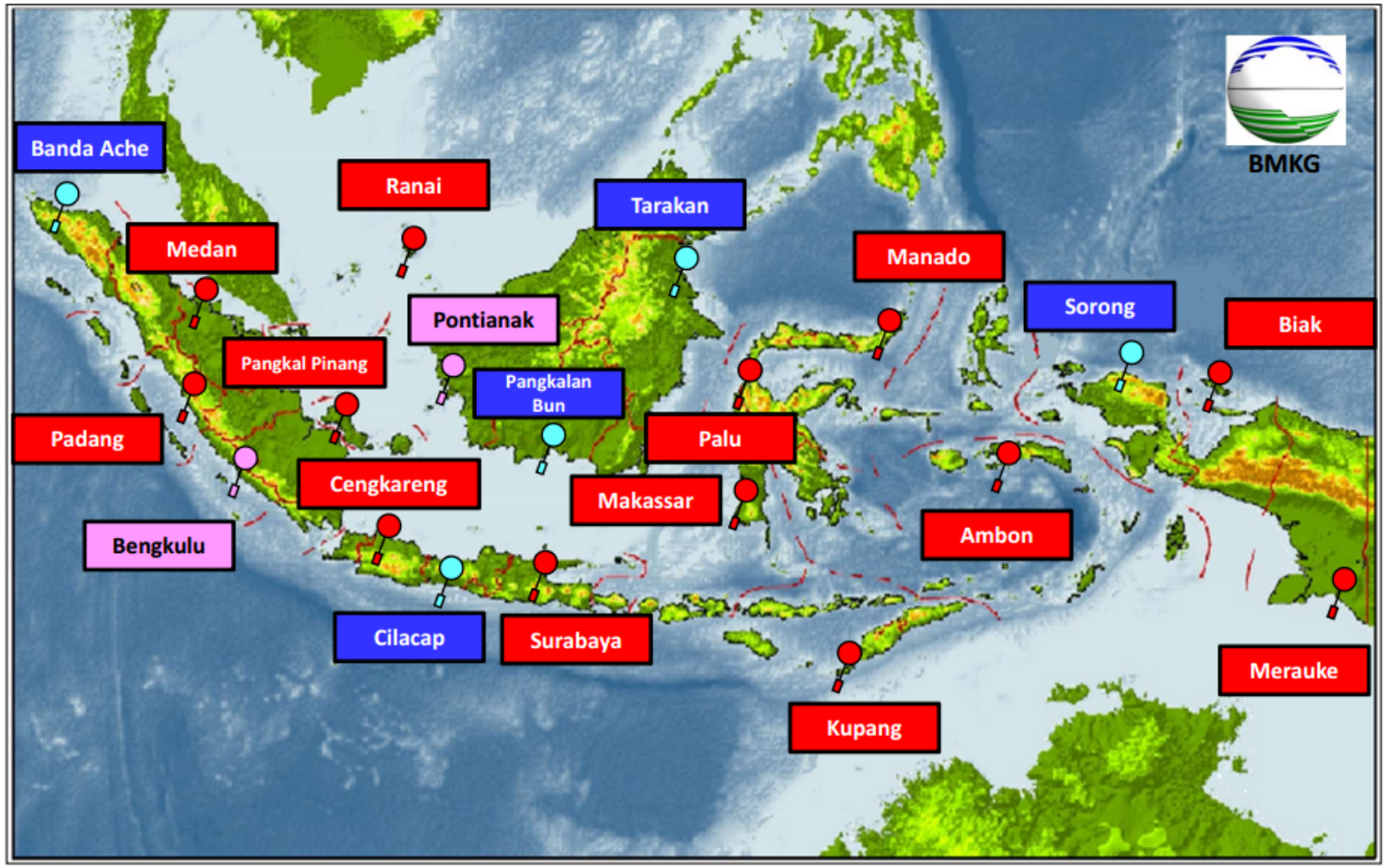
BMKG RADIOSONDE SOUNDING NETWORK

13 (2013), 5 (2014), 2 (2015) Stations



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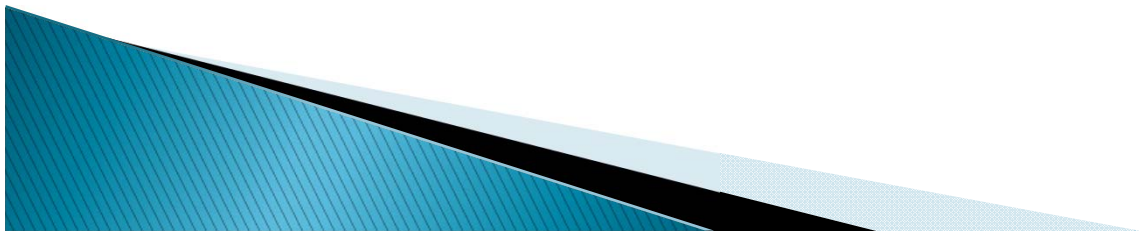

OBJECTIVES

1. To gain a comprehensive understanding of:
   - Local circulation,
   - Sea interaction in the Indonesia MC,
   - Diurnal precipitation and cloud cycle,
   - MJO cycle and variability,
   - Dipole Mode (DM) and ENSO,
   - Quasi-Biennial Oscillation (QBO),
   - Tropospheric Biennial Oscillation (TBO),
   - Monsoon,
   - ITF transport.

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OBJECTIVES

2. To strengthen weather and climate modelling on Indonesia MC using assimilation with observational data and be able to simulate daily to weekly extreme conditions.
3. To develop a monitoring system of the ITF and its influence on weather/climate formation and SST diurnal cycle during active and non-active MJO phases.

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OUTCOMES

- Developing a monsoon and MJO detection system
- Assessing Mesoscale Convective System (MCS) characteristics
- Assessing aerosol characteristics in the IMC and its impact to climate
- Understanding SST diurnal cycle related with active and non-active MJO phases
- Acquiring information on object propagation for Search and Rescue (SAR) operation and pollutant trajectories
- Establishing WRF-DA based weather prediction system which assimilated with radio sonde, satellite, and synoptic data
- Acquiring information on real time surface wind, wave, and current
- Enhancing the understanding of upwelling and developing a monitoring system of the ITF

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RESEARCH DETAILS

1. Detection of monsoon onset and withdrawal
2. MJO: prediction and impact assestments
3. Mesoscale Convective System: better understanding of MCS characterictics at each phase & impact to wind and precipitation
4. Improving model prediction skill: how to assimilate observation data into the model
5. Wave propagation: will be studied by using HF coastal radar system
6. Enhancement of upper air observations: increase the quantity of upper air observation
7. Aerosol and its impact to climate

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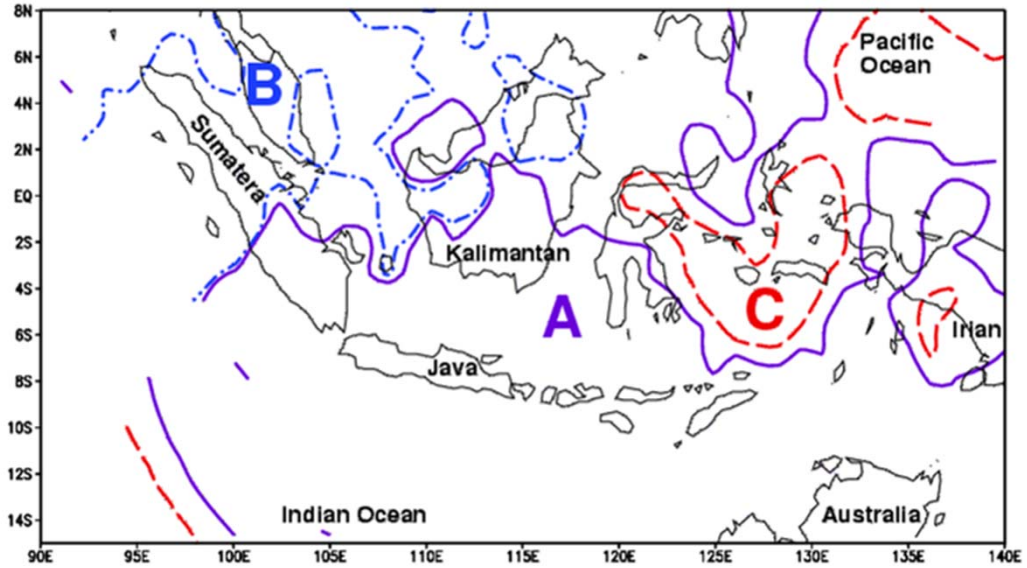
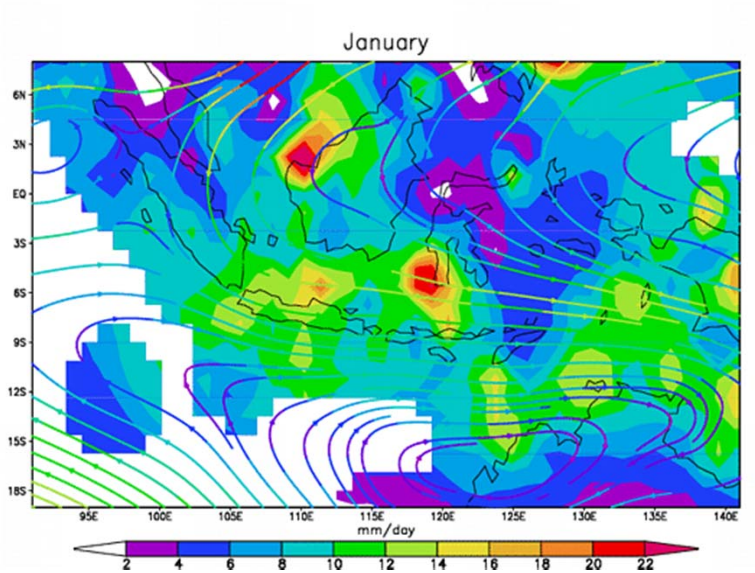
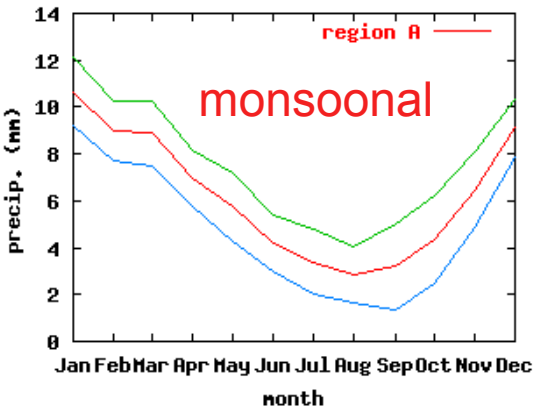
RESEARCH DETAILS

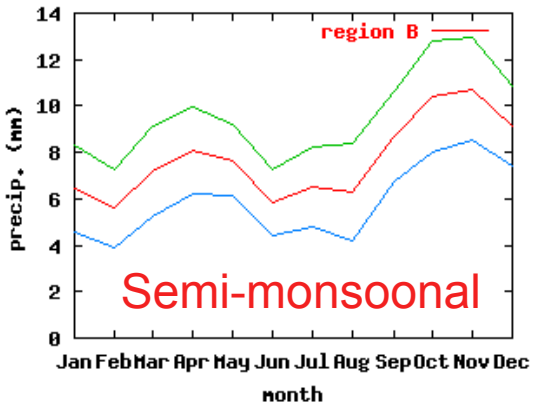
- Mainly monsoonal
- Three distinct rainfall climate regions

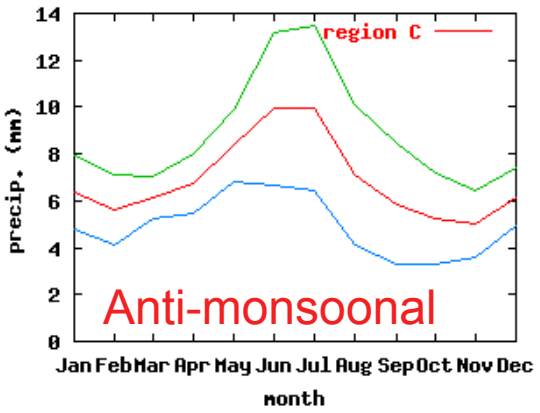




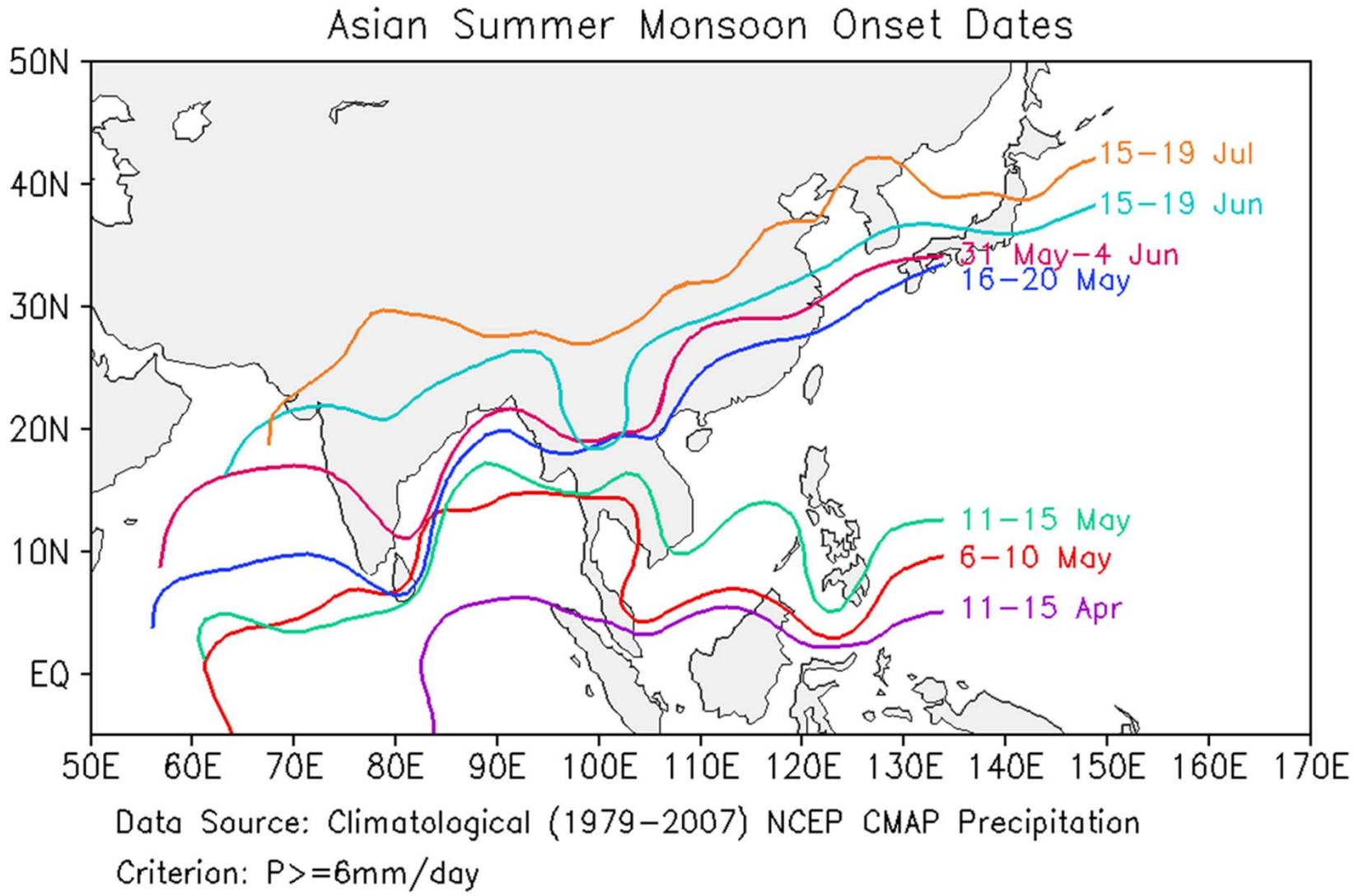
Three climate regions update previous work by Wyrtki, 1956



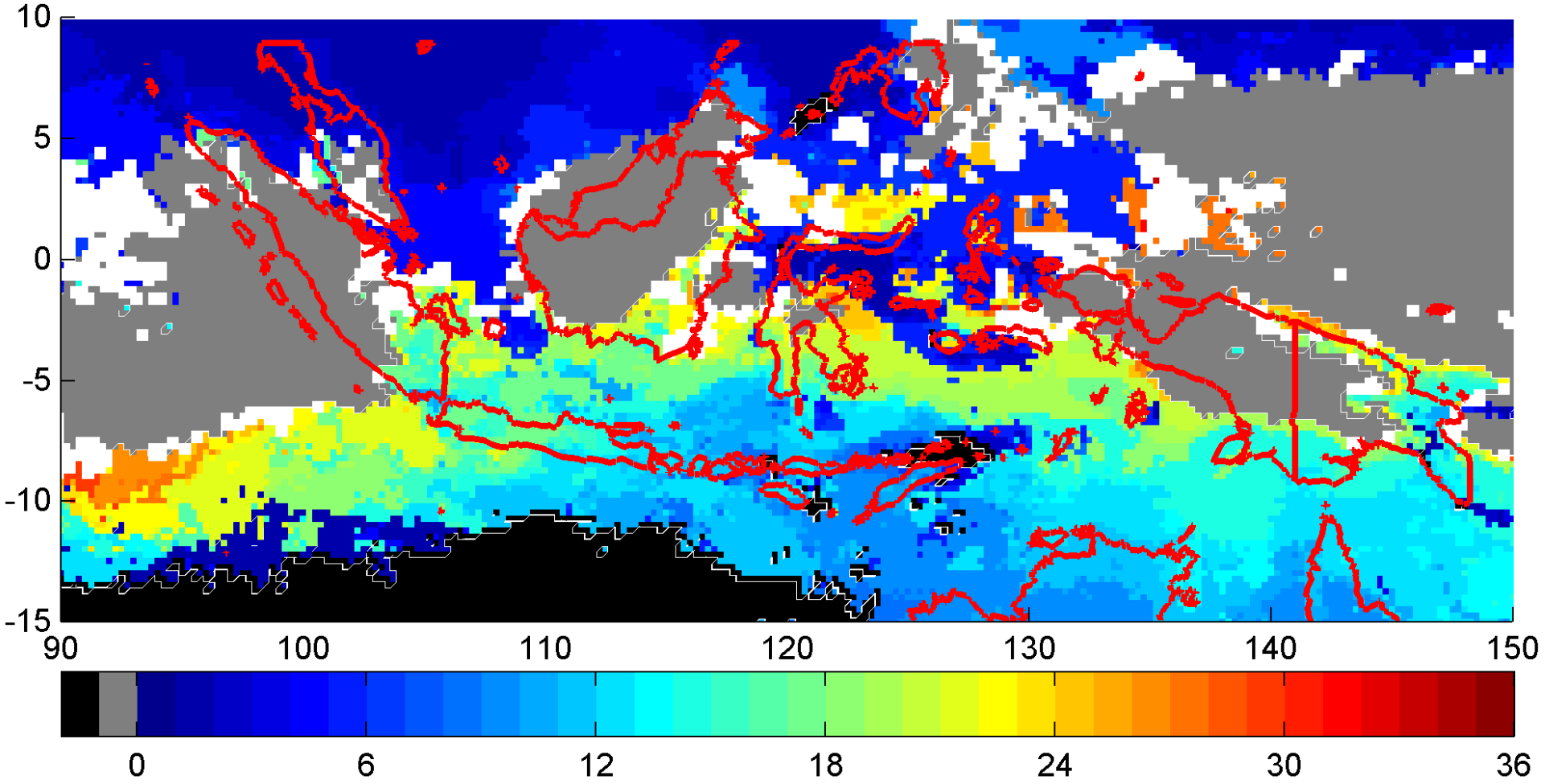




Onset Dates of Asian Summer Monsoon



Dry Season onset (TRMM data 1998-2010)



Area with rainfall > 50mm/10 days (Non Monsoon)

Areas with rainfall < 50mm/10 days (Non Monsoon)

Colour indicates 10 days

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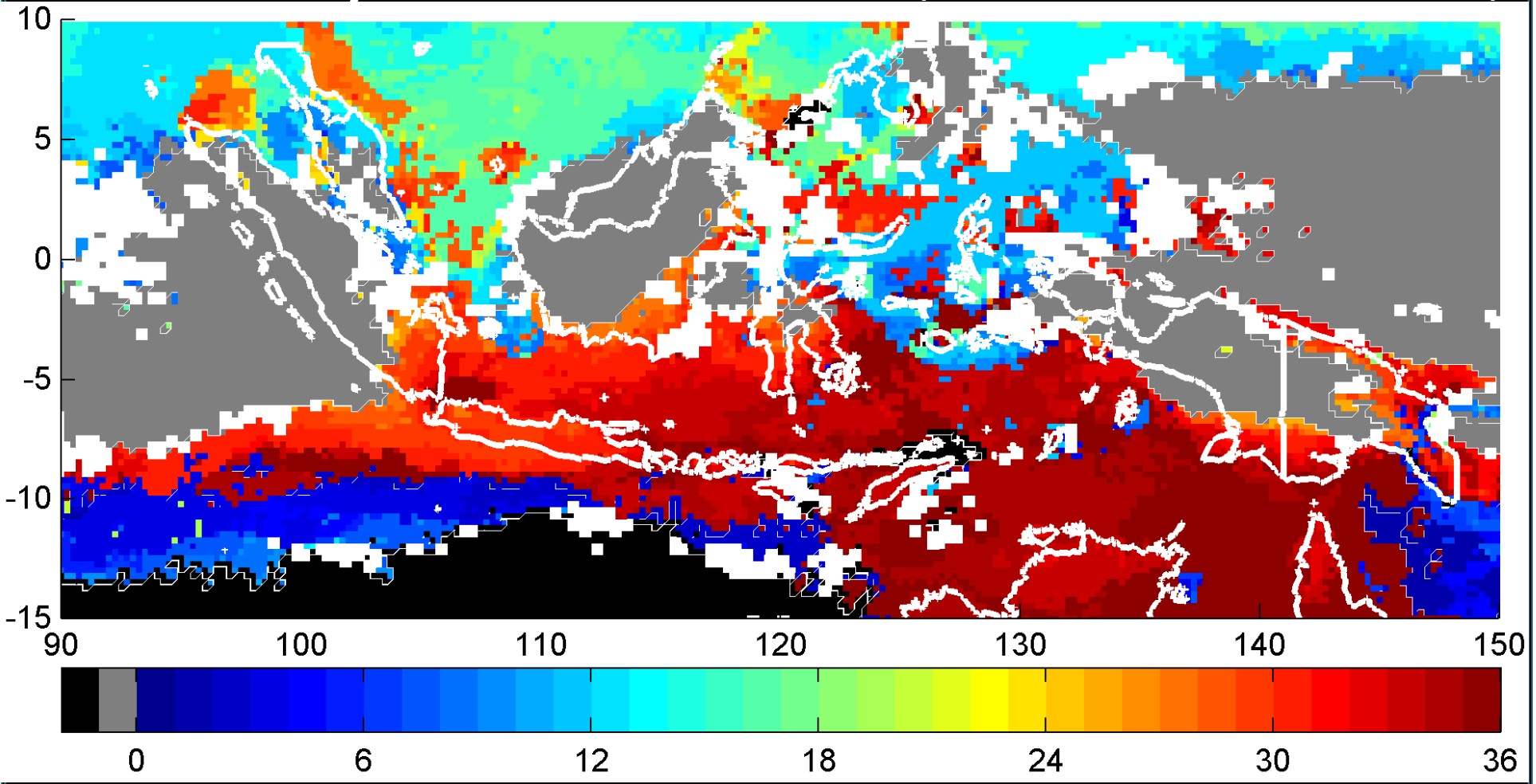
Rainy Season onset (TRMM data 1998-2010)



Area with rainfall > 50mm/10 days (Non Monsoon)

Areas with rainfall < 50mm/10 days (Non Monsoon)

Colour indicates 10 days

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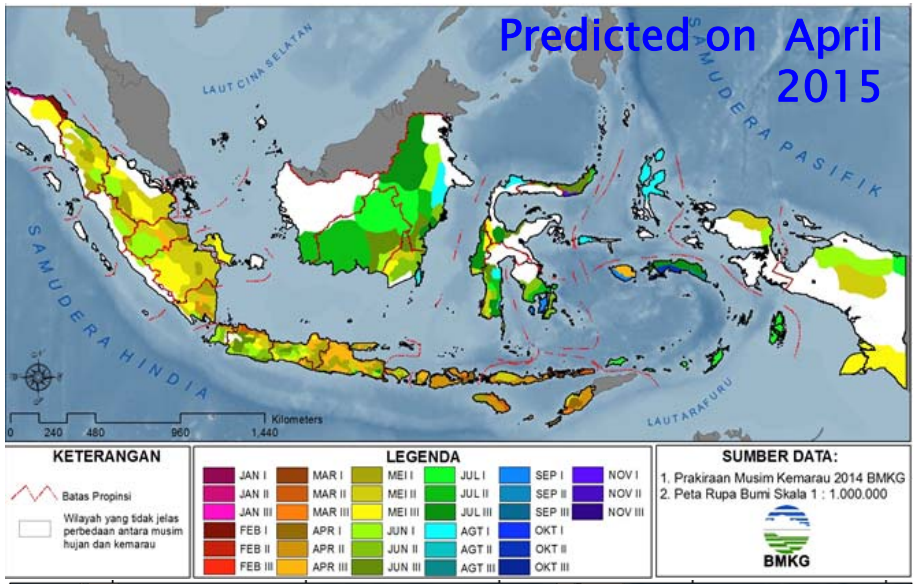
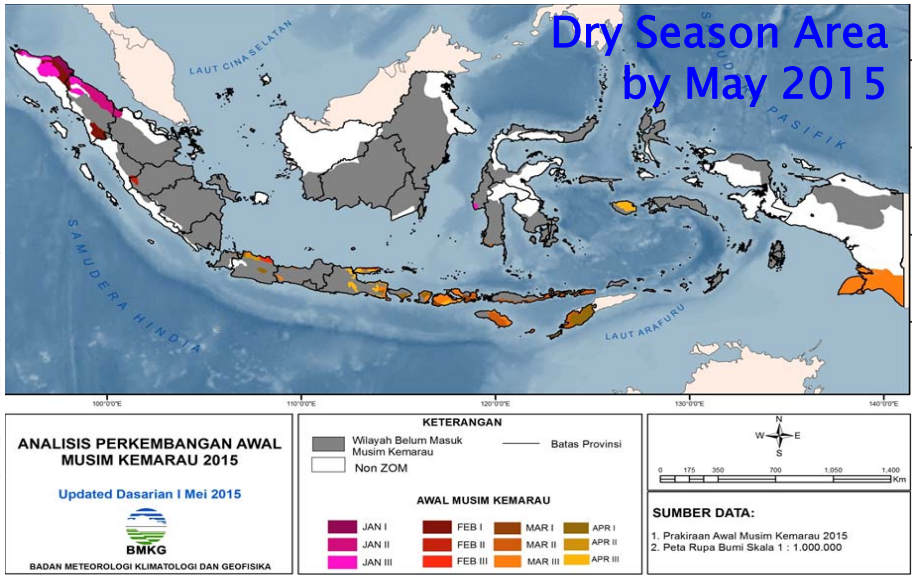
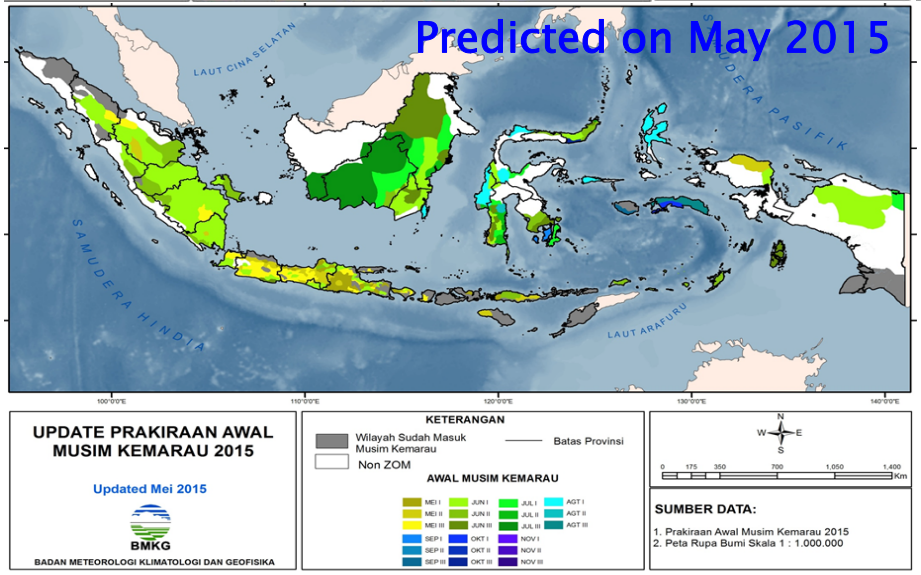
Dry Season Onset Prediction 2015







The "shifting" between "initial" seasonal onset prediction and the "real" one pose a challenge to the Agency, not only concerning the methodology but also the way how to disseminate this correctness timely and properly to end users and interface institutions;

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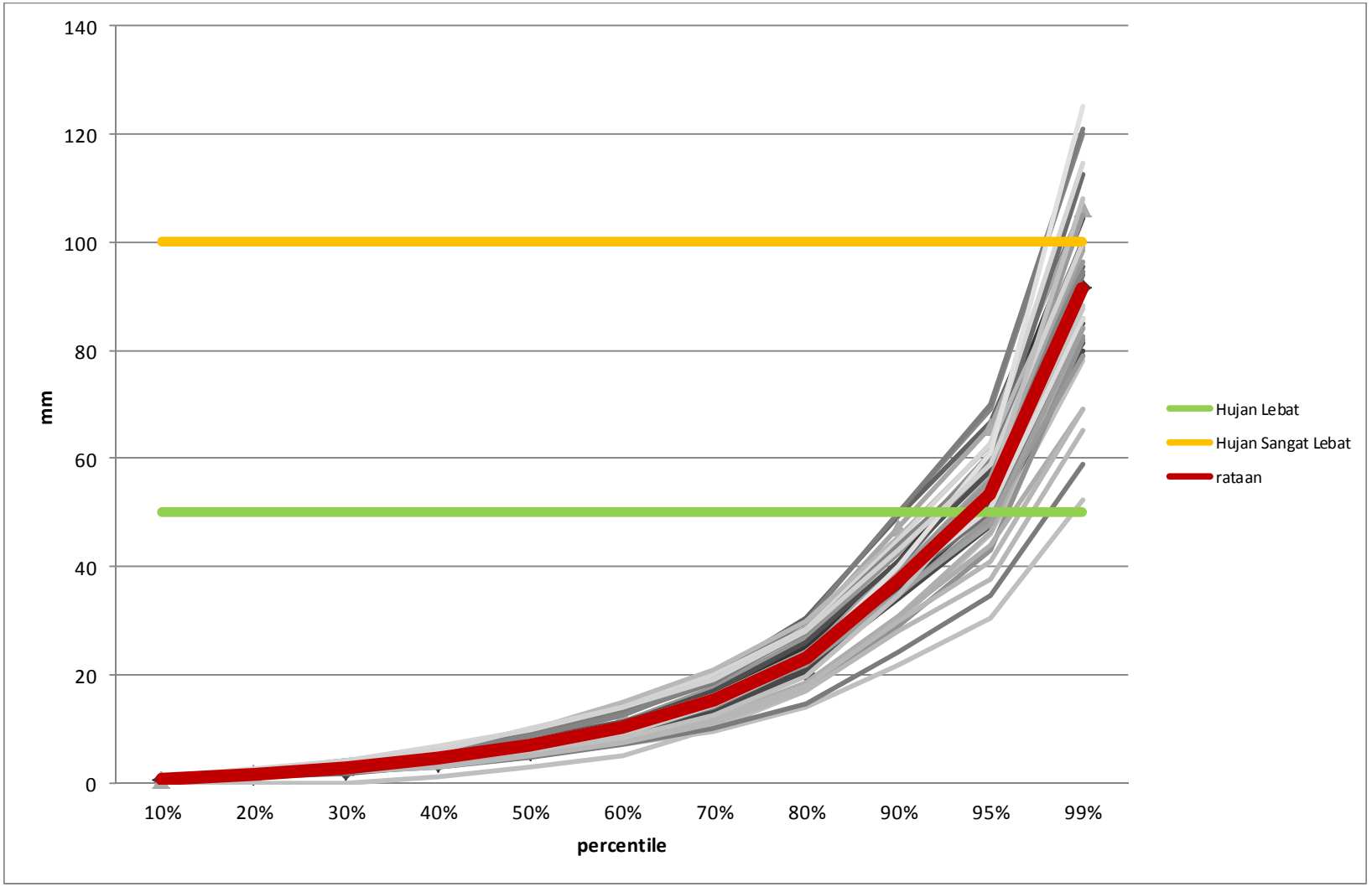
Average percentile of daily rainfall in Indonesia



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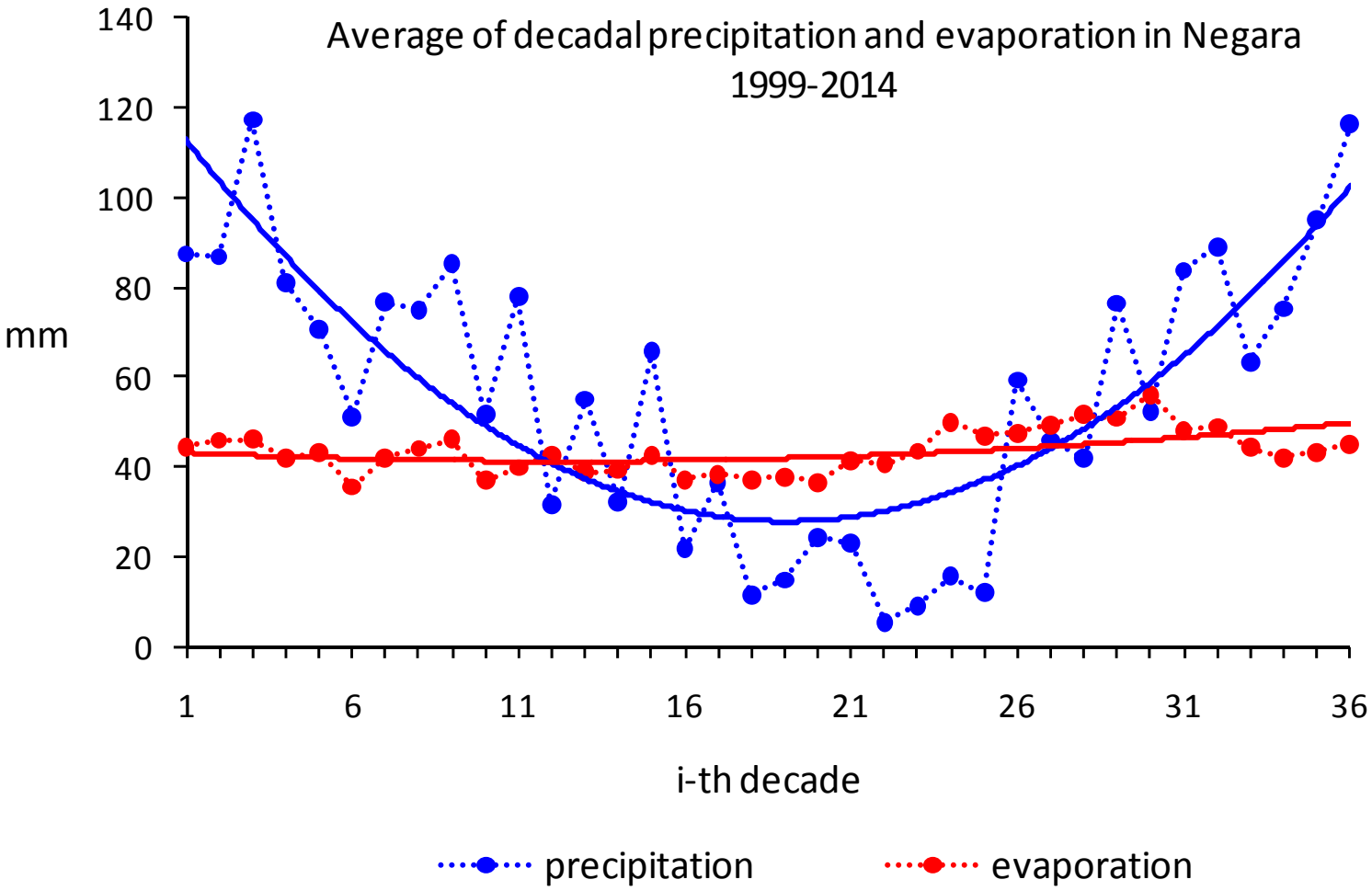

	Dekad (10 days)	Minimum rainfall in dekad (mm)
Wet season onset	27.1	44.6
Dry season onset	11.9	41.3

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Wet season onset (Staklim Negara)

Notes:
* Falls on the same year
-- 2010 wet season all year long

Year	True Onset		BMKG	
	Start	End	Start	End
1999/2000	29	17	29	11
2000/2001	31	17	31	11
2001/2002	36	11	36	8
2002/2003	31	13	31	7
2003/2004	26	9	26	9
2004/2005	32	12	32	11
2005/2006	28	15	28	13
2006/2007	3*	11	3*	11
2007/2008	29	10	35	9
2008/2009	33	15	33	10
2009/2010	36	--	11*	--
2010/2011	--	15	--	3
2011/2012	29	14	29	9
2012/2013	34	21	34	21
2013/2014	35	14	35	9

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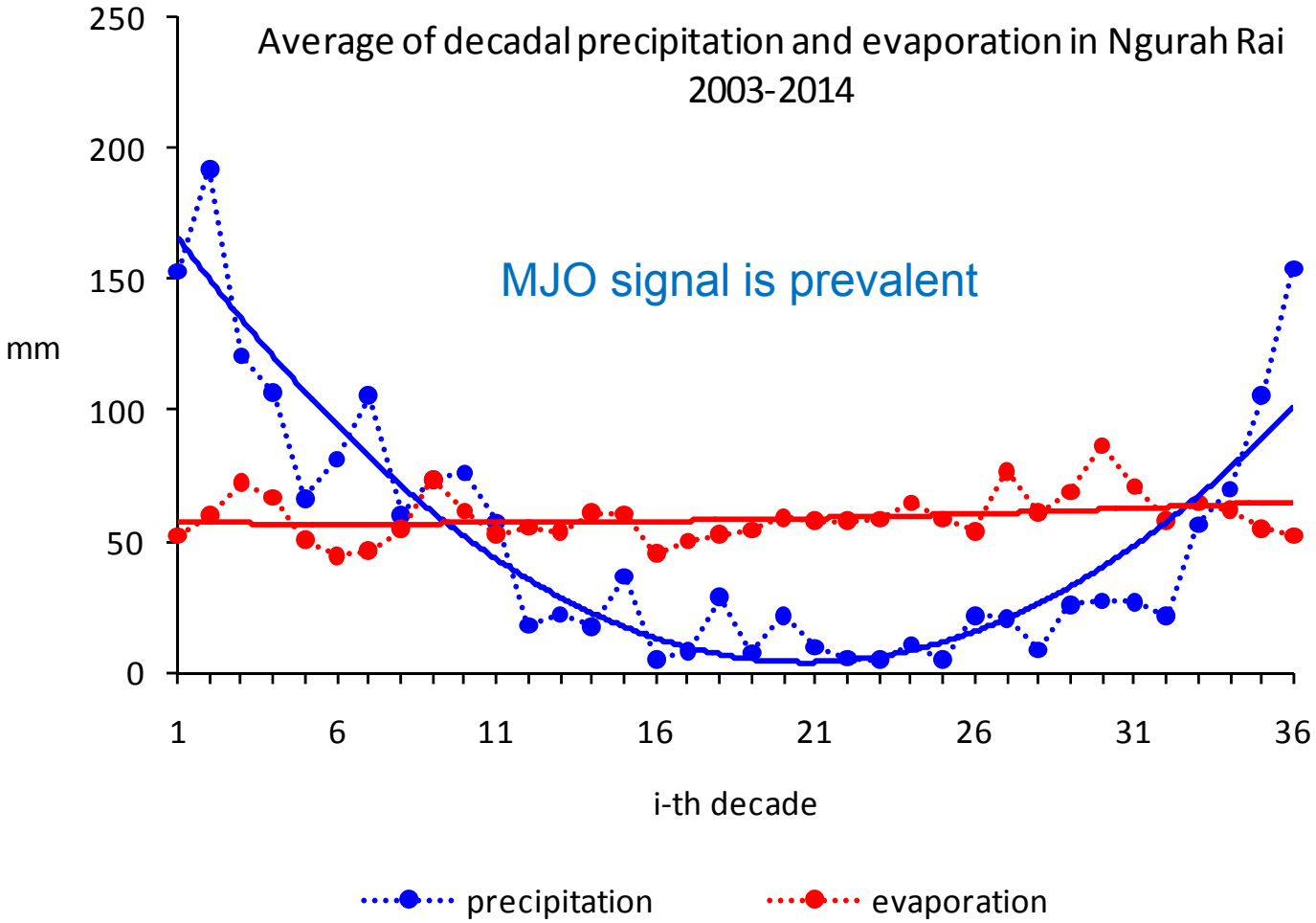

	Dekad (10 days)	Minimum rainfall in dekad (mm)
Wet season onset	32.7	63.4
Dry season onset	9.4	56.9

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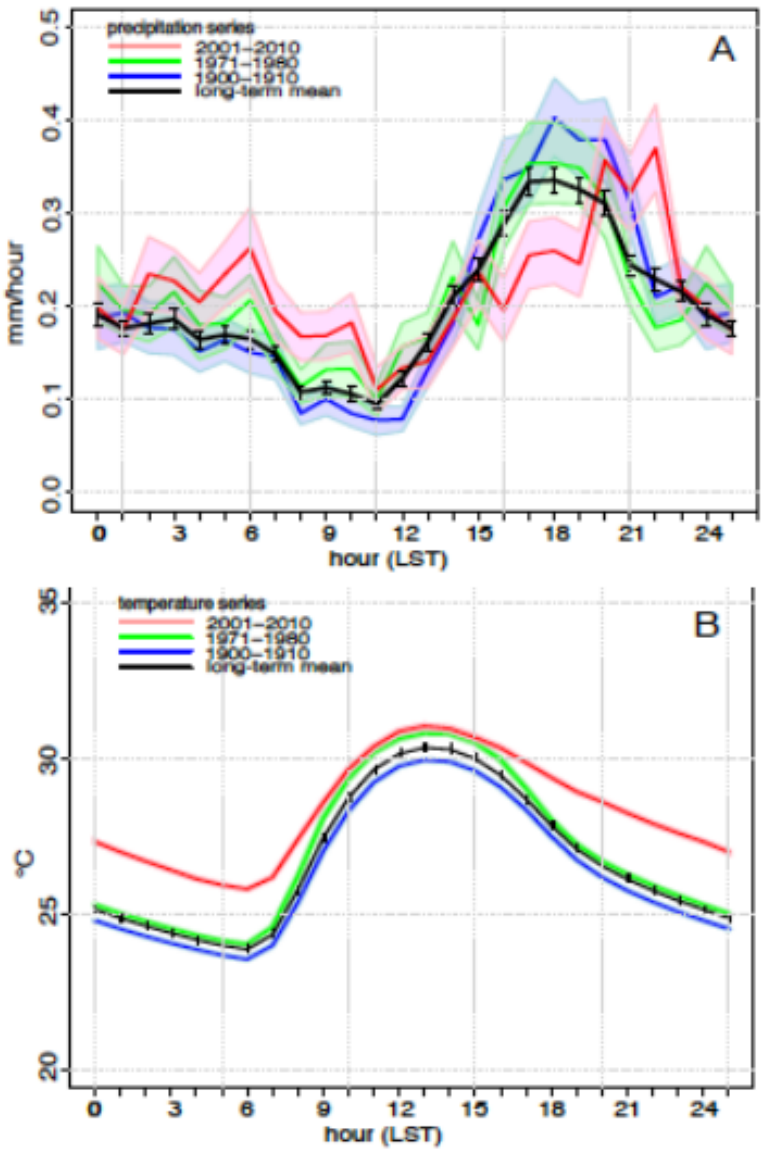

Precipitation characteristics: Changes in diurnal cycles

- Mean diurnal cycle: peaks in the late afternoon and a minimum before noon
- A shift in the afternon rainfall into the evening (preceded by a depletion during late afternoon precipitation in the recent time)
- The morning precipitation peak becomes increasingly more pronounced as time proceeds, leading to a semi-diurnal pattern
- A considerable maximum temperature increase during day-time by as much as 1.8˚C between 1901 – 1910 to 1971 – 1980, while the minimum night – time temperature increases only by 0.5˚C
- In contrast, the minimum night-–-time temperature increase between period 1971—1980 to 2001-2010 is pronounced with about 2˚C

  → urbanisation? UHI?

Source: Siswanto et al. (2015)

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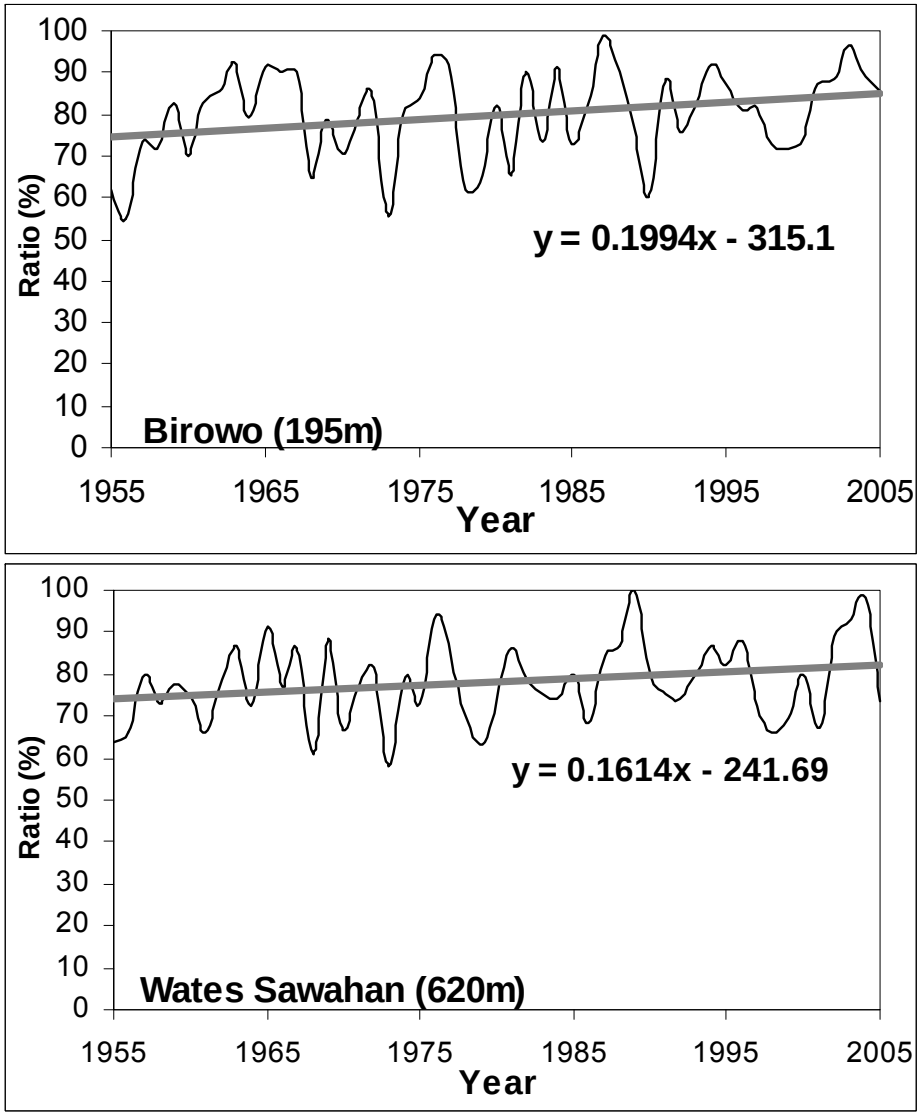
Change of rainfalls ratio in wet season to total (east Java)

- Higher risk of flood and drought
- Quasi Biennial oscillation is prevalent



Aldrian and Djamil 2008, Intl J Climatol

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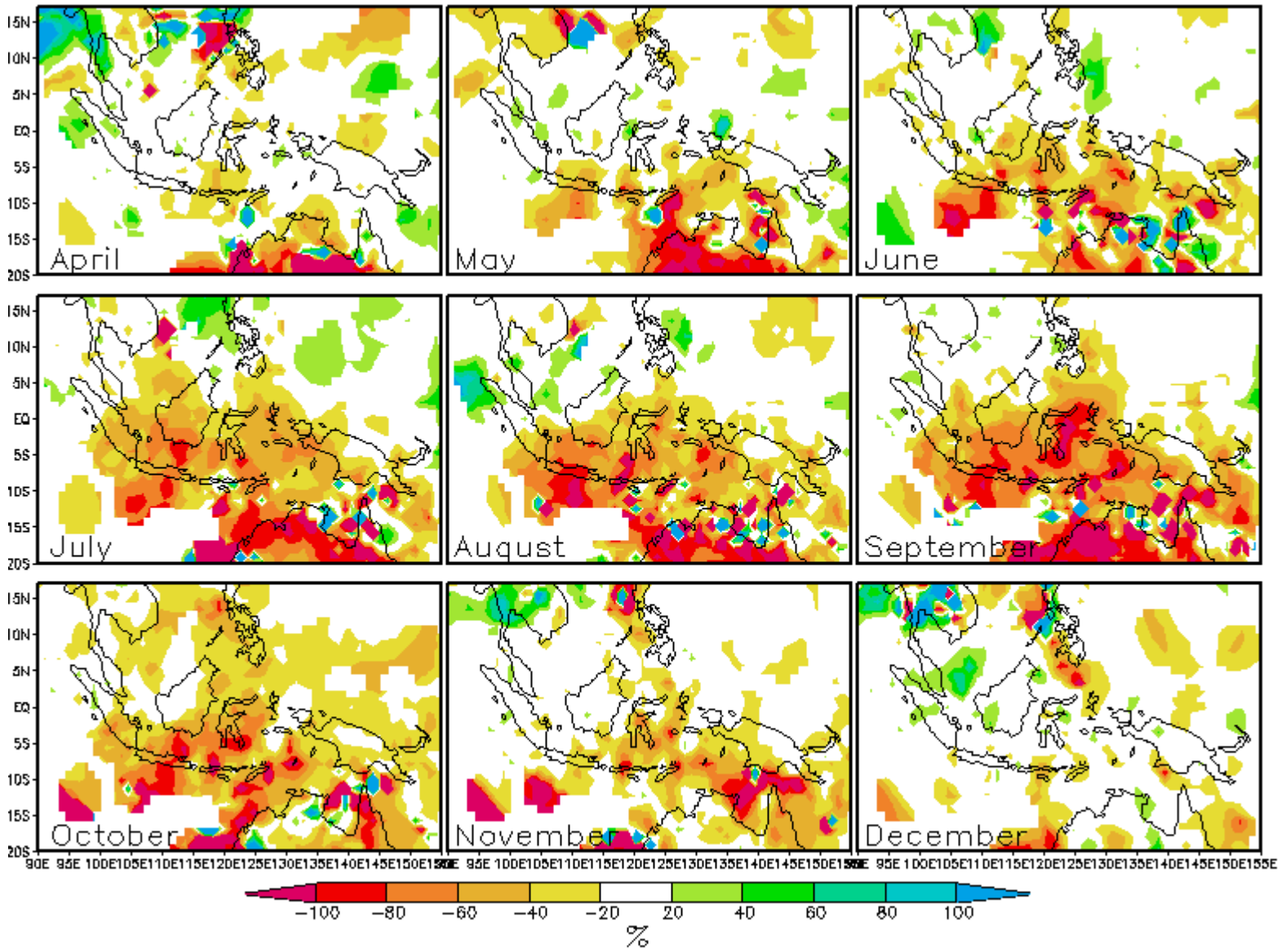
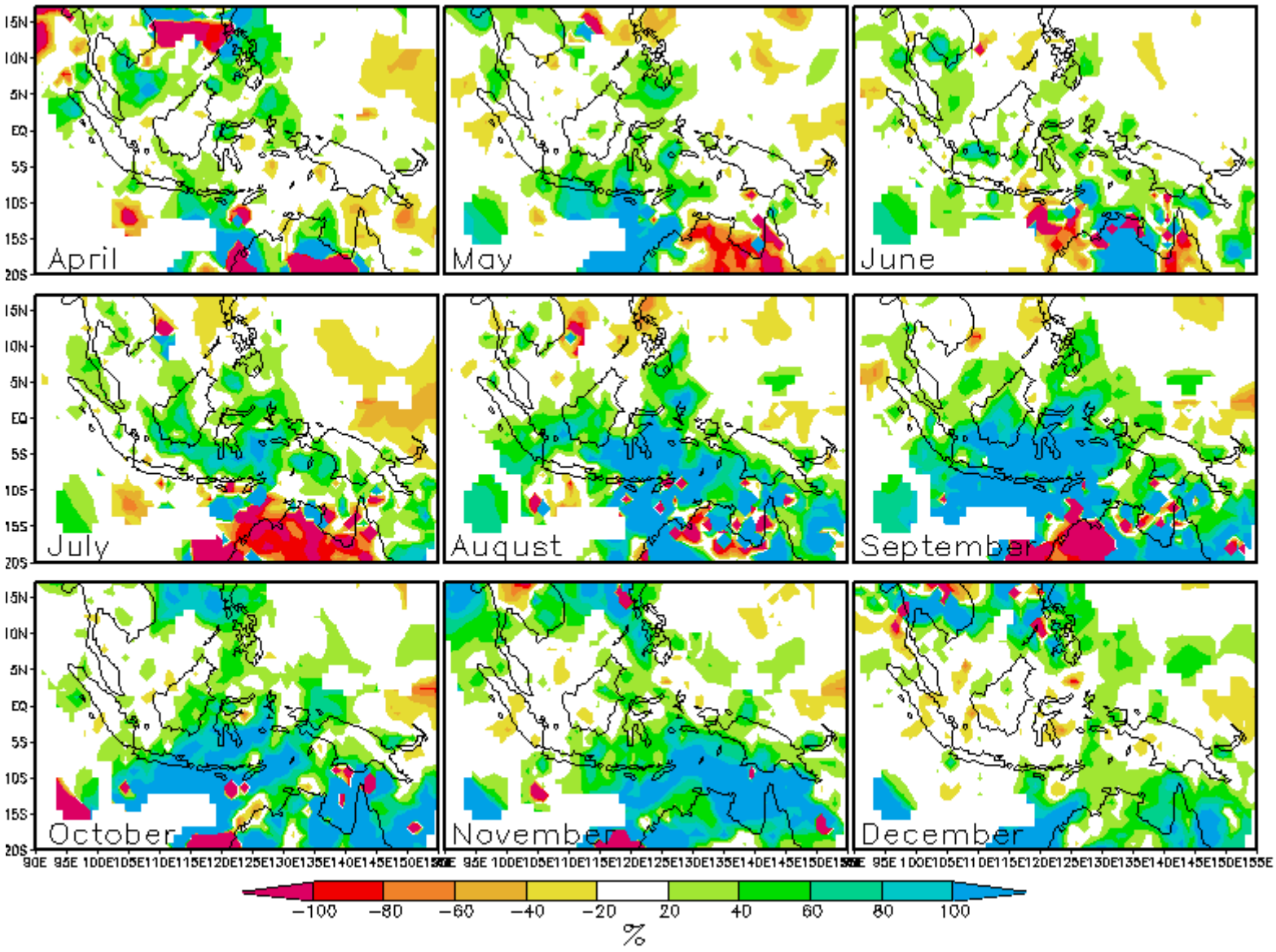
El Niño impact episode



Ensemble El Niño events during 1960-1991 against climatology

La Niña impact episode



Ensemble La Niña events during 1960-1991 against climatology

OBSERVATION / FIELD CAMPAIGN

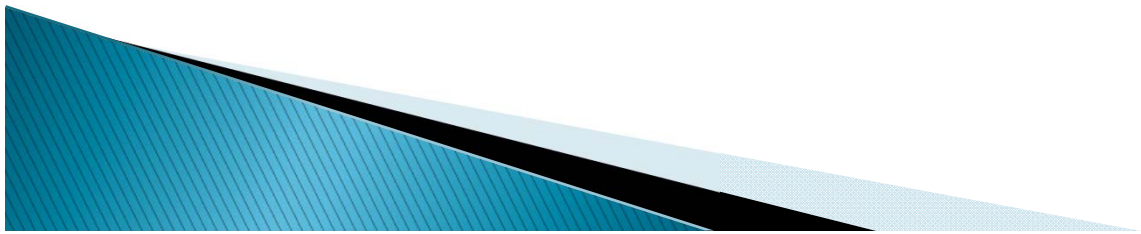
- Upper-air observations
- Surface weather observations (rainfall, temperature, humidity, solar radiation, pressure, and wind direction and speed)
- Ocean current observation
- Ocean wave (significant wave and directional spectra)
- Ocean currents observation
- Sea surface temperature observation

INSTRUMENTS

1. Seaglider [for observation in Karimata Strait]
2. Ship charter
3. Radiosonde
4. Rawinsonde [will be launched 4 times per day; launching sites: Surabaya, Kupang, Natuna, Ambon, Manado]
5. Portable Weather Station (PWS)
6. 10 (ten) Automatic Weather Station (AWS) [station sites: Pekanbaru, West Sumatera, Jakarta, Pontianak, Balikpapan, Biak, Langkat, South Aceh, Southeast Aceh (Bukit Barisan Mountains), Pematang Siantar]

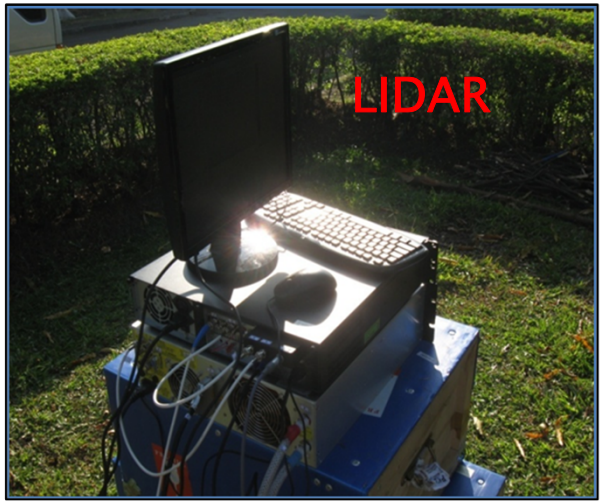
INSTRUMENTS

7. 4 (four) High Frequency Coastal Radar [sites: Bengkulu, West Kalimantan, South Sulawesi, and northern coast of Java]
8. 5 (five) coastal buoys [sites: Karimata Strait, central part of Java Sea, central part of Makassar Strait, south coast of Java, and Banda Sea]
9. Sun Photometer CIMEL Electronique
10. 5 (five) Sun-Photometer Handheld Microtops II Solar Light, sites: Palangkaraya, Pontianak, Jambi, Sorong, and Makassar
11. Pyrheliometer
12. High Performance Computing Server (HPC Server)
13. Data storage



INSTRUMENTS ON R&D CENTER

Current

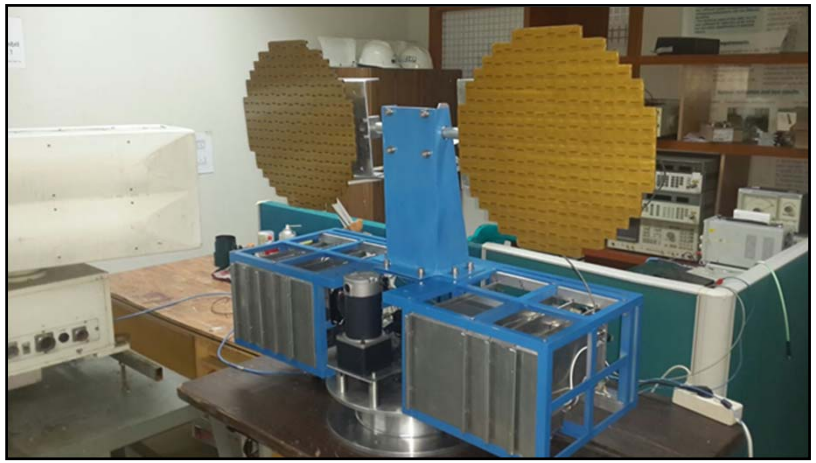


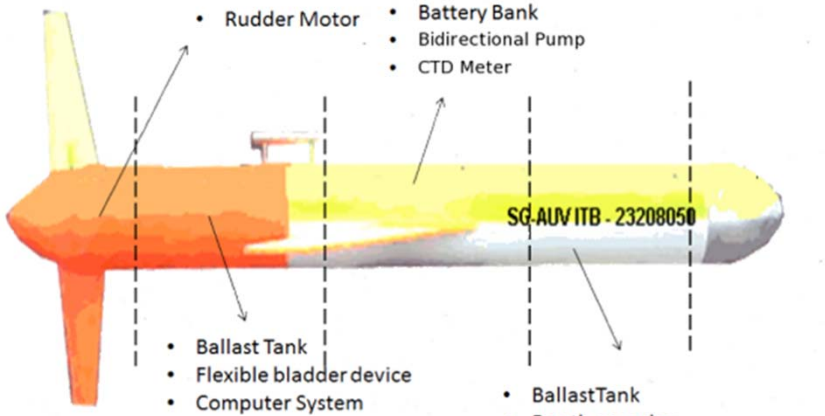
LIDAR

WINDCUBE

On development phase

MINI WEATHER RADAR X BAND



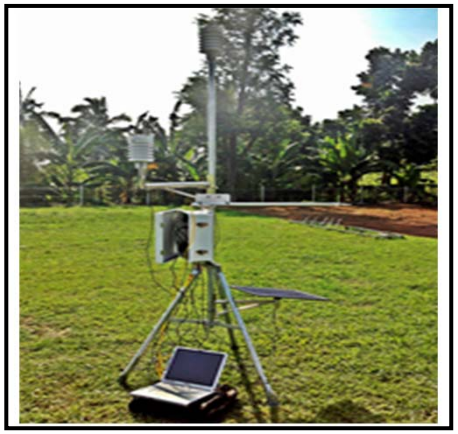


SEA GLIDER

INSTRUMENTS ON R&D CENTER

CURRENT

WAVE RECORDER



WEB BASED MULTI GAS SENSOR
(CO, CO2, NO2, SO2, TEMP, RH)

SOIL HEAT FLUX METER

RADIOSONDE SENSOR

Thank you