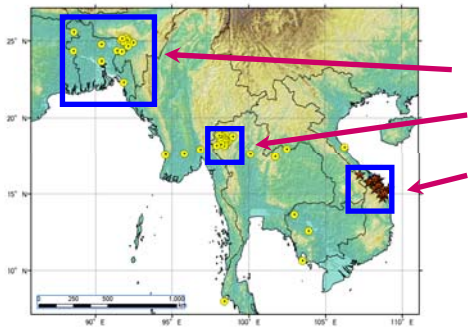
Japan EOS Promotion Program (JEPP) Theme 2-2 by Prof. Matsumoto, U-Tokyo

Development of rainfall observation system in Southeast Asia

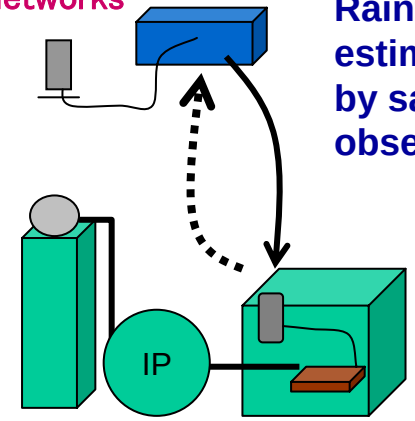
Objective: Develop rainfall observation system in order to understand water cycle and its variability by climatic changes in tropical Asian monsoon region over Indochina

(1) Research on rainfall distribution
Rainfall observation by automatic rain gauges and development of real-time data transmission system

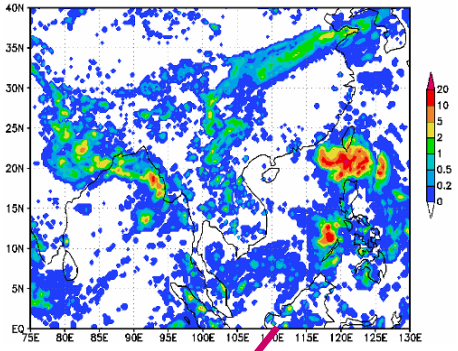
(2) Research on flood prediction
Rainfall estimation using radar and satellite observation and its application to flood prediction

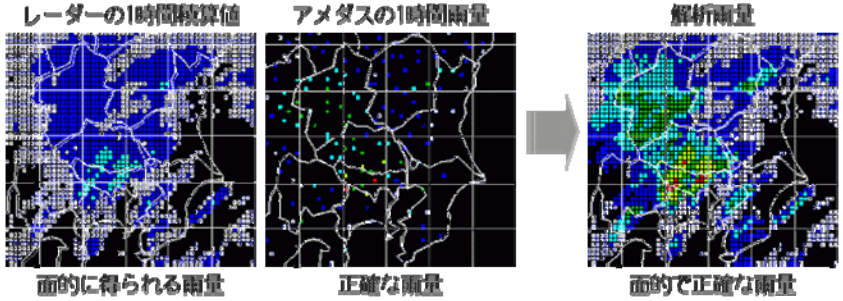


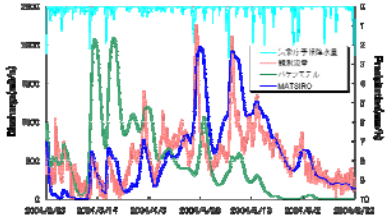
Automatic rain gauge Networks
India, Bangladesh 36
Thailand 18
Vietnam 33



Rainfall estimation by satellite observation







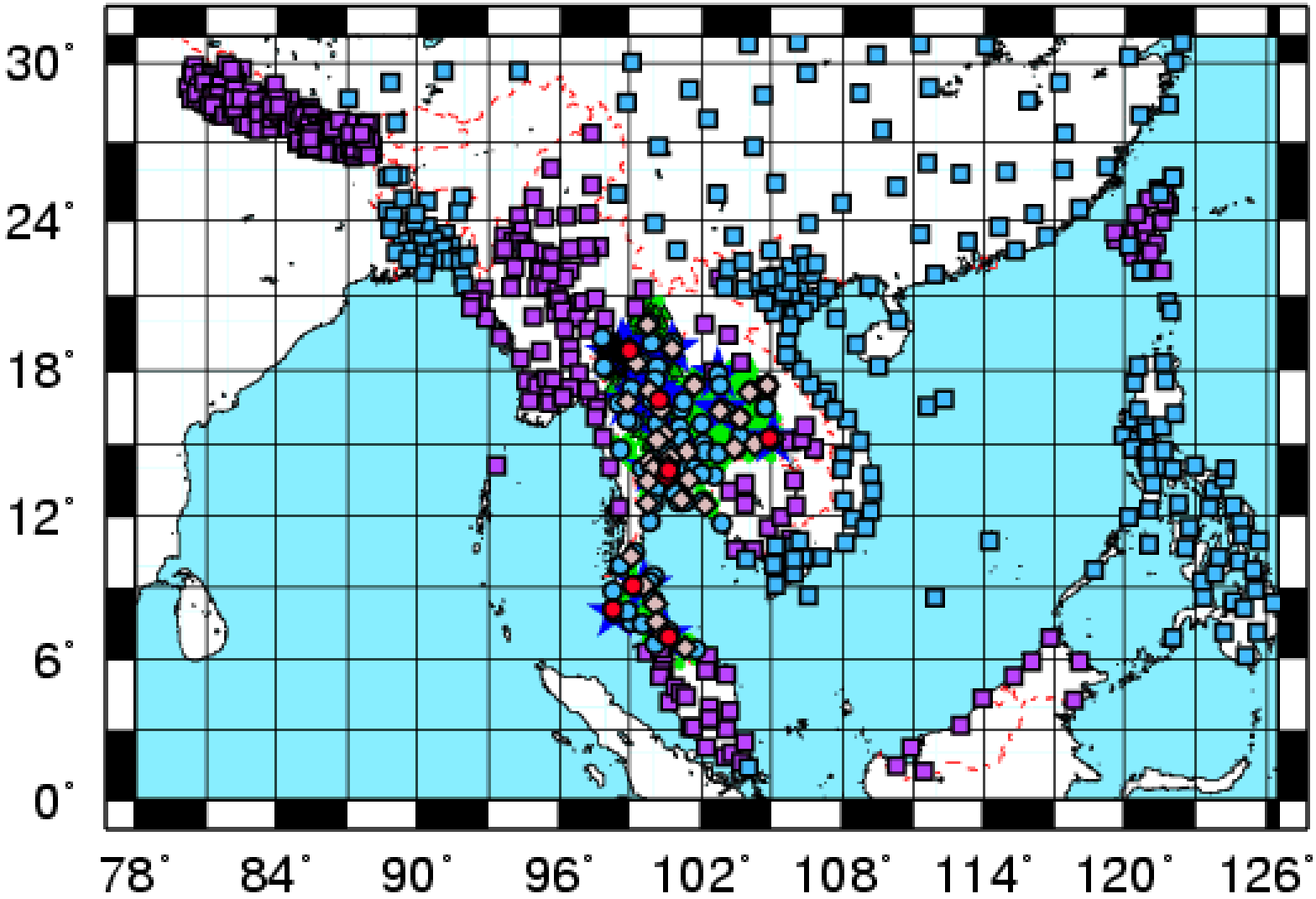
Radar data + Raingauge data → Composite rainfall data

Similar to Radar-AMeDAS system in Japan

Flood prediction

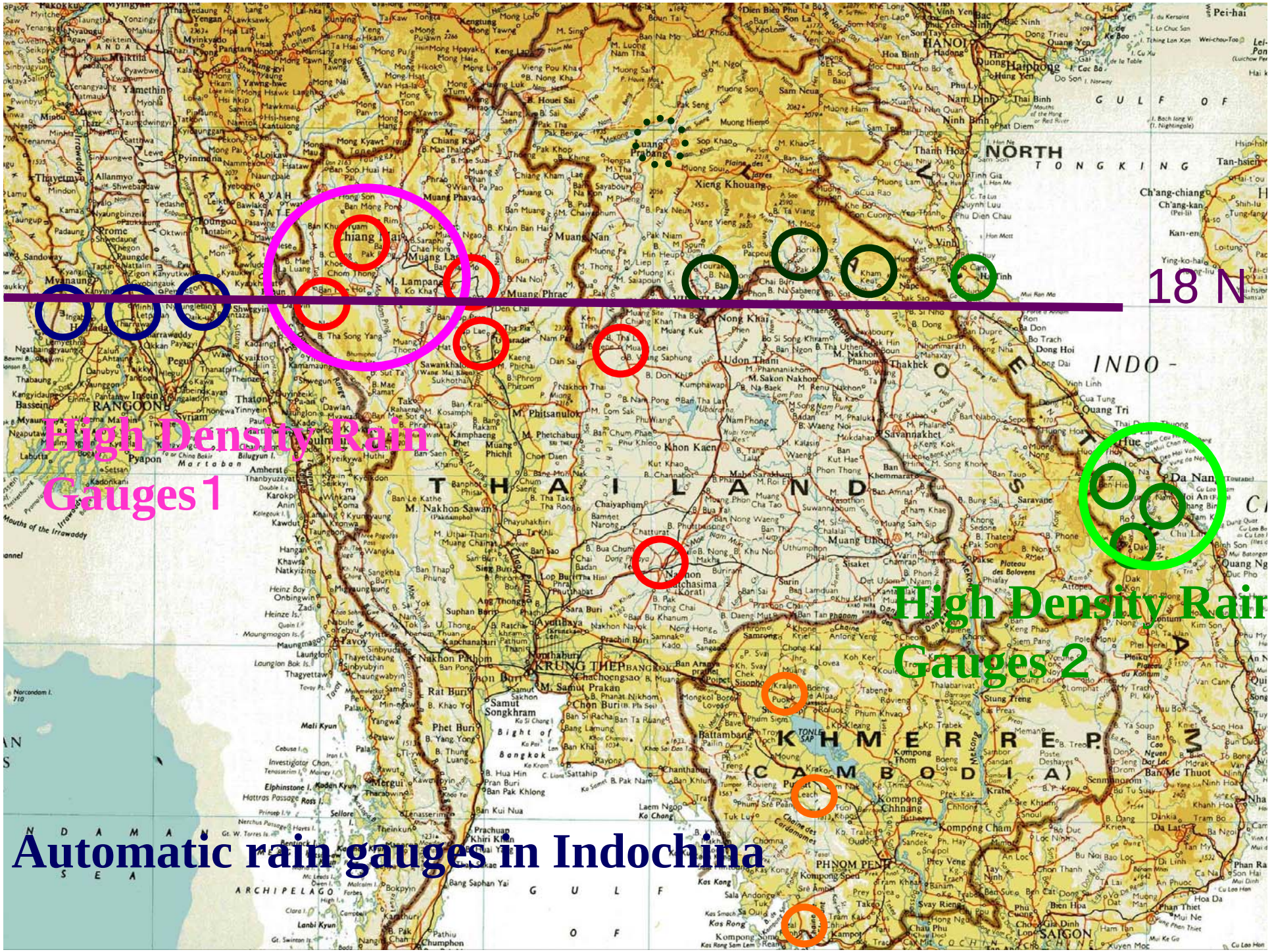
We have collected quite good data for Indochina

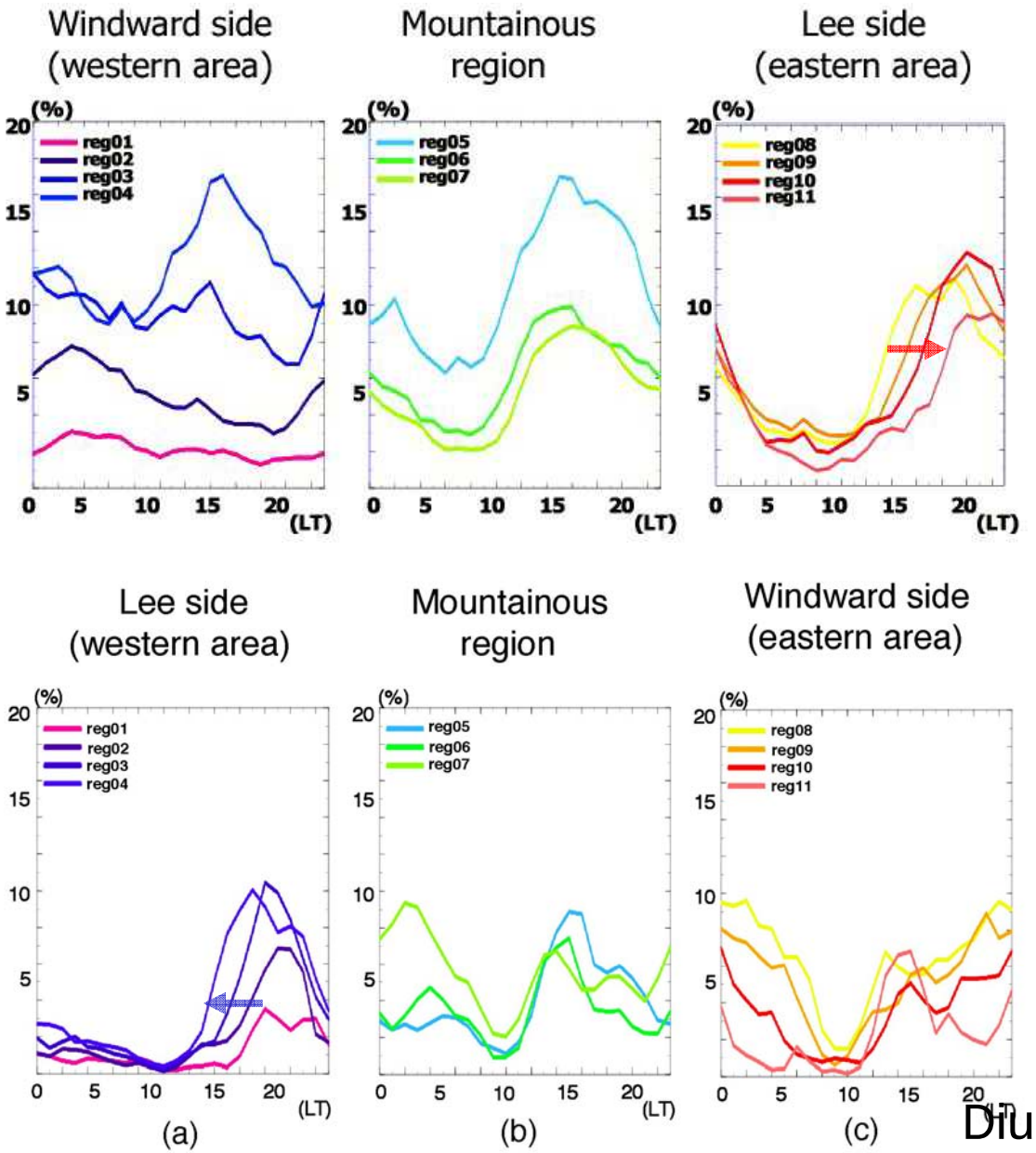
Routine Obs. Stations in Ver. 2

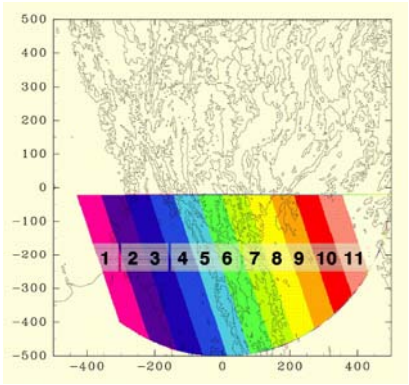


http://hydro.iis.u-tokyo.ac.jp/GAME-T/GAIN-T/index.html

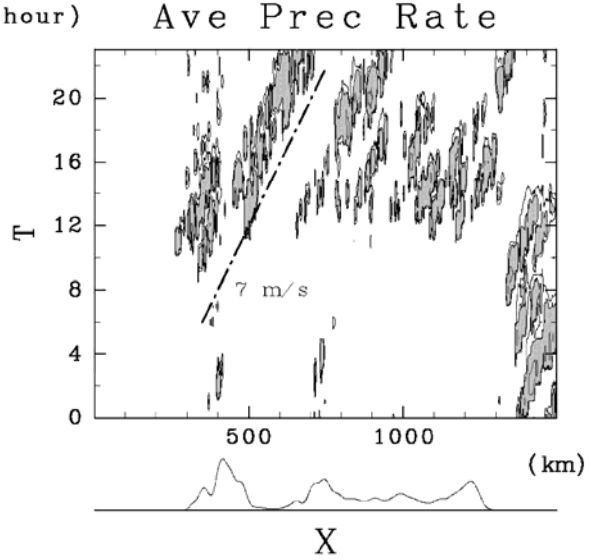
http://gain-hub.mri-jma.go.jp


18 N
High Density Rain
Gauges 1
High Density Rain
Gauges 2
Automatic rain gauges in Indochina



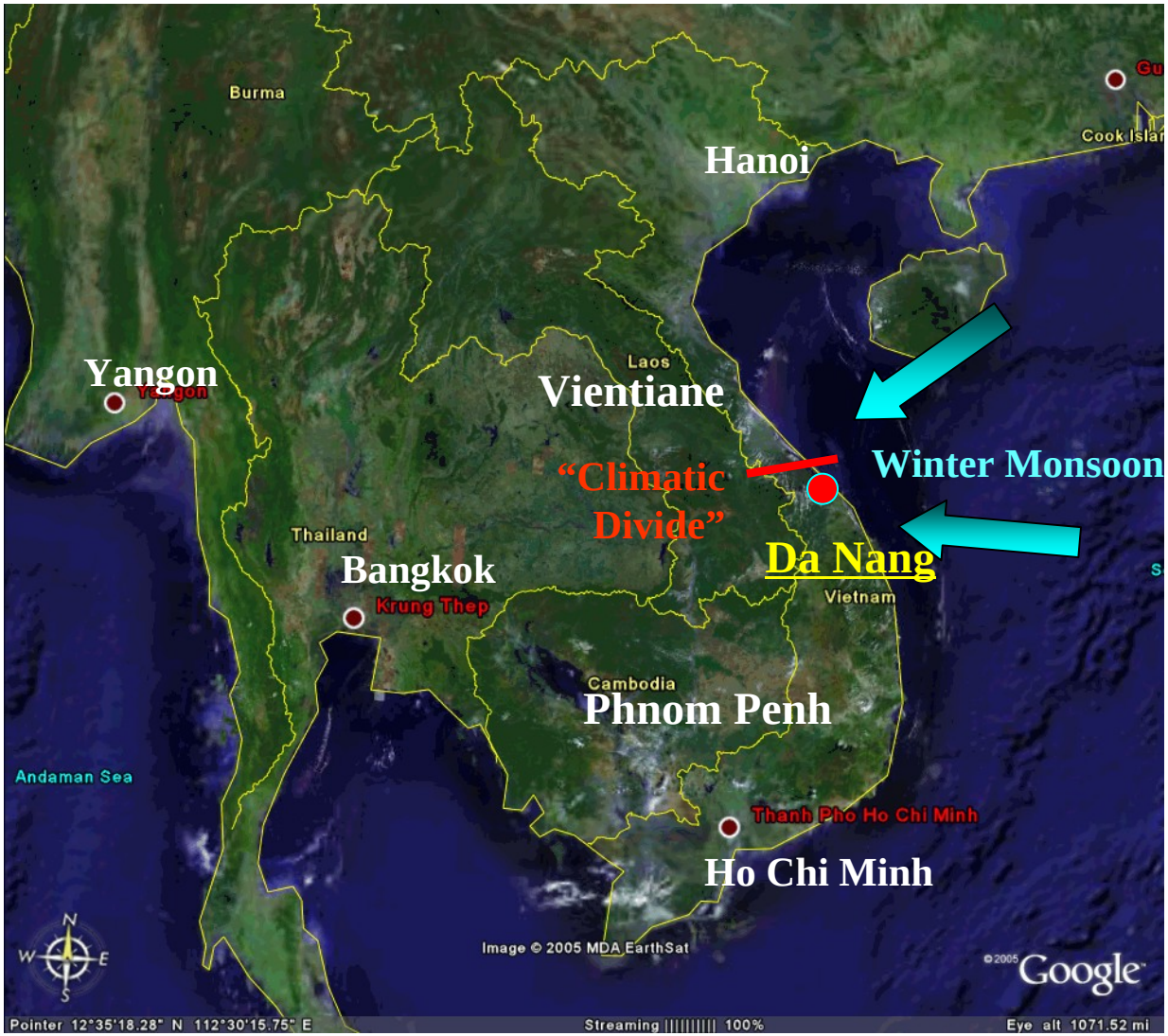


Shift of Echo Area Max Time by CAPPI data of Om Koi radar (Okumura et al., GRL)



Diurnal Variation of Precipitation Simulated by Cloud Resolving Model (Satomura, 2000: JMSJ)

Topographic Setting of Danang area



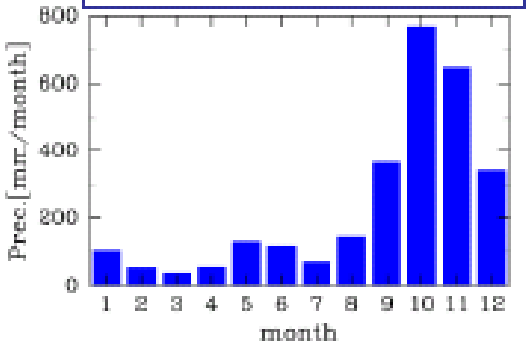
Source : Google Earth

- Just the South of Hai Van Pass (雲海峠), "climatic divide" of Viet Nam

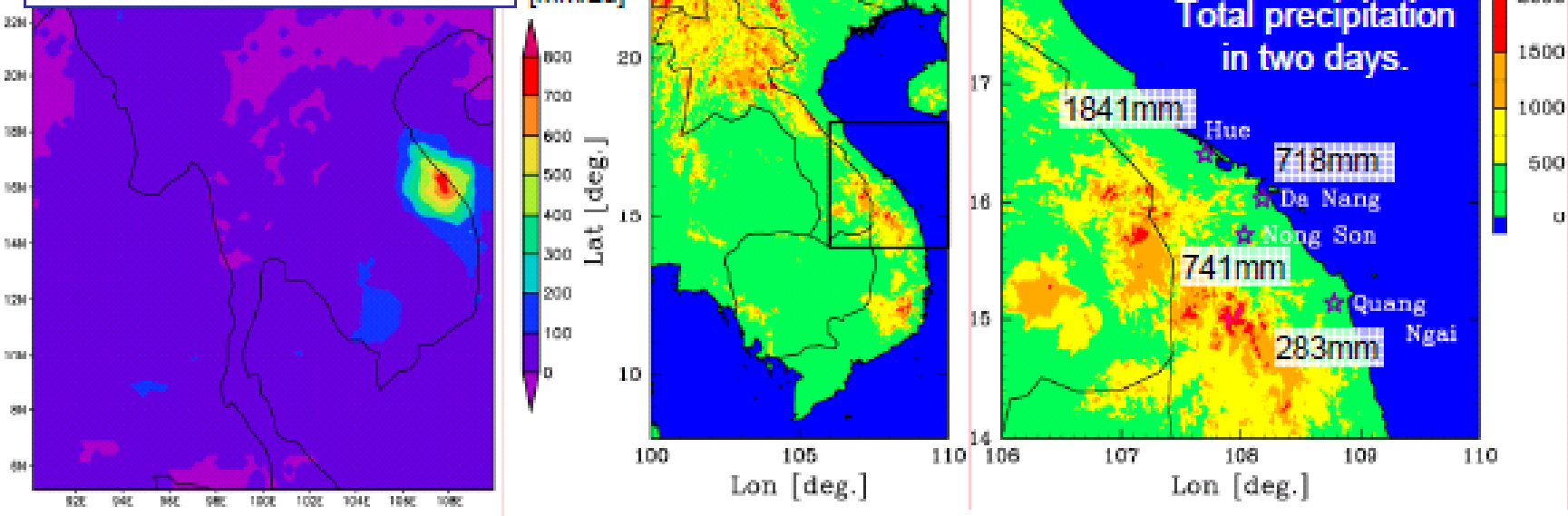
A heavy rainfall event in central Vietnam in November 2-3, 1999

- Precipitation on Nov. 2 and 3, 1999 in Hue (16.4N, 107.7E) is more than 800 mm/day.
  - the maximum precipitation event since 1951.
- Heavy rainfall concentrates in central Vietnam east of the Annam range.

Climatological monthly precipitation at Hue

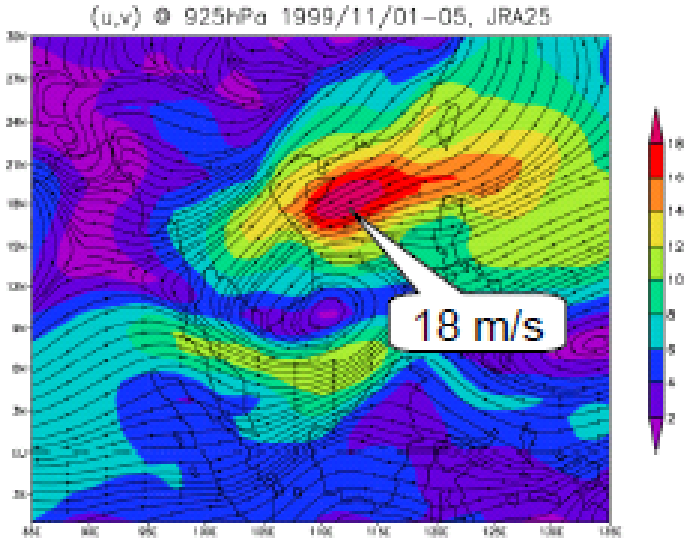


Precipitation in Nov. 2-3, 1999 (TRMM3B42)



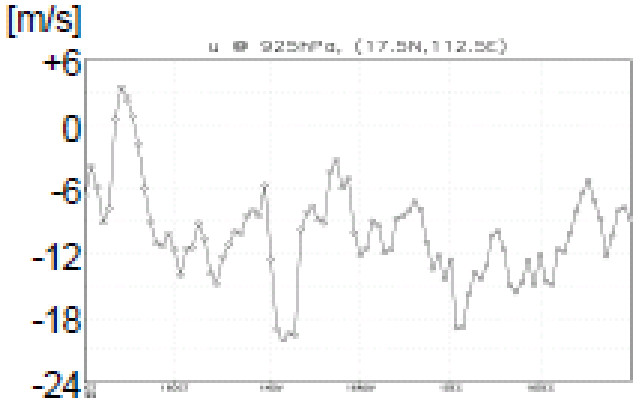
Circulation field and possible causal mechanisms:

- Prior to the heavy rainfall, monsoonal northeasterly over the South China Sea strengthened.
- How? (Causal mechanism)
  - Some cold-surge-like features were observed.
  - westward-moving disturbances (TD, Rossby waves, etc.)?
  - Upper-level trough?
- Attempt to reproduce with MM5.

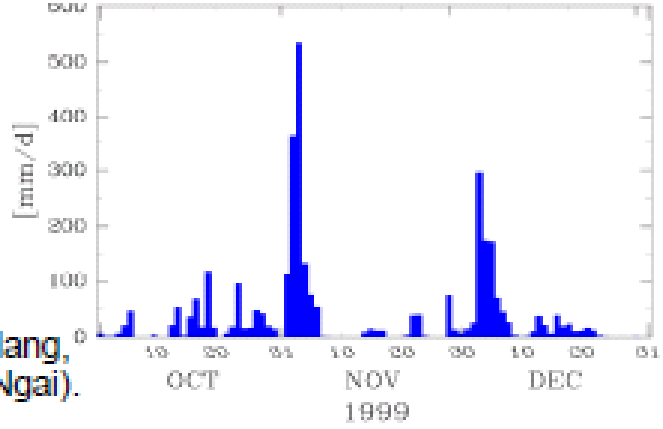


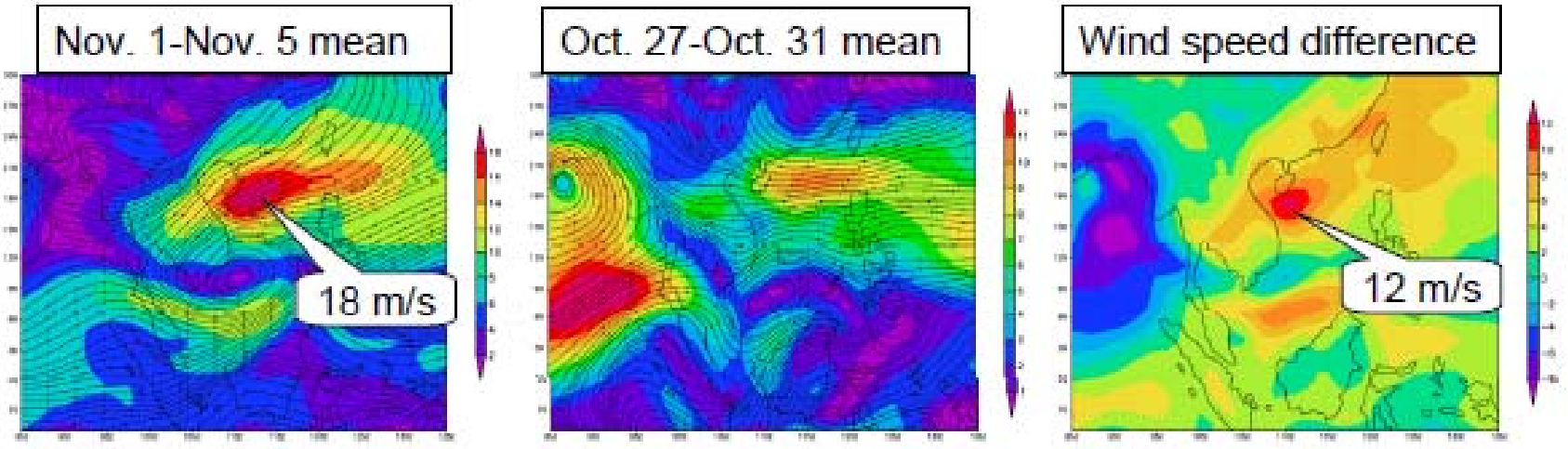
Zonal wind at 925hPa averaged from Nov. 1 to Nov. 5. (JRA25)

u(925hPa) over the northern SCS

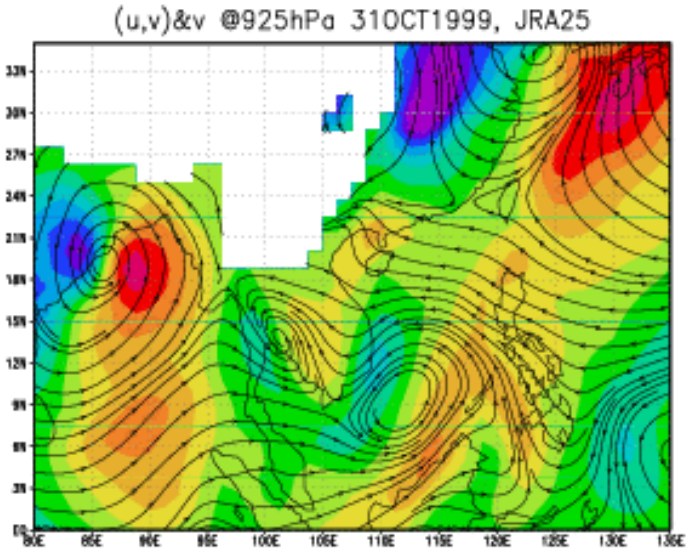


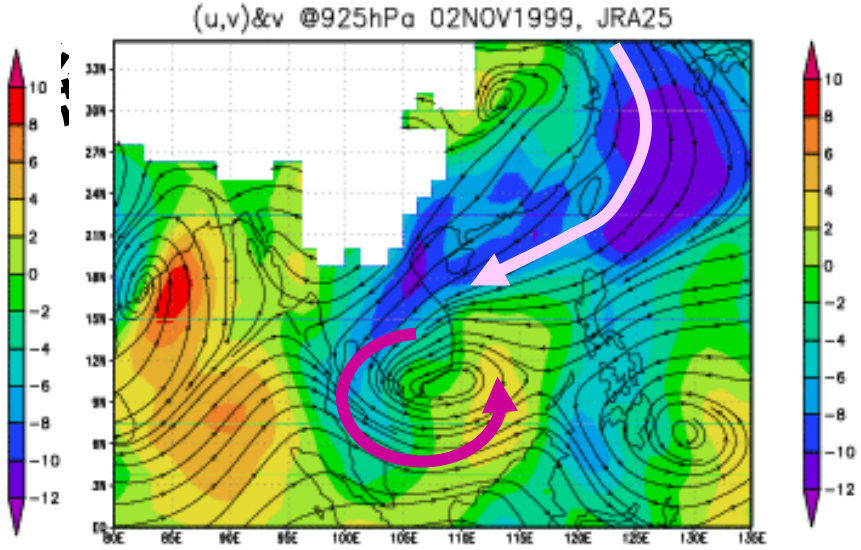
Daily precipitation averaged over four stations (Hue, Da Nang, Nong Son, Quang Ngai).



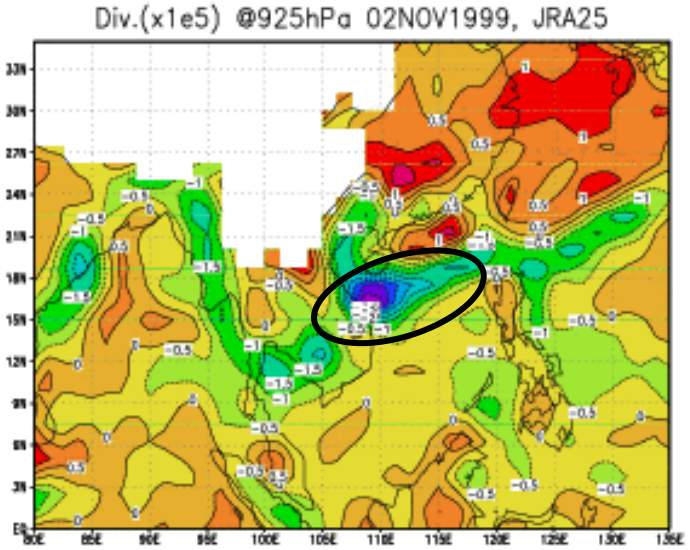


Stream line and wind speed at 925hPa. (JRA25)





925hPaStream line&v



925hPa divergence

Cold surge (CS)

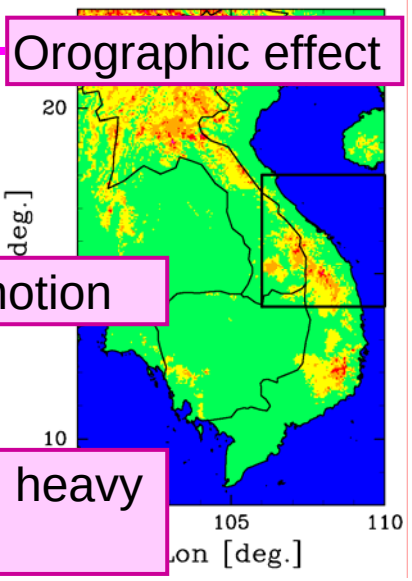
convergence

Tropical depression (TD)

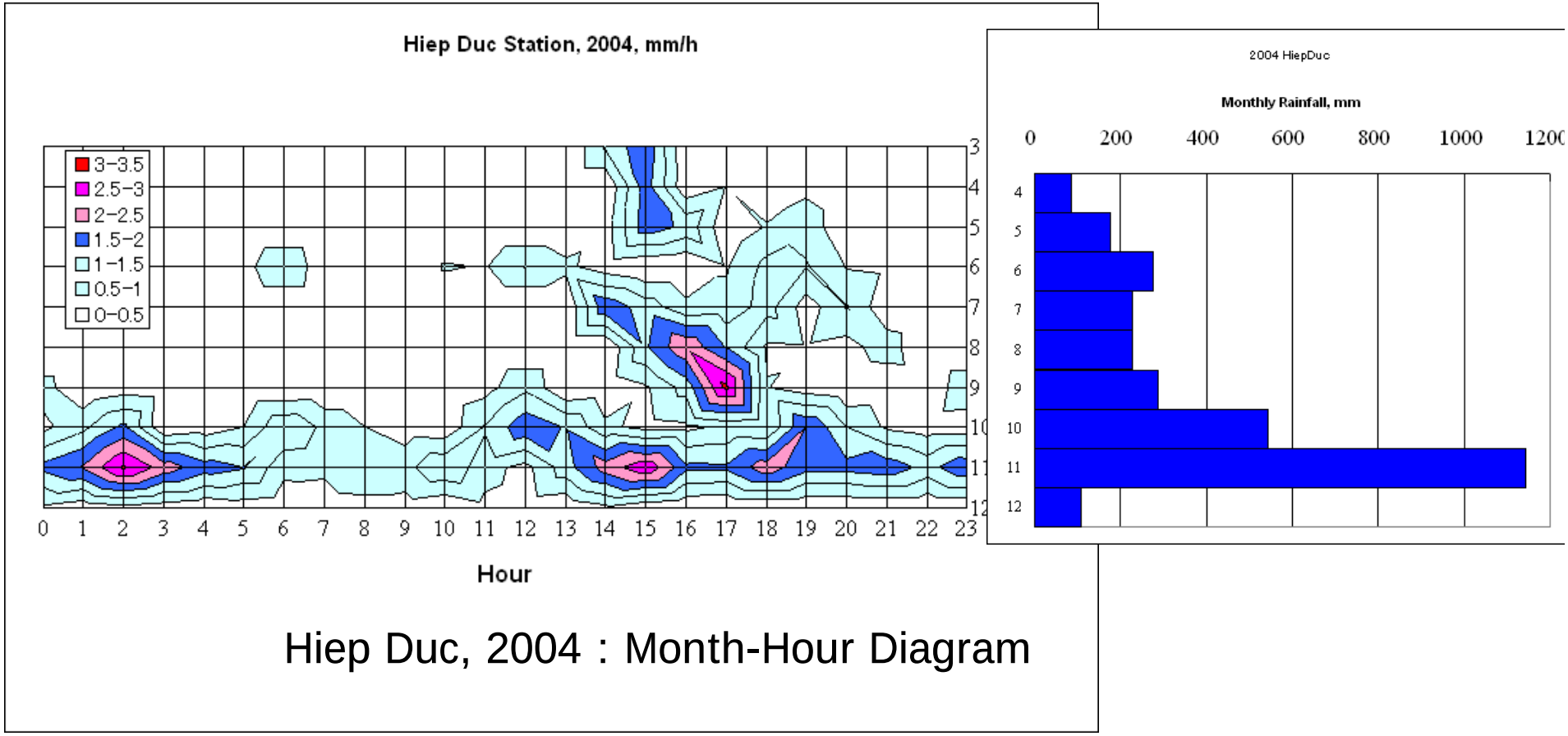
Orographic effect

Upward motion

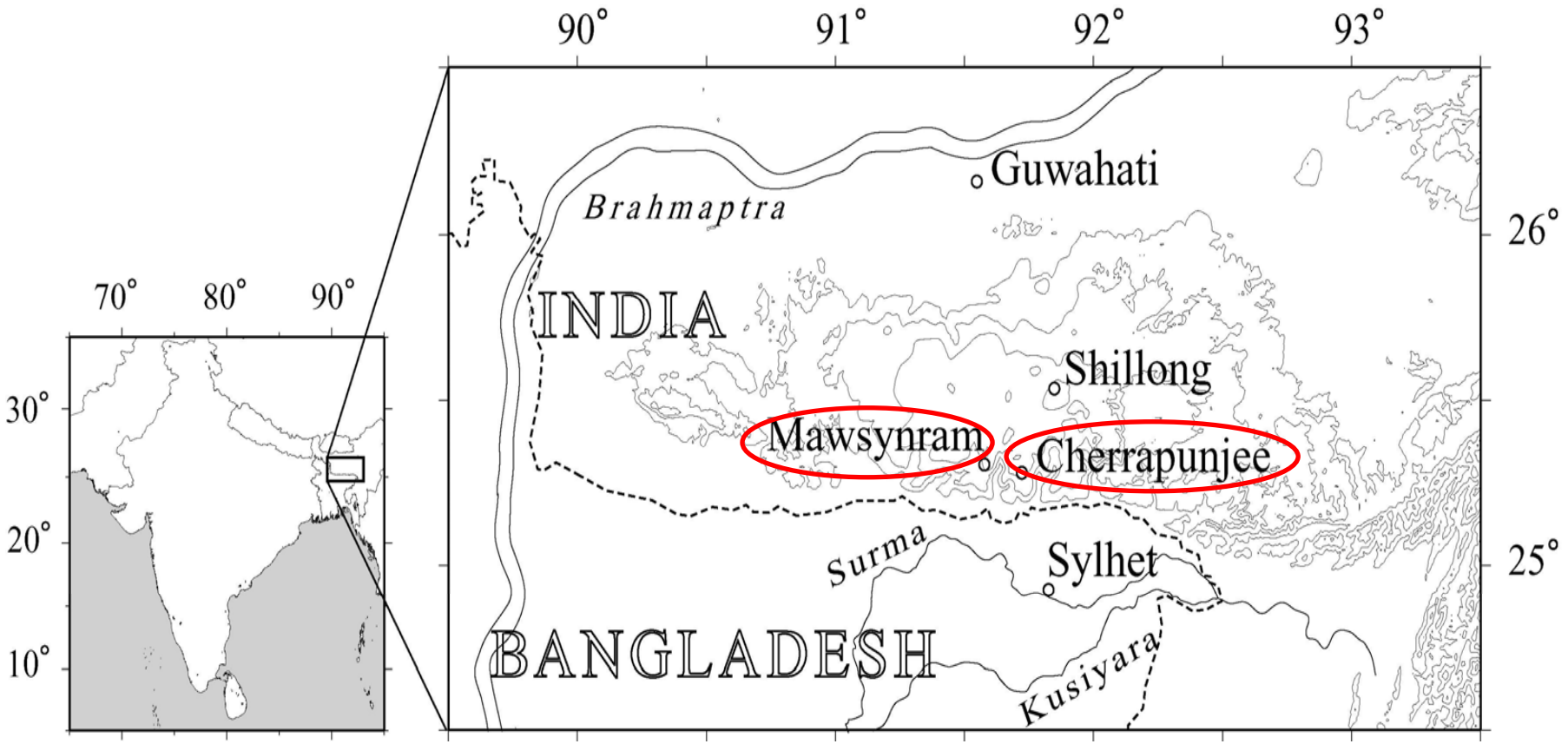
Continuous heavy rain

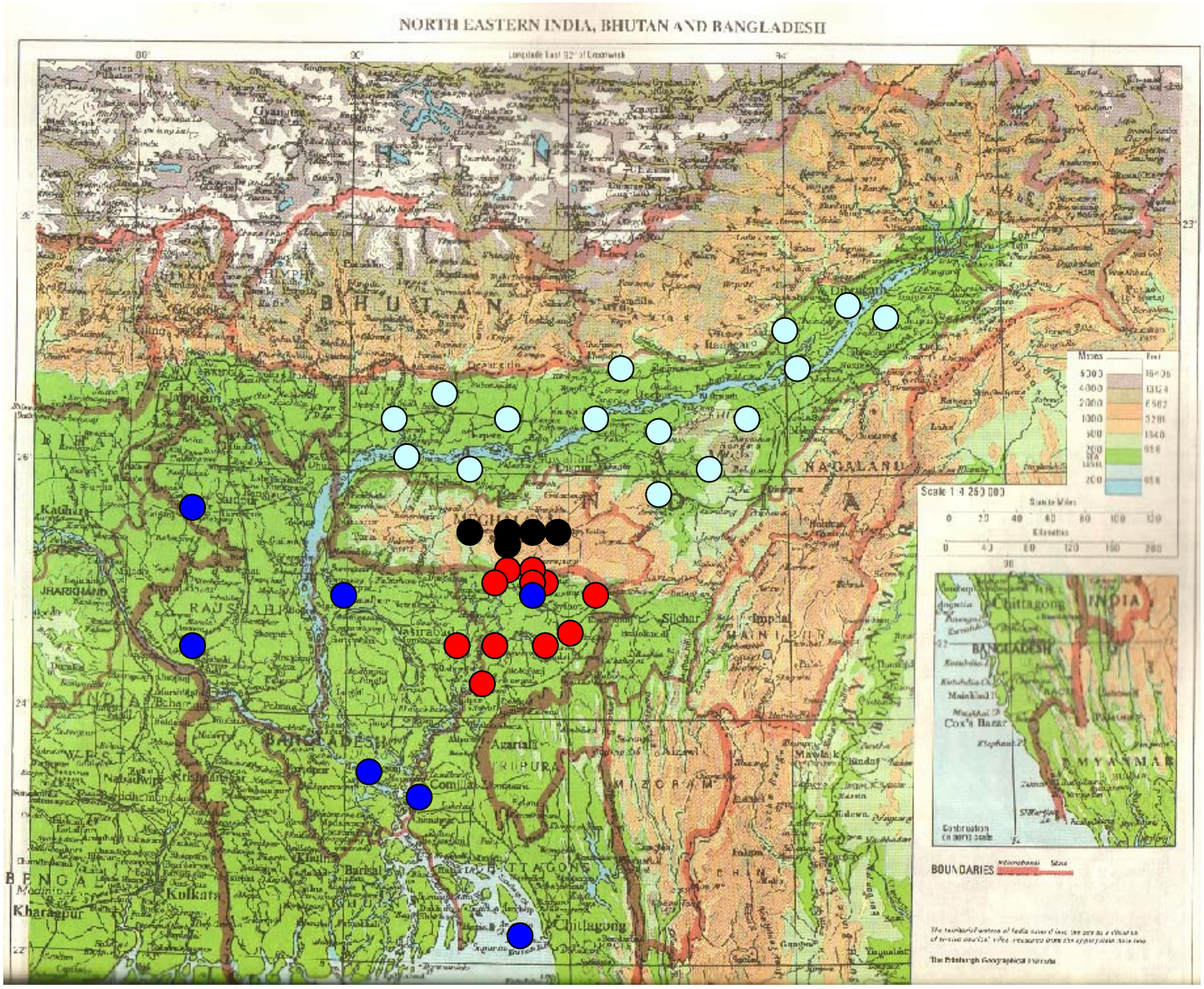


- **Diurnal and seasonal rainfall variations by automatic rain gauge at Hiep Duc, central Vietnam in 2004**



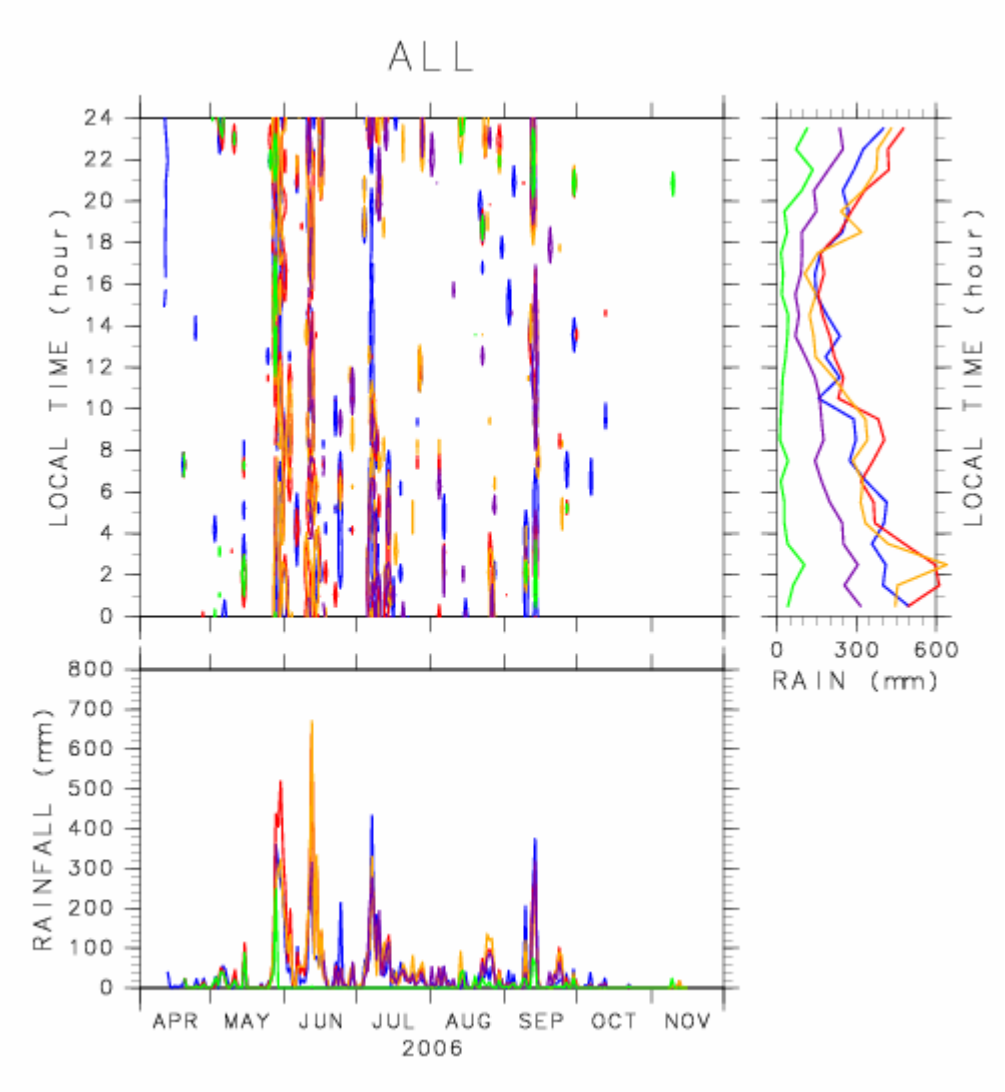
Hiep Duc, 2004 : Month-Hour Diagram

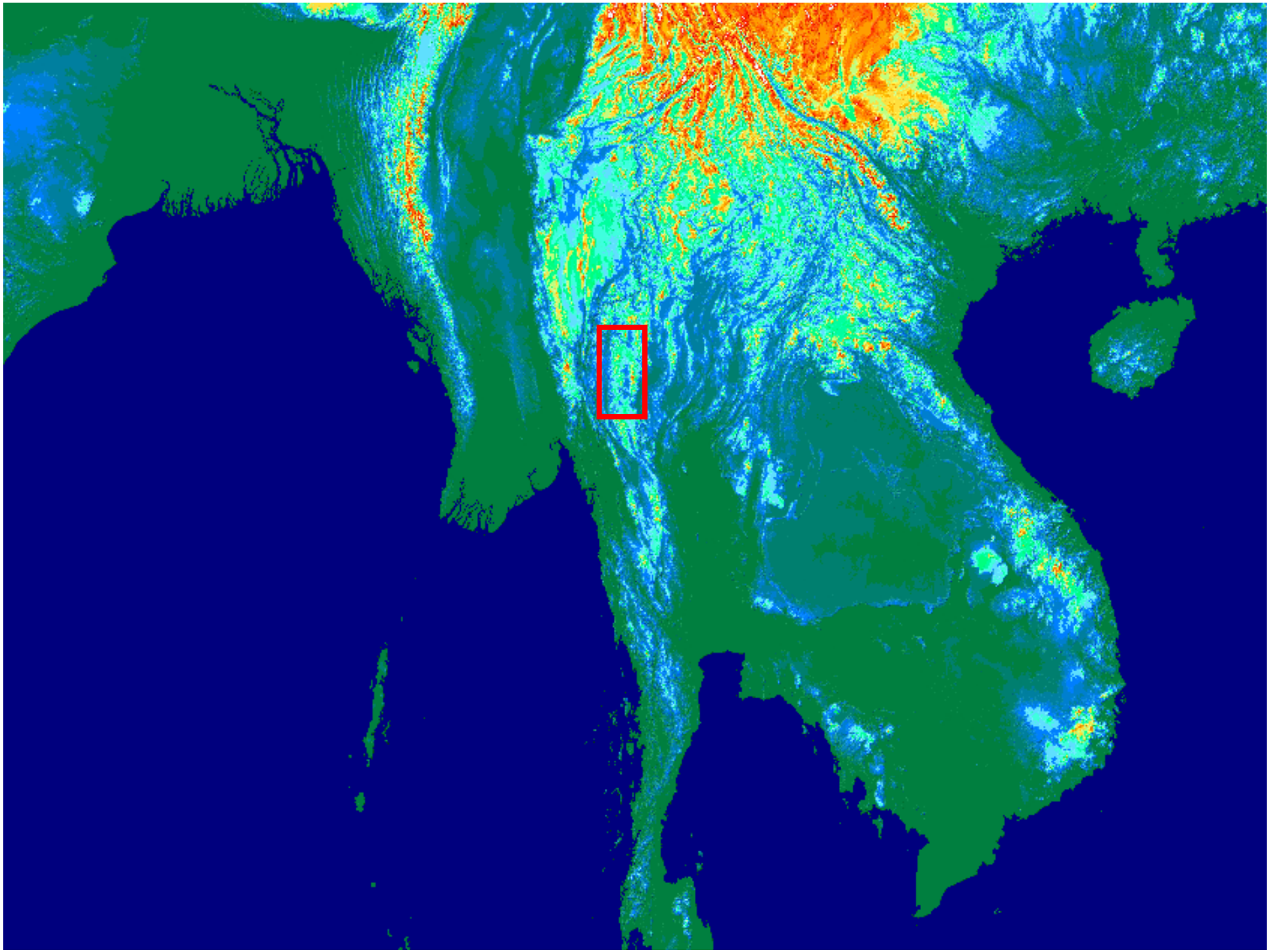

90°
91°
92°
93°
26°
25°
Guwahati
Brahmaptra
INDIA
Shillong
Mawsynram
Cherrapunjee
Surma
Sylhet
BANGLADESH
Kusiyara
70°
80°
90°
30°
20°
10°

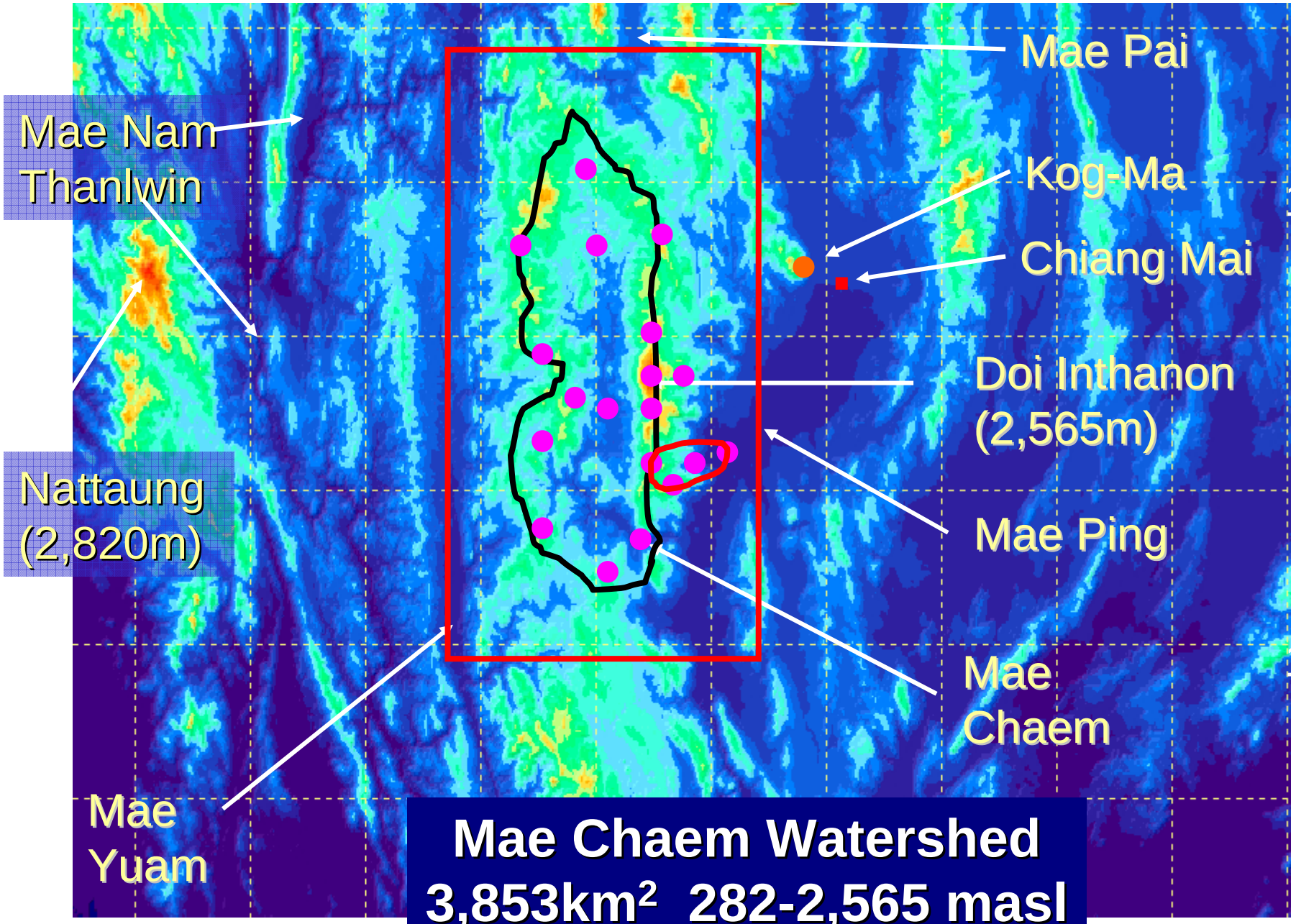

NORTH EASTERN INDIA, BHUTAN AND BANGLADESH
BHUTAN
NAGALAND
MIZORAM
TRIPURA
BANGLADESH
INDIA
MYANMAR
Scale 1:4 250 000
BOUNDARIES

Rainfall in Meghalaya in 2006

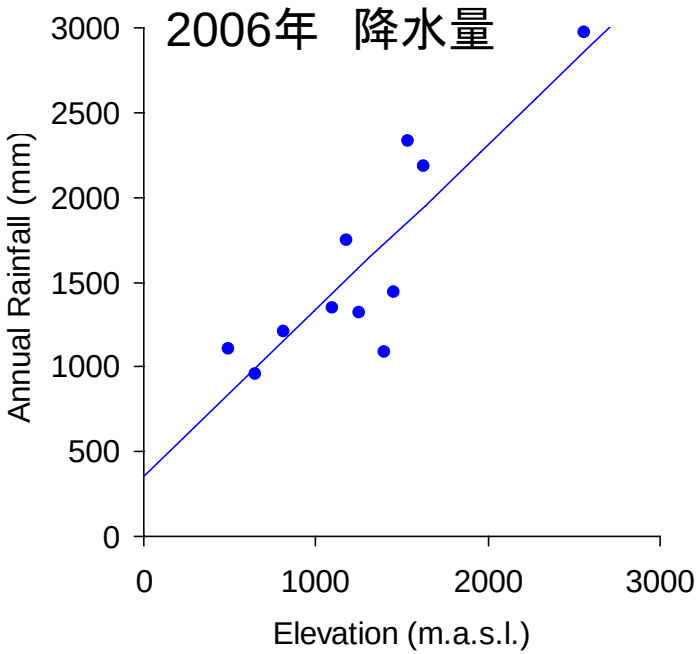
Thankalan Park
Pynur
Mawsingram
Cherrapunjee
Amlaerem

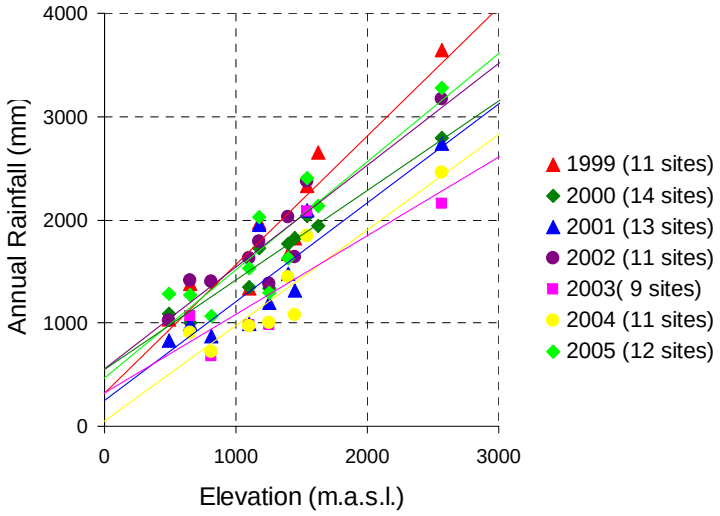


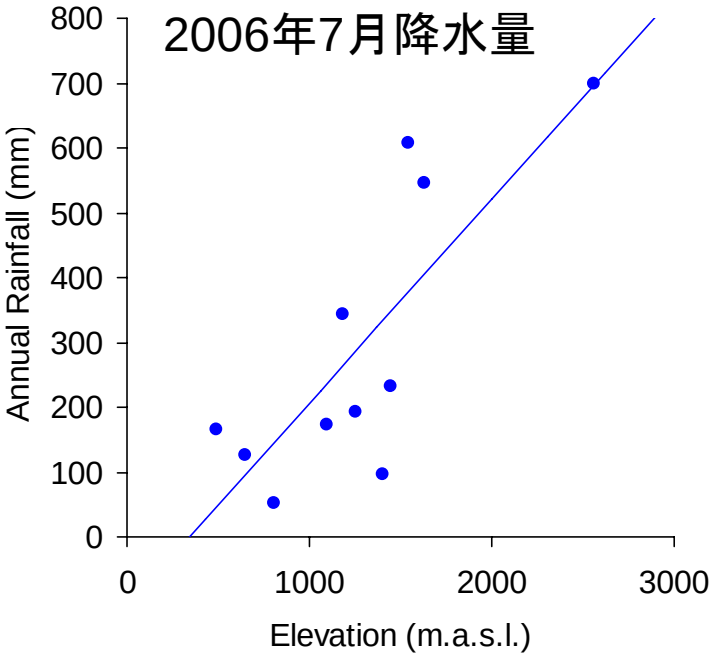


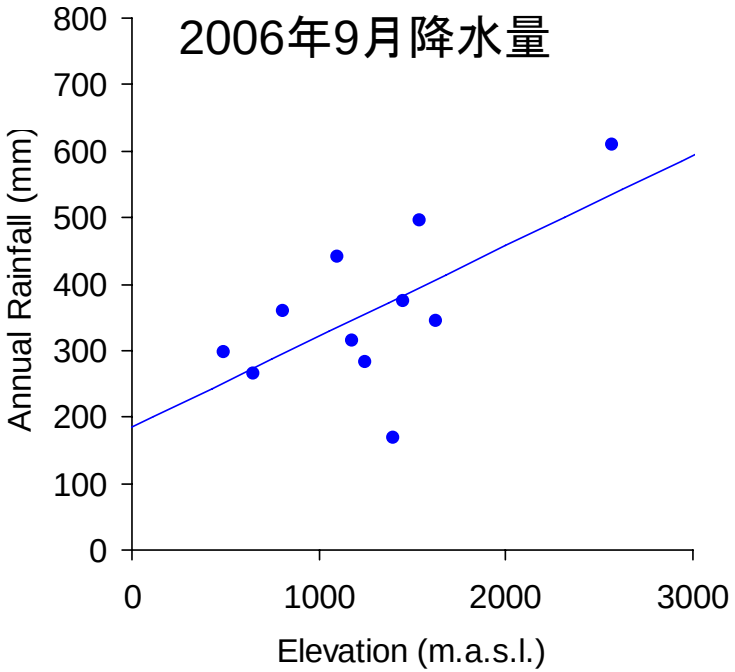

Mae Pai
Mae Nam Thanlwin
Kog-Ma
Chiang Mai
Doi Inthanon (2,565m)
Nattaung (2,820m)
Mae Ping
Mae Chaem
Mae Yuam
Mae Chaem Watershed
3,853km² 282-2,565 masl

Rainfall-elevation









In AMY2008…

- Hourly rainfall
- Radar observations
- Some AWS station data in Bangladesh, Meghalaya, Central Vietnam

Data will be open through CEOP data-base