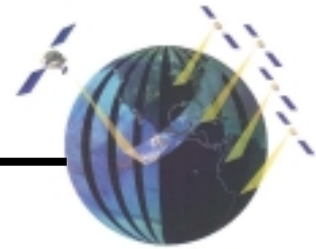
TRMM Heritage to GPM

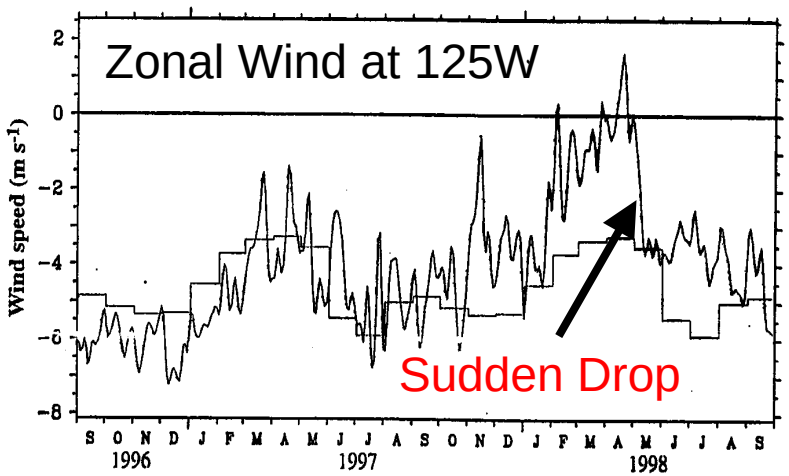


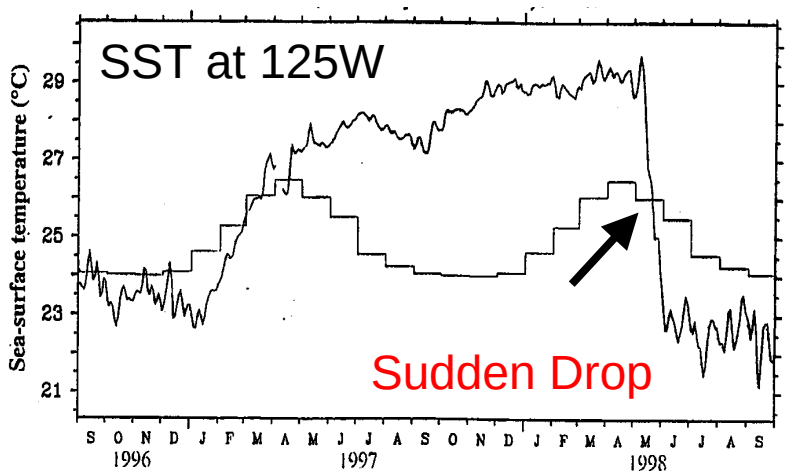
Tetsuo Nakazawa JMA/MRI, Japan

- **Contribution to Science**
  - MJO(30-60 day Oscillation) Dynamics
  - Tropical Rainfall System
    - Vertical Profile of Rain
    - Diurnal Cycle
- **Contribution to Society**
  - Water Cycle over the Ocean
  - Data Assimilation of TRMM Data
  - Real Time Data Application

MJO Terminated the last El Niño

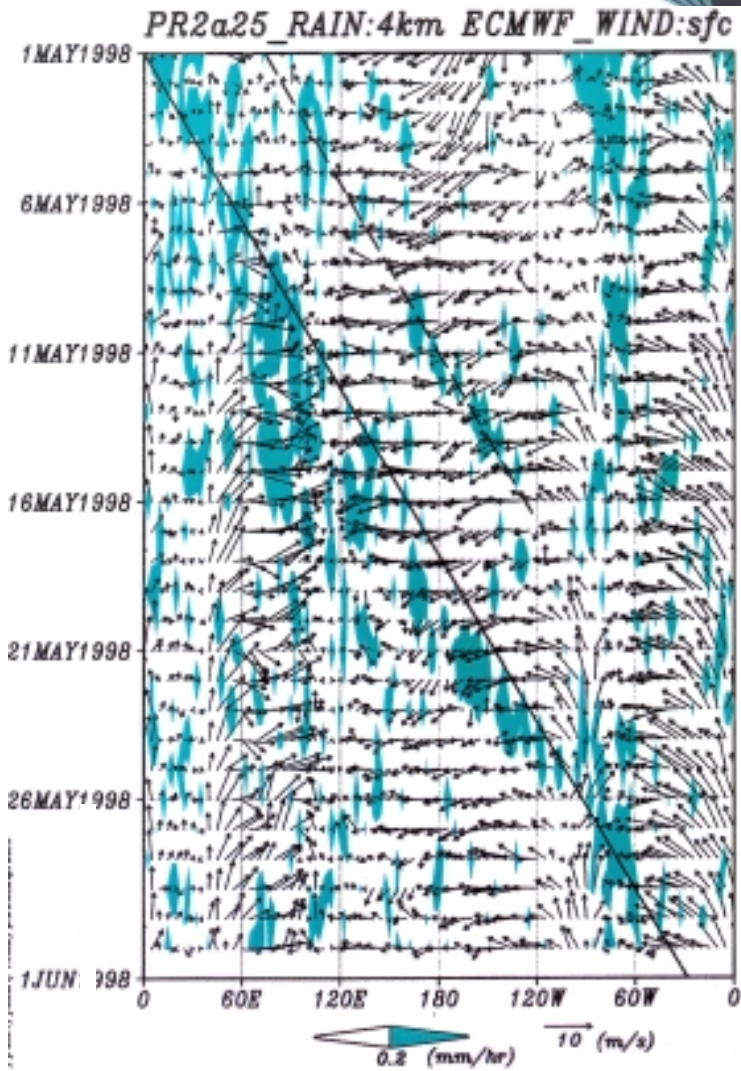
TOGA-TAO Buoy





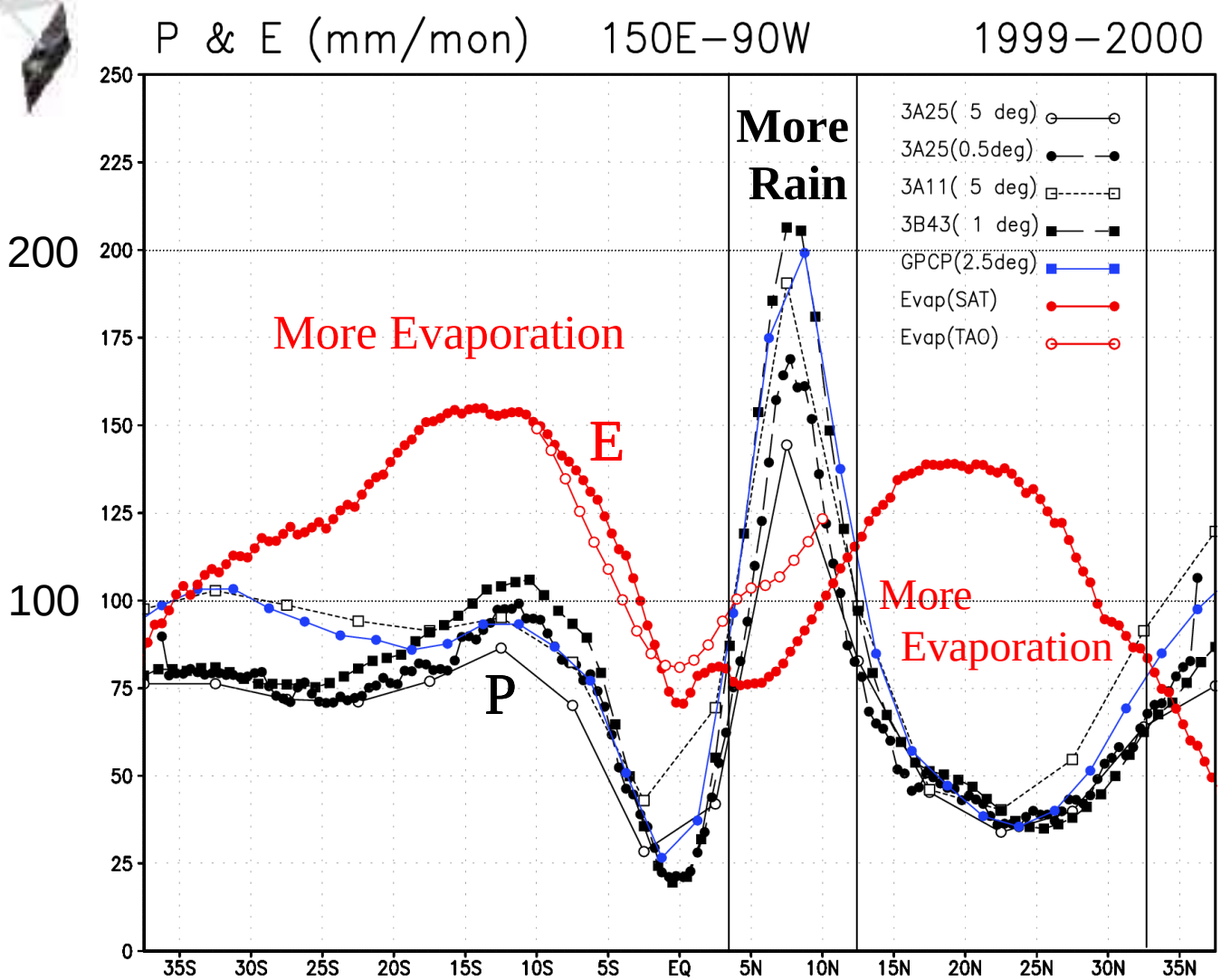
McPhaden (1999)

TRMM/PR



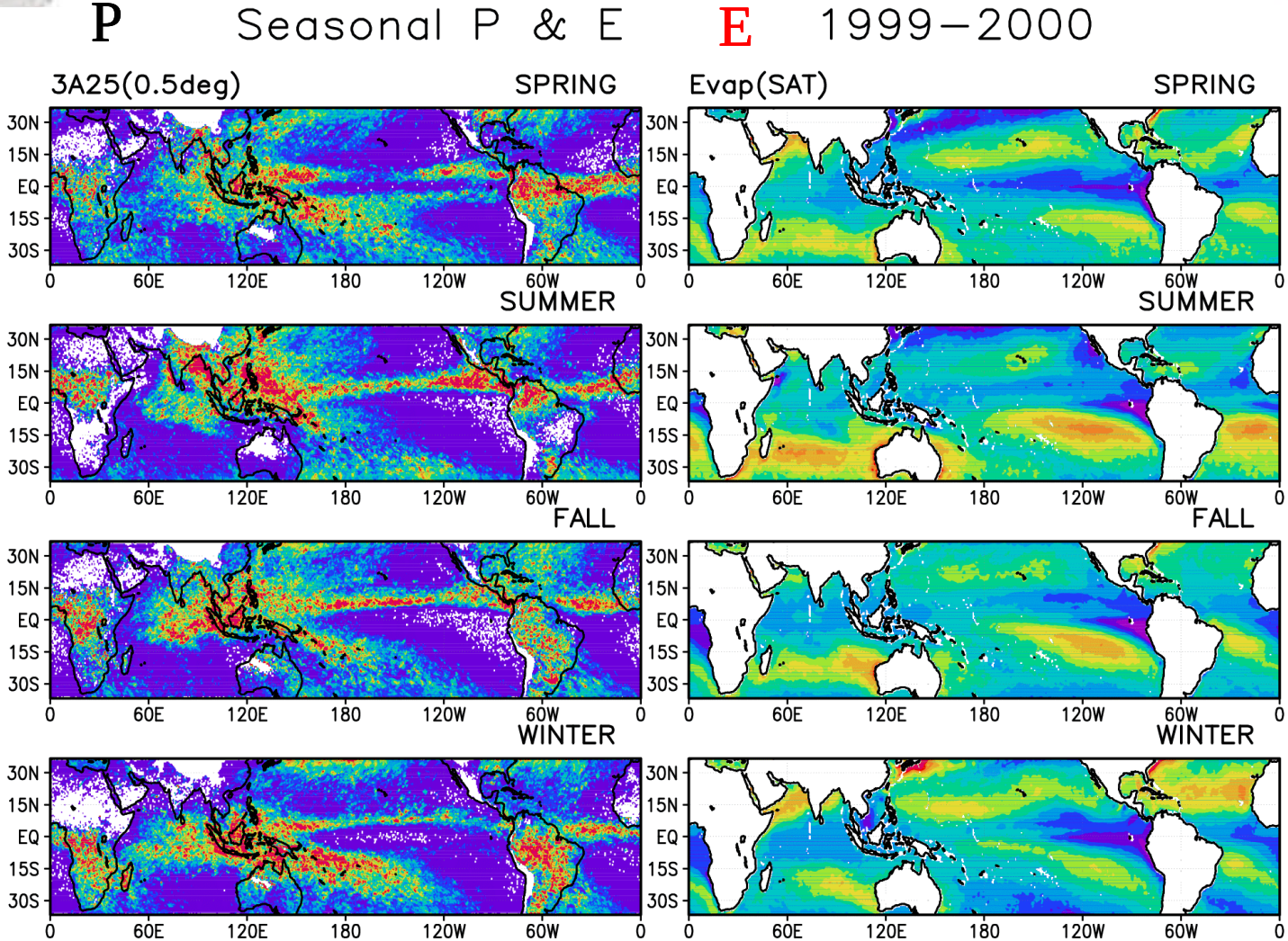
Takayabu et al. (1999)

Water Cycle over Ocean



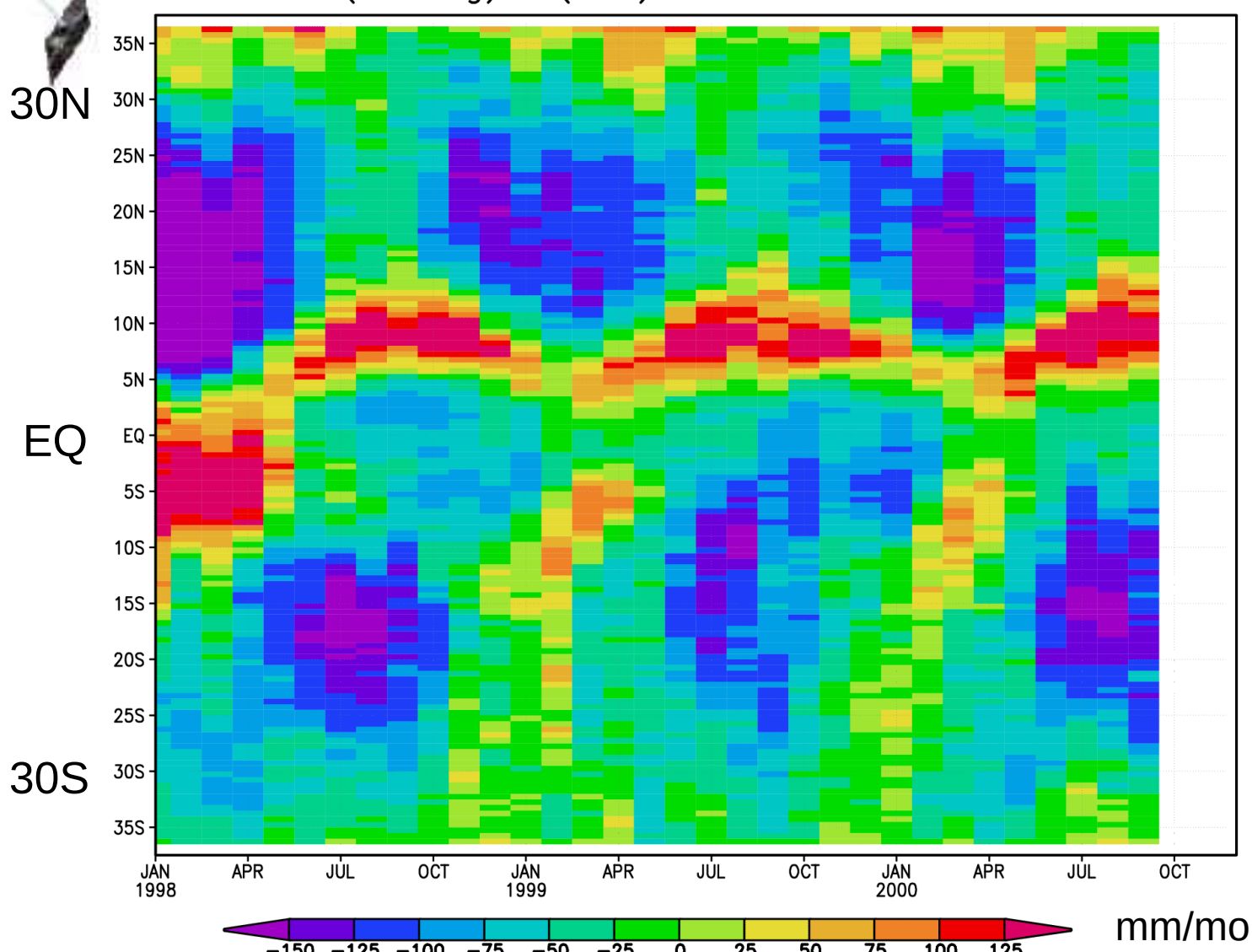
Nakazawa(2001)

Preciptation (PR), Evaporation (TMI)



Nakazawa(2001)

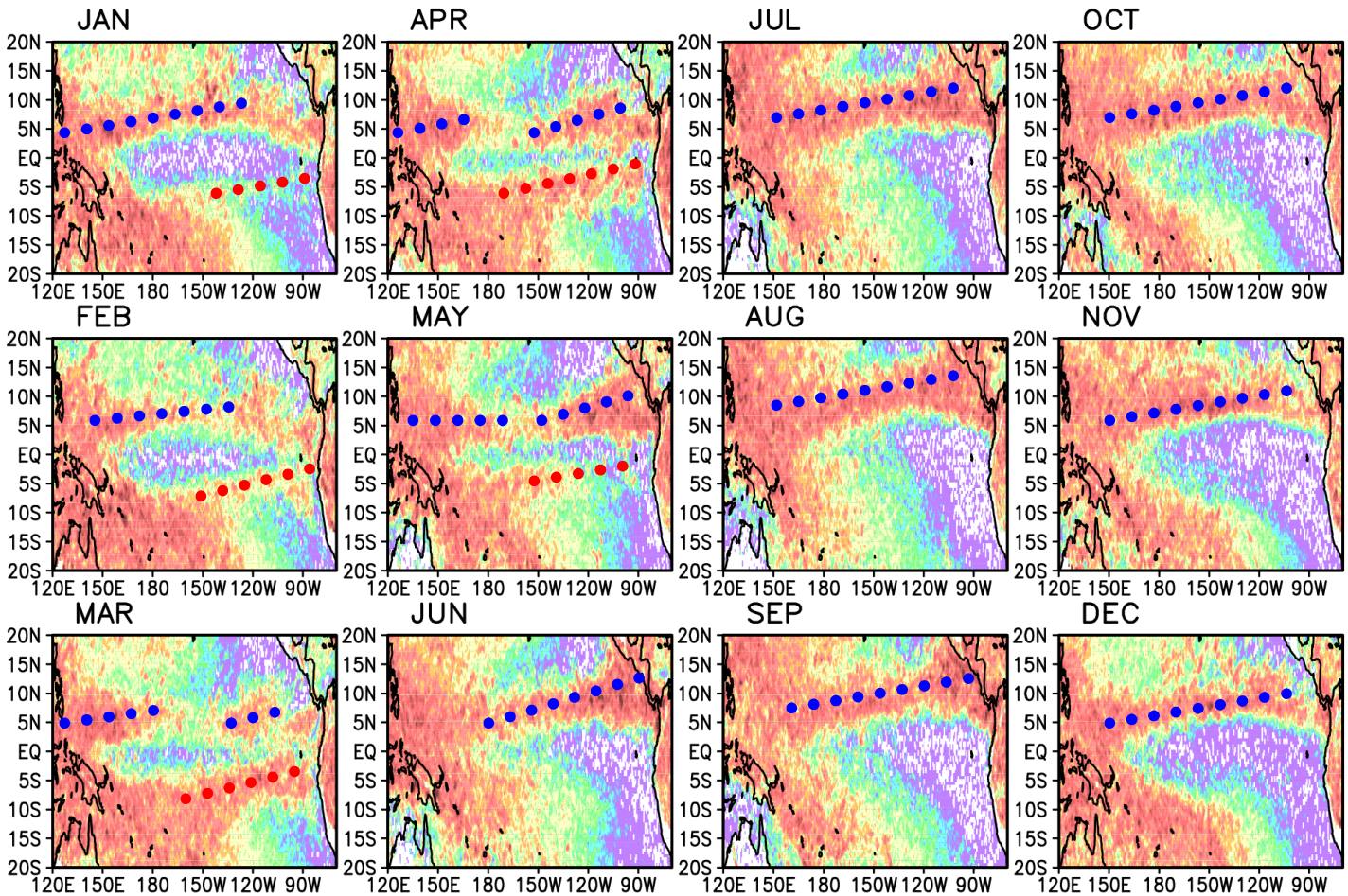
Fresh Water Flux (P-E)



Climatological Double ITCZ

TRMM PR Rain

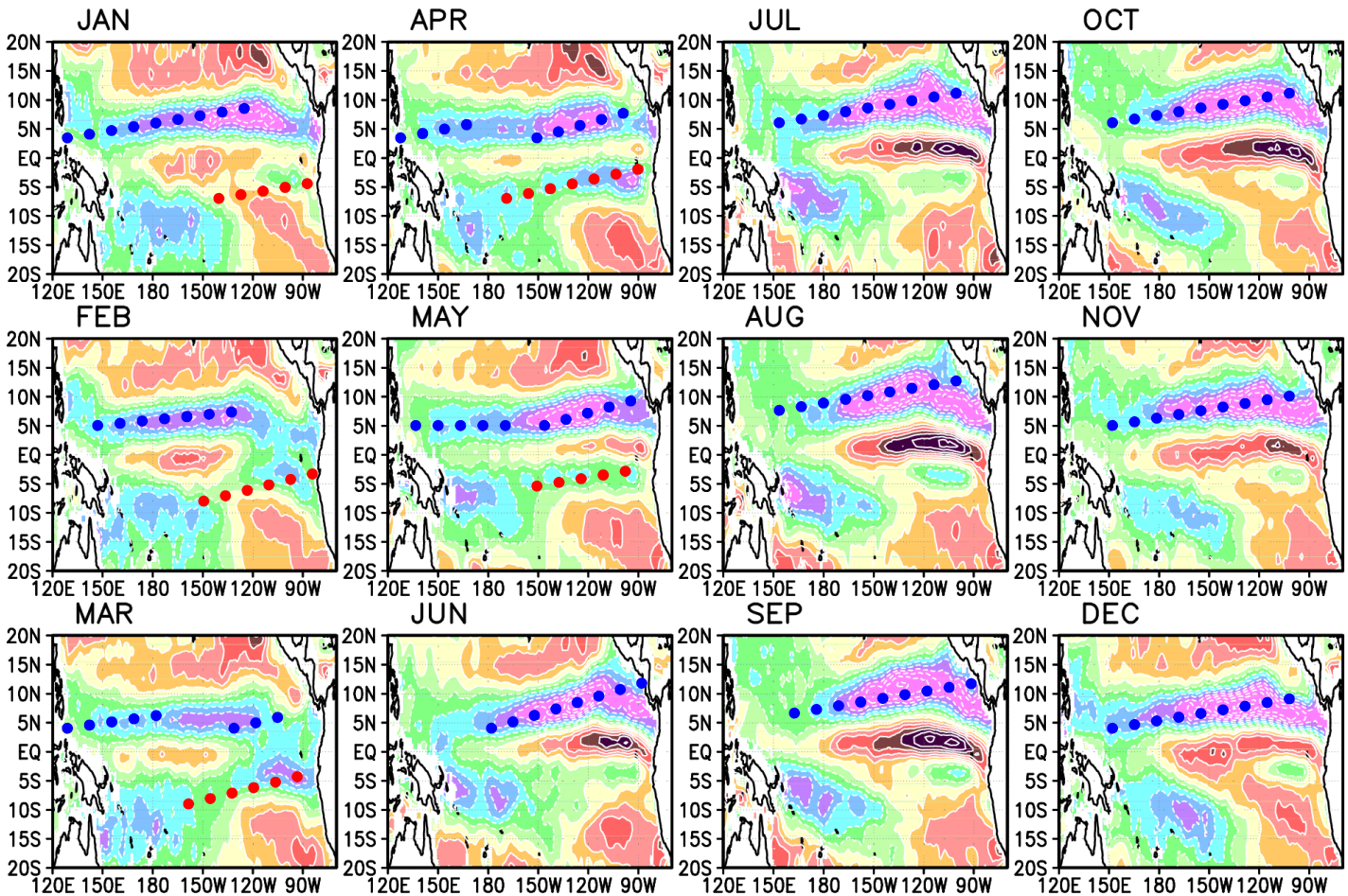
Clim 1999–2000



Nakazawa(2001)

Climatological Double ITCZ

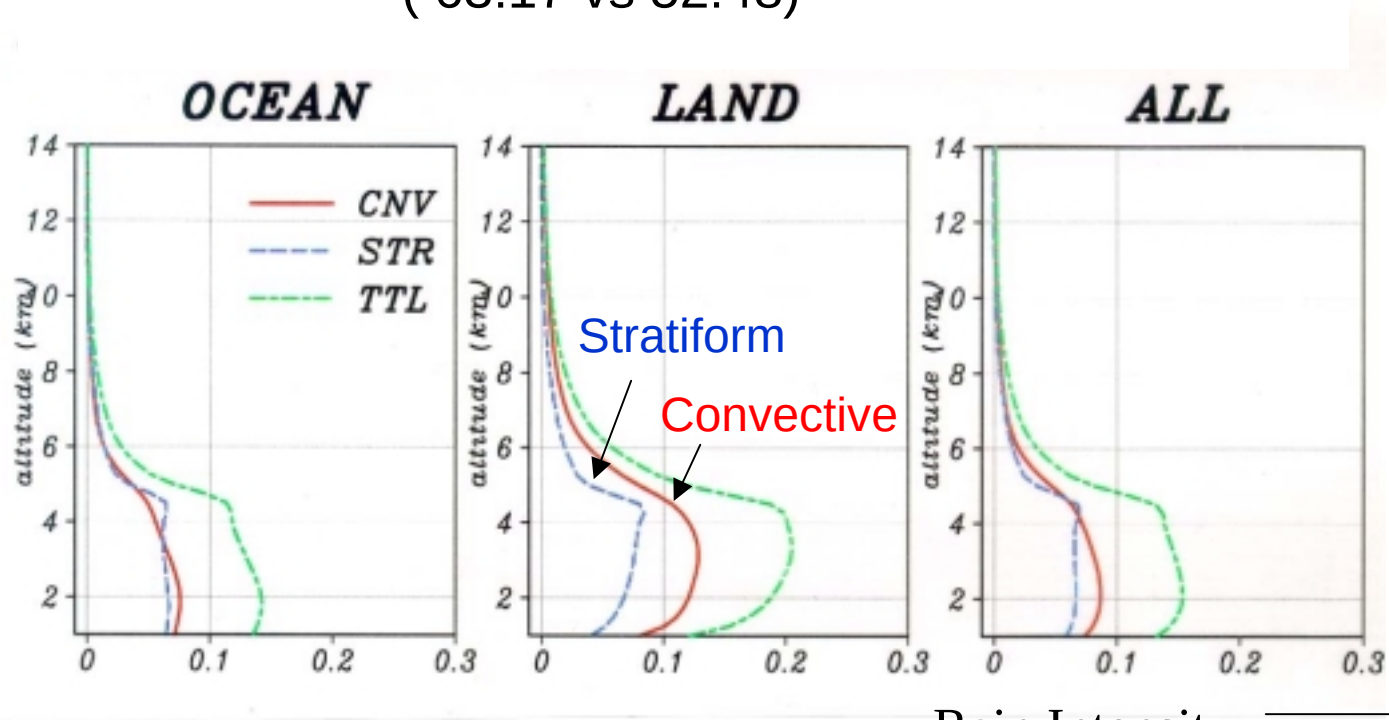
Divergence ERS-2 Clim 1991–1999



Nakazawa(2001)

Vertical Profile of Rain by TRMM/PR

- Over Land 50% Heavier Rain Intensity than over Ocean
  (0.21 mm/hr vs 0.14 mm/hr)
  More Convective Rain than over Ocean
  (63:17 vs 52:48)



Altitude (km)

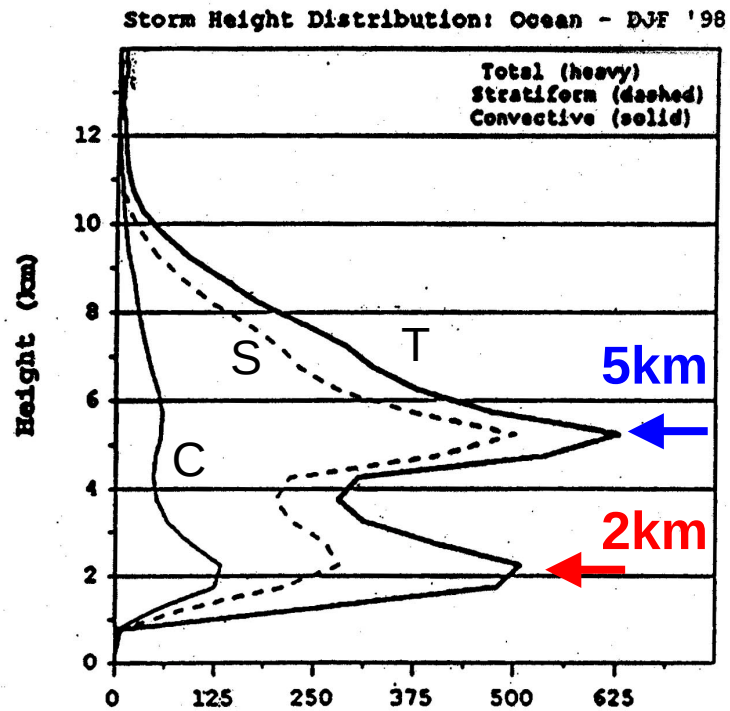
Rain Intensity (mm/hr)

Takayabu(2000)

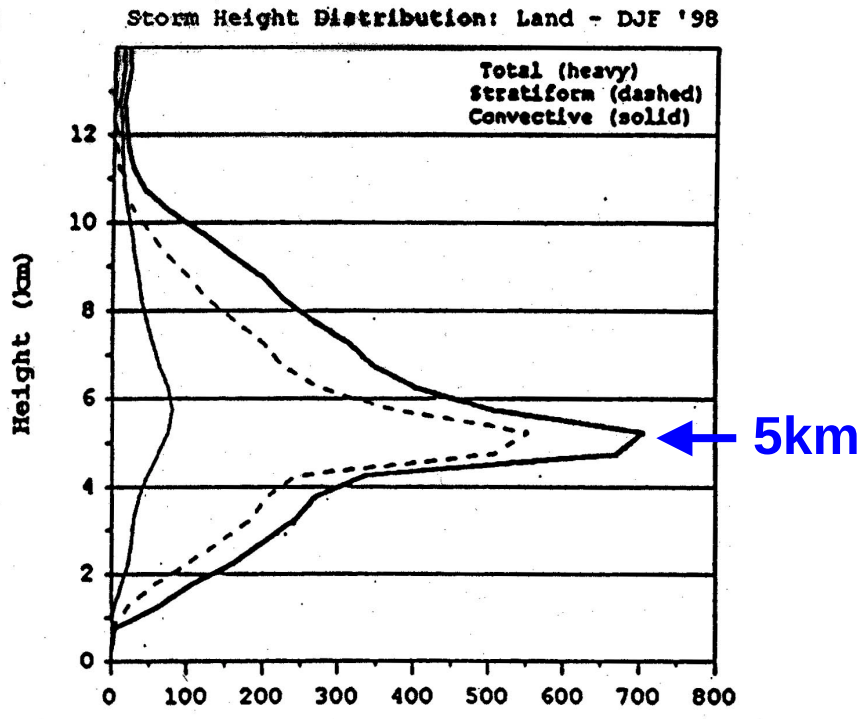
Shallow Rain over Ocean

Storm Height Distribution from TRMM/PR

Ocean

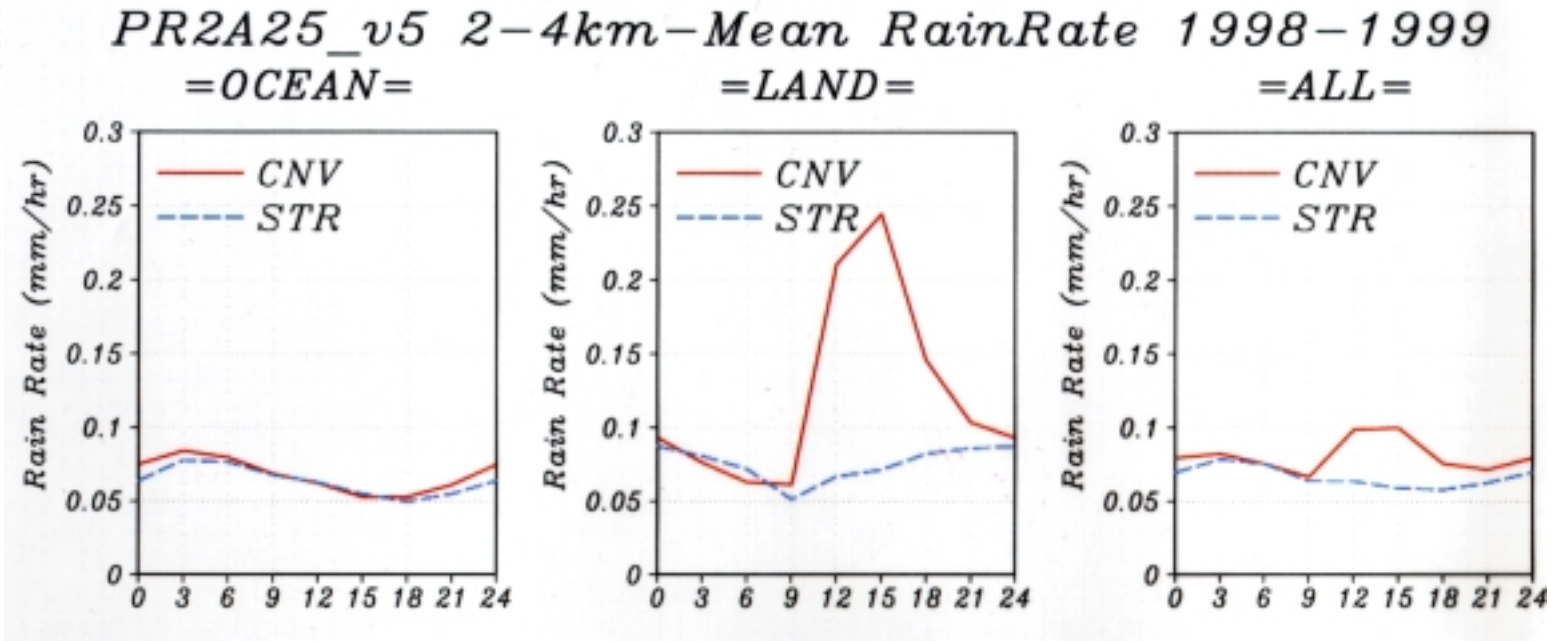


Land



Short and Nakamura(2000)

Diurnal Cycle from TRMM

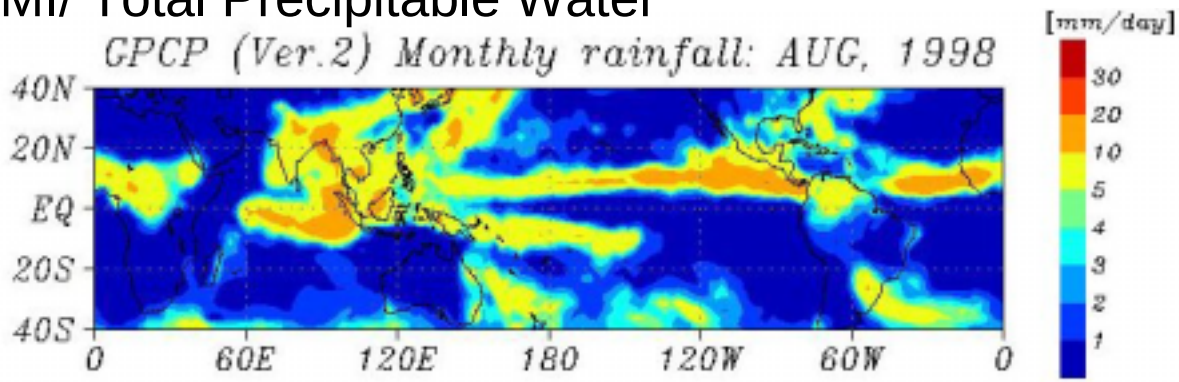


- Strong Diurnal Cycle of Convective Rain over Land
  - Rainfall Peak : between 12 - 15 LST
- Over Ocean
  - Weak Diurnal Cycle with a peak at Early Morning (3 - 6 LST)

Takayabu(2000)

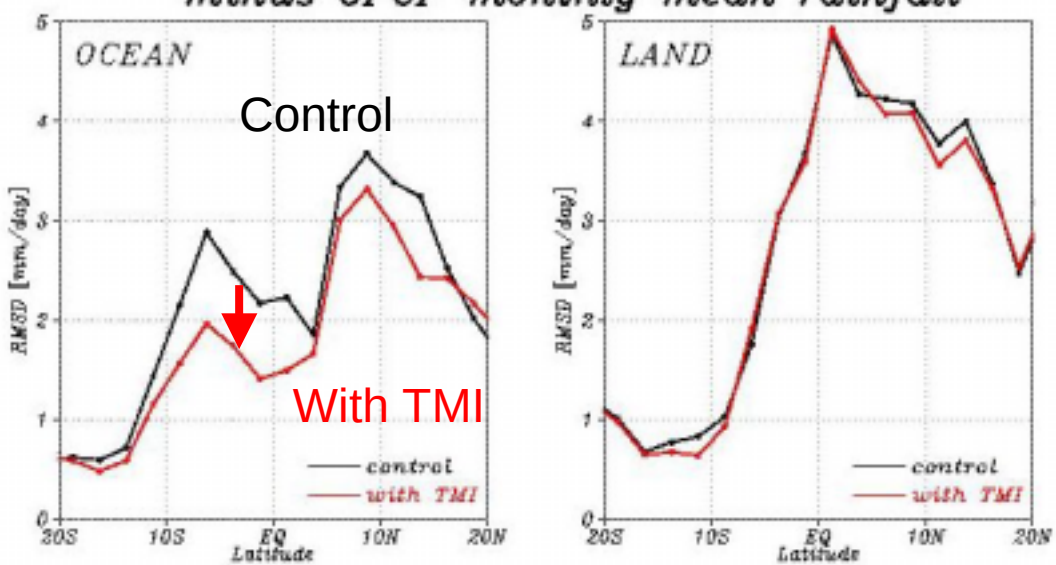
Data Assimilation Study

- JMA-NASDA Cooperative Research
- TMI/ Total Precipitable Water



Monthly mean rainfall of NWP 1-day forecast minus GPCP monthly mean rainfall

RMSE



Kachi et al.(2000)

Near Real Time Data Distribution

http://www.eorc.nasda.go.jp/TRMM/

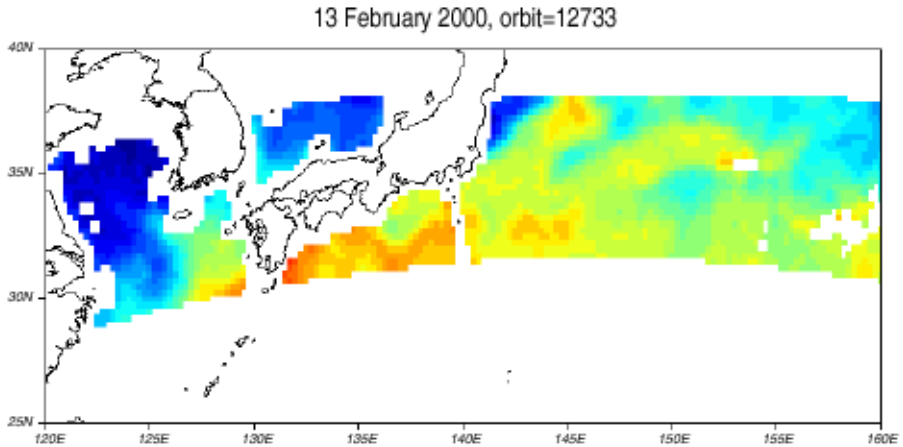
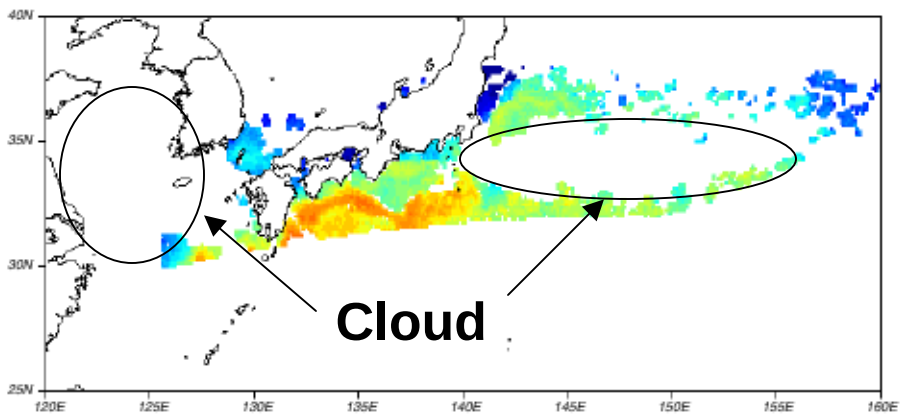


Fig.1 TMI Sea Surface Temperature



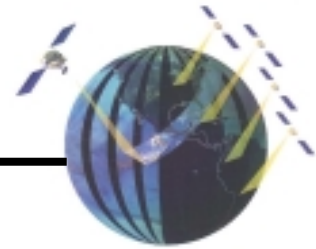
TMI

SST under Clouds

VIRS

SST Missing under Clouds

TRMM to GPM Era



- TRMM has provided numerous scientific results
  - El Ni o
  - Tropical / Monsoon Variability
  - Large-scale Dynamics vs Cloud Dynamics
  - Diurnal Cycle
  - Water Cycle in the Tropics
- GPM may provide
  - Precise Global Rainfall Estimation
  - Global Water Cycle
  - Forecast Improvement through Data Assimilation