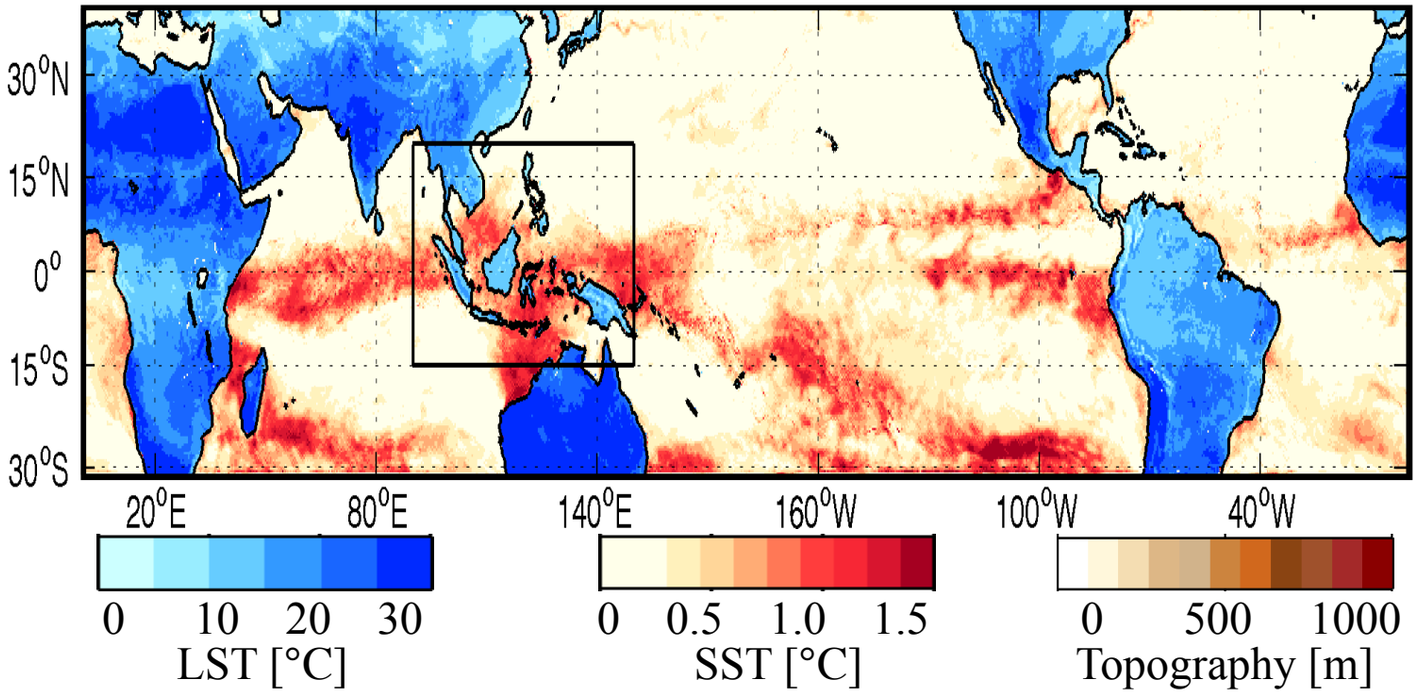
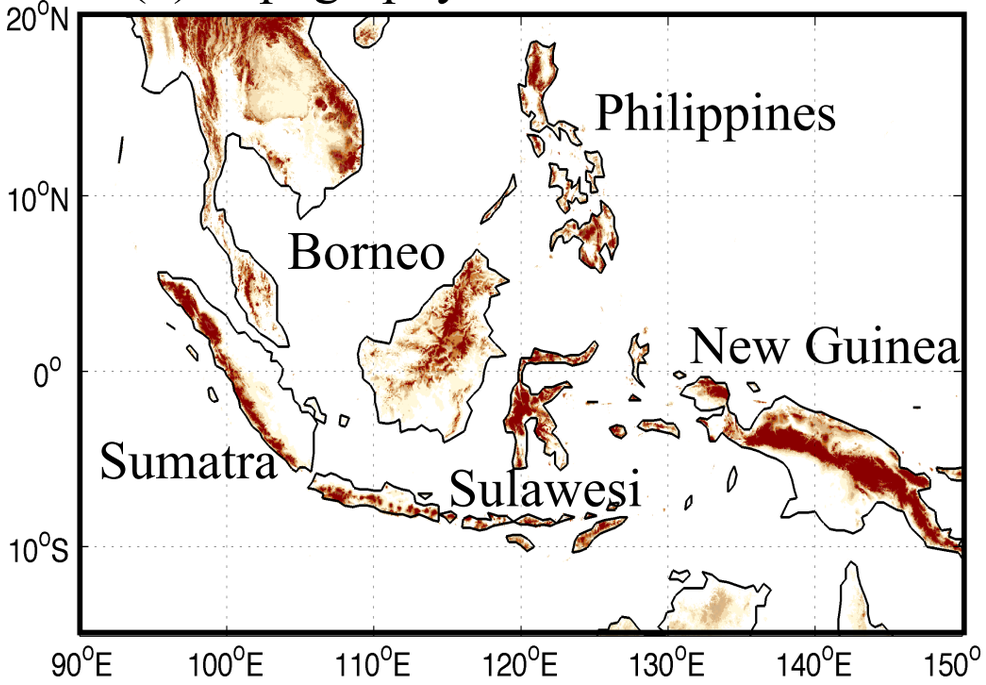
# Diurnal SST and diurnal rainfall in the Maritime Continent

## from a 40 km regional coupled model during Nov14-Dec13, 2011

(a) Diurnal amplitude of land and sea surface temperatures




(b) Topography in the MC domain

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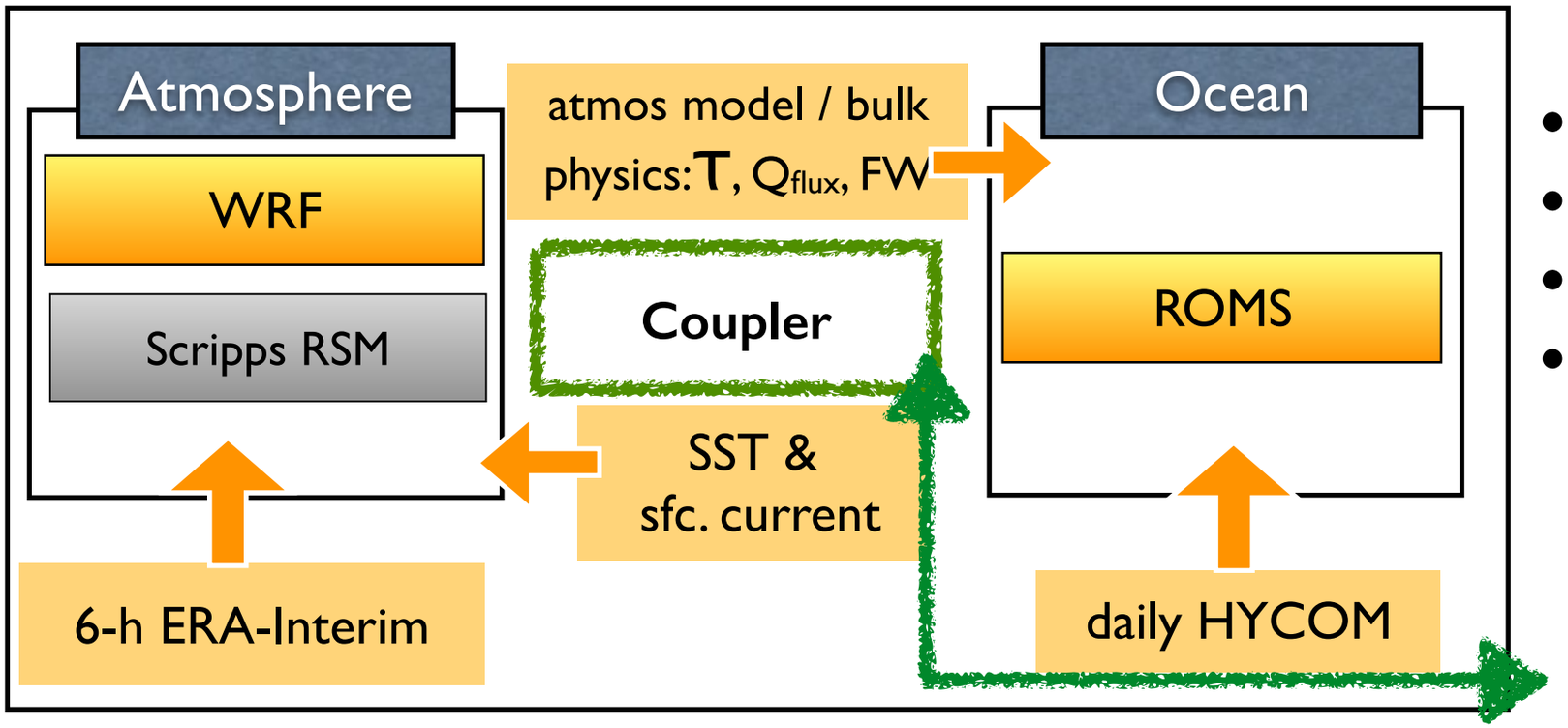
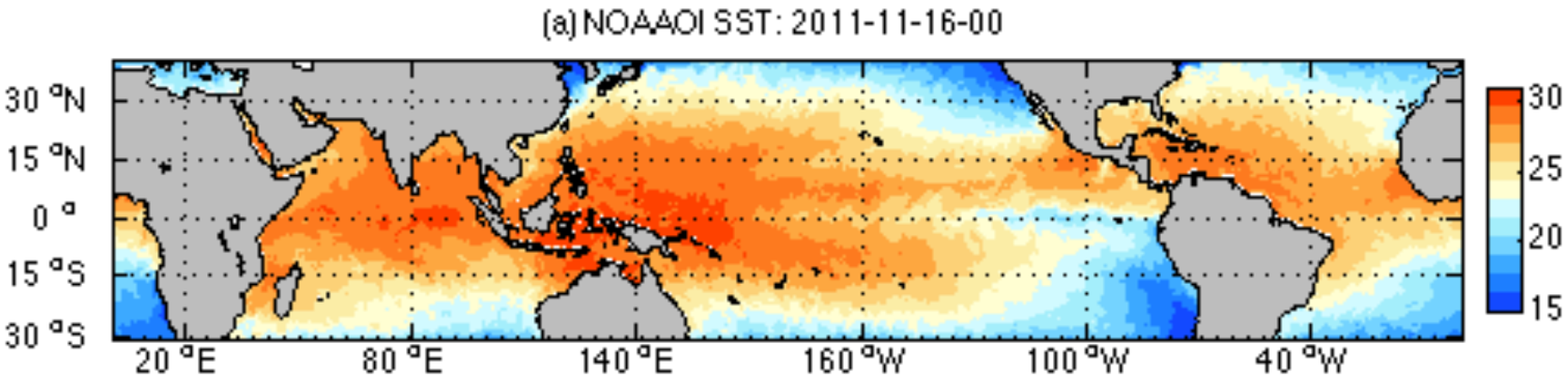
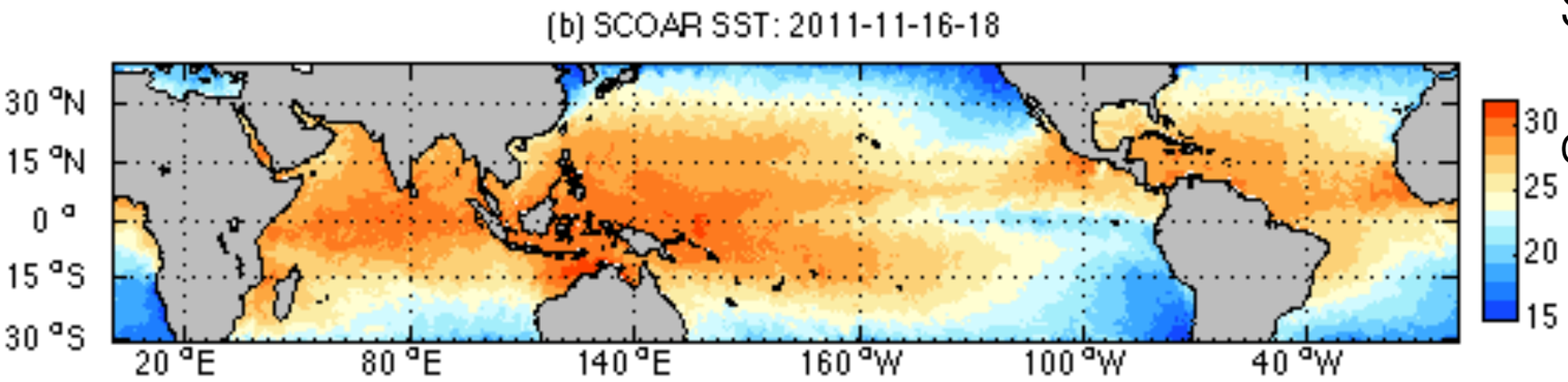
# SCOAR regional coupled model




- 40 km O-A resolutions
- Tropical channel
- 5 ensemble members
- Nov 14-Dec 13, 2011

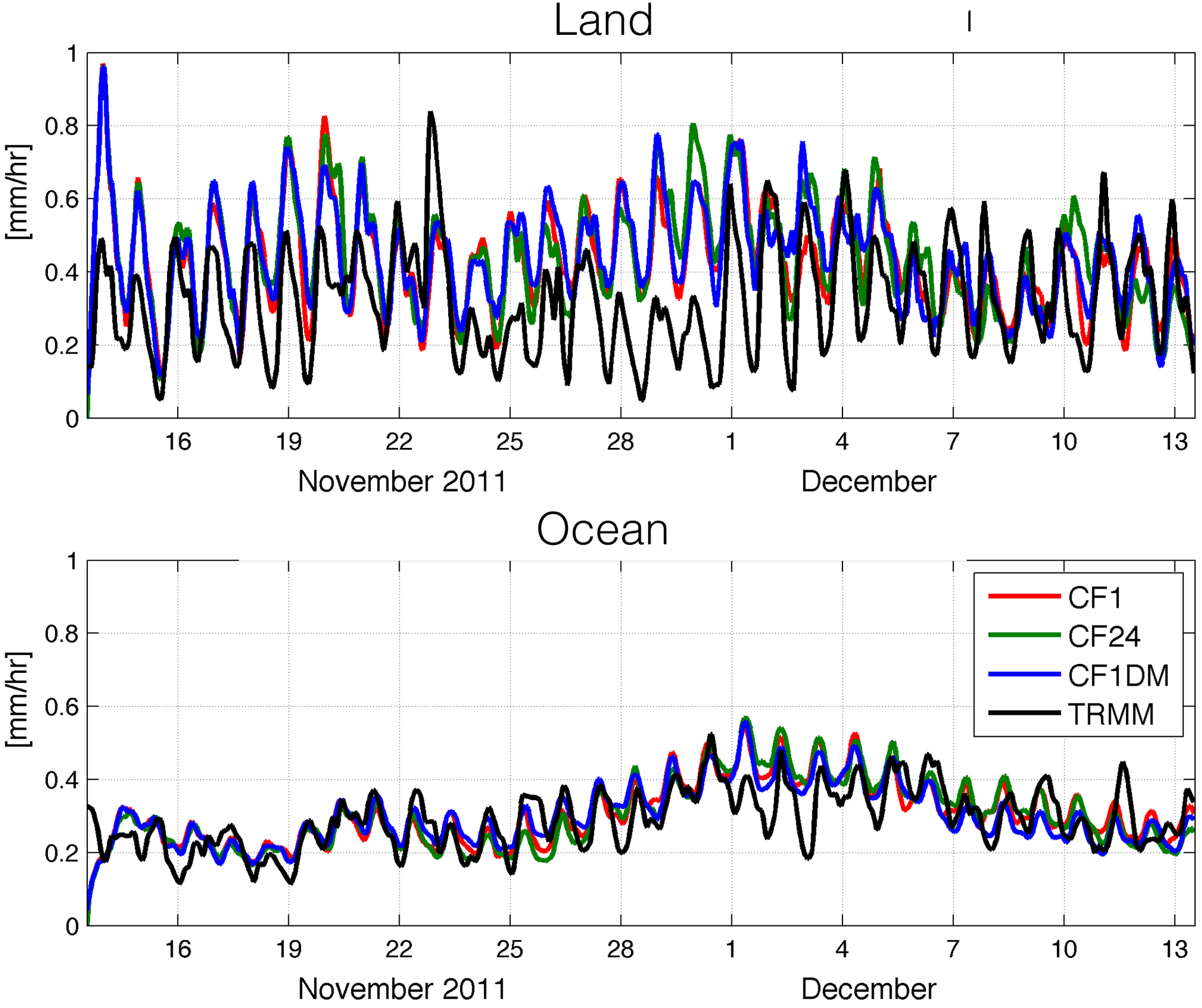
**CF1**: 1-hr coupling
**CF1DM**:WRF forced with Daily-Mean CF1 SST
**CF24**: 24-hr coupling



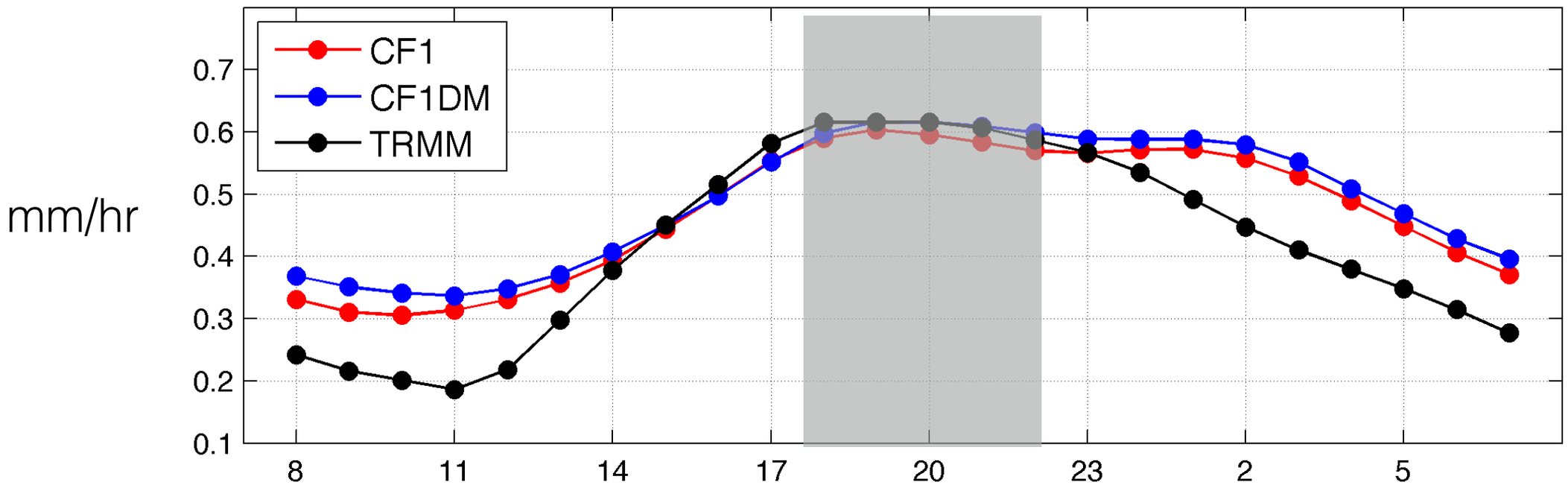

Seo et al. (2014): J. Climate Coupled impacts of the diurnal cycle of sea surface temperature on the Madden-Julian Oscillation.

# Rainfall time-series over land and ocean

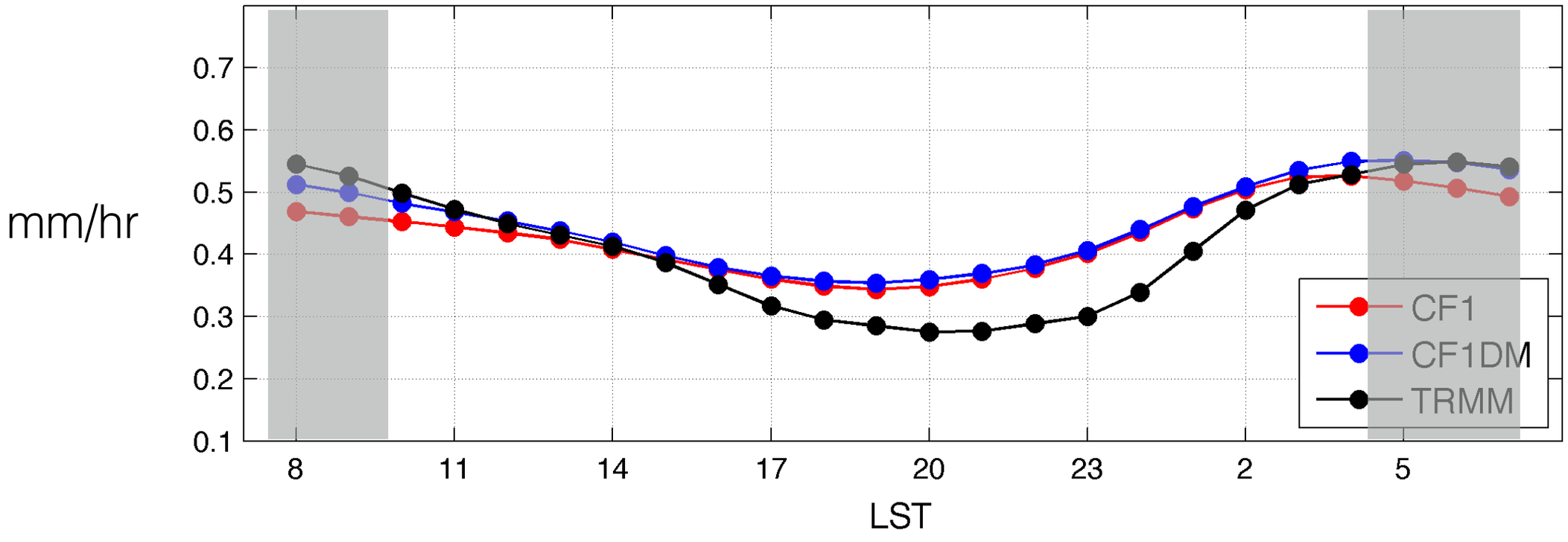


# Hourly rainfall composites

## Rainfall over land

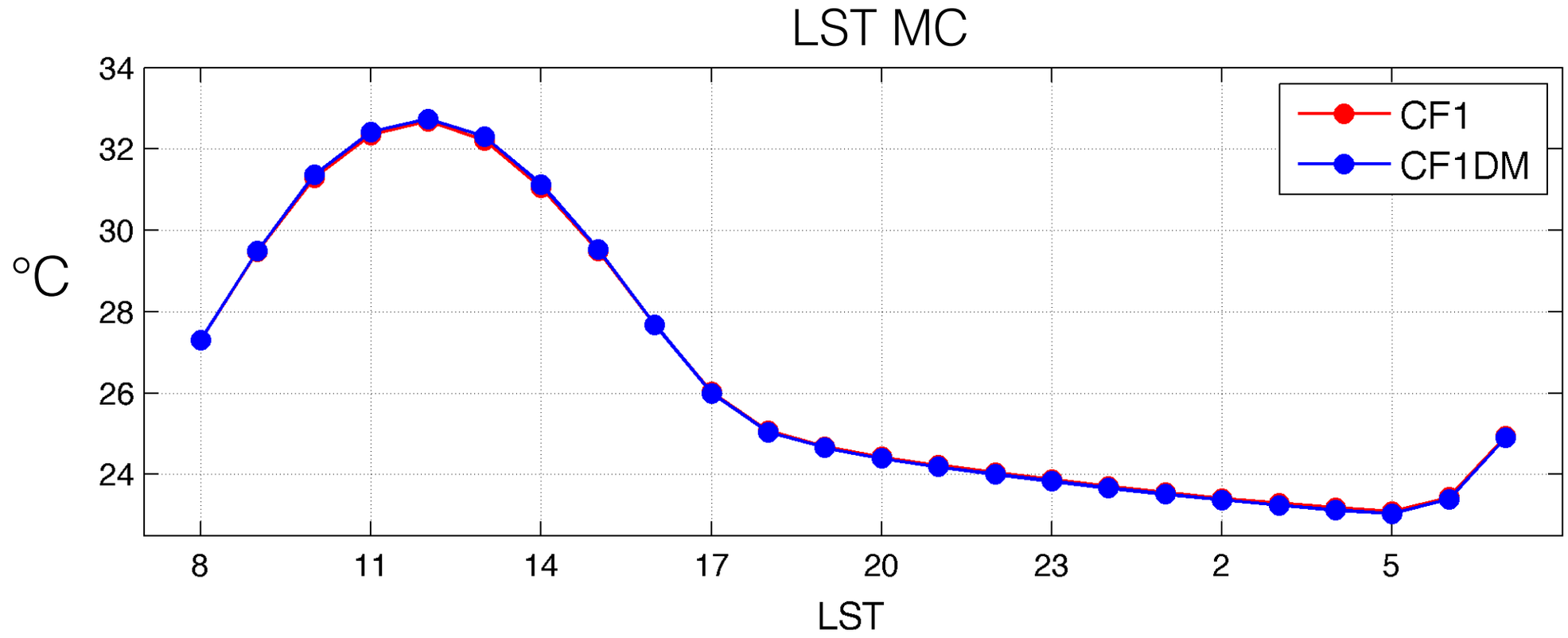


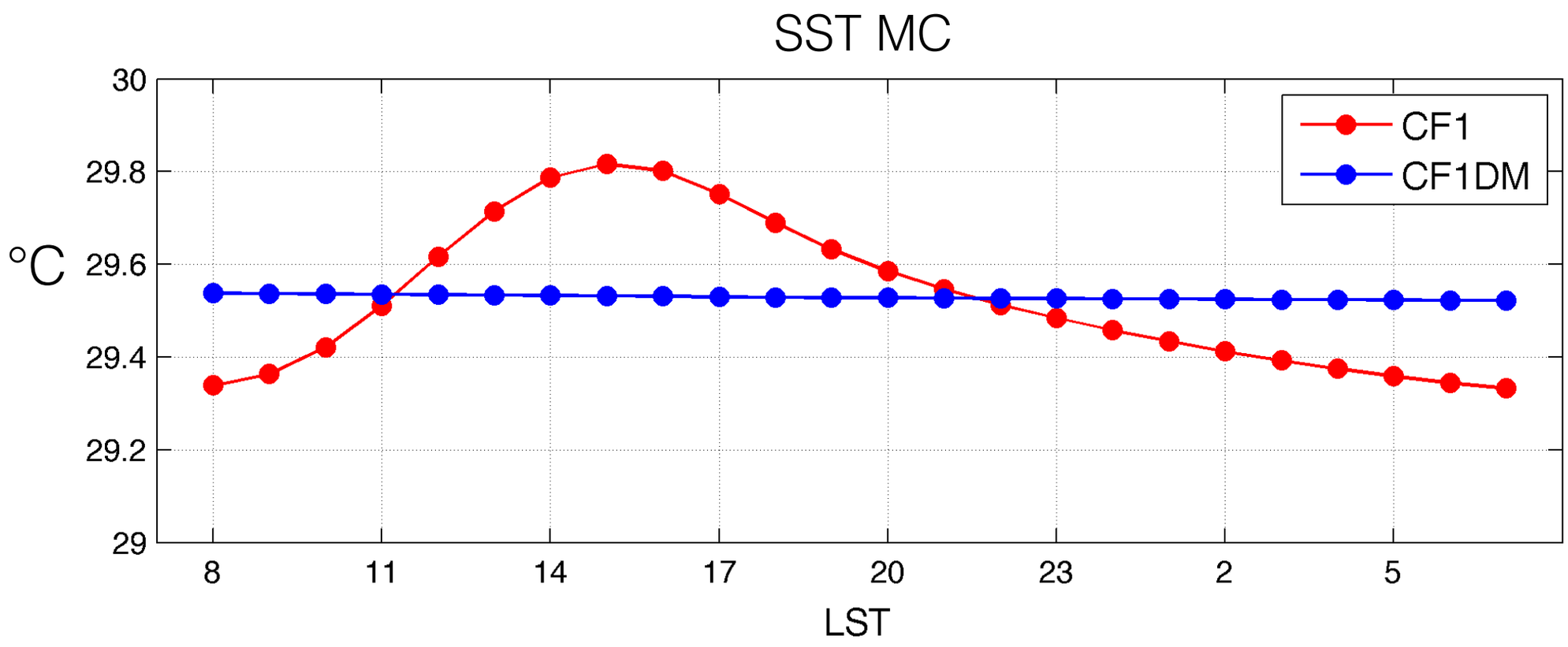

## Rainfall over the ocean




Reduced early morning rainfall in both land and ocean

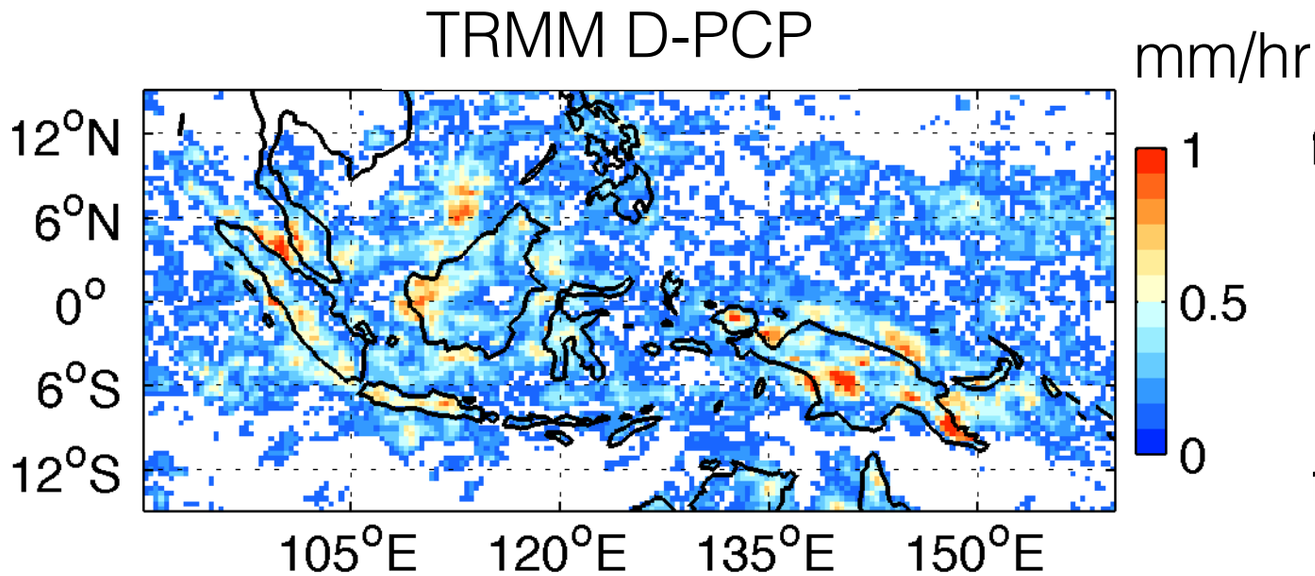
# Hourly surface temperature composites

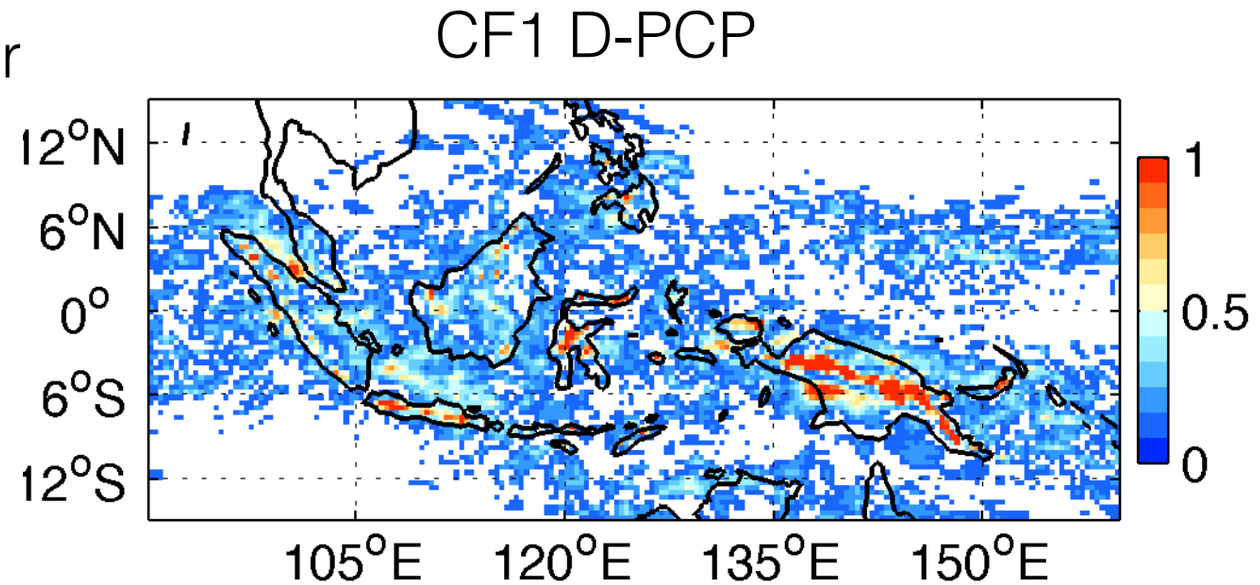


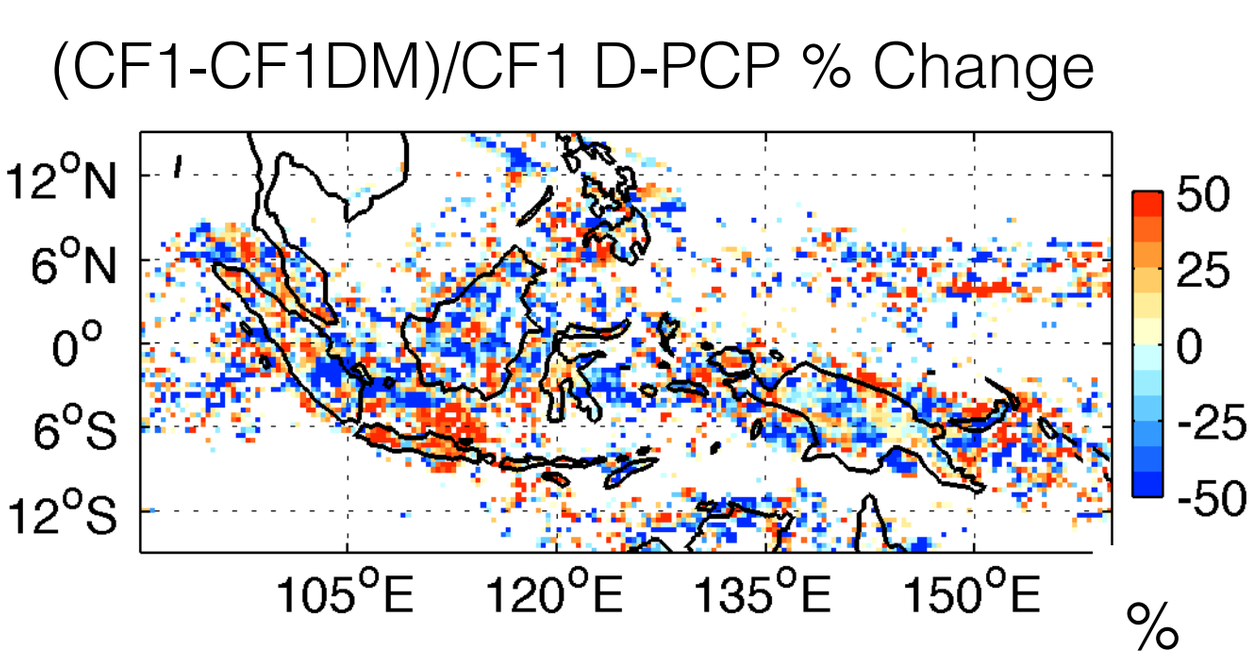



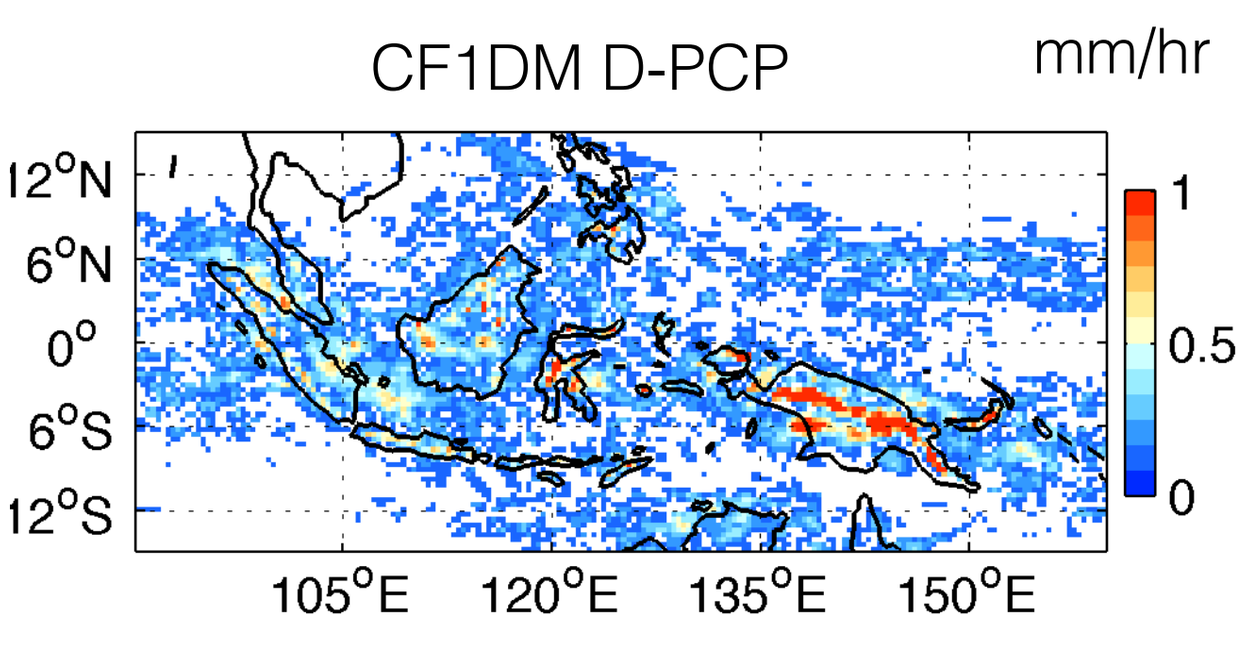

Reduced land-sea thermal contrast during the morning and night hours

# Diurnal amplitude of rainfall



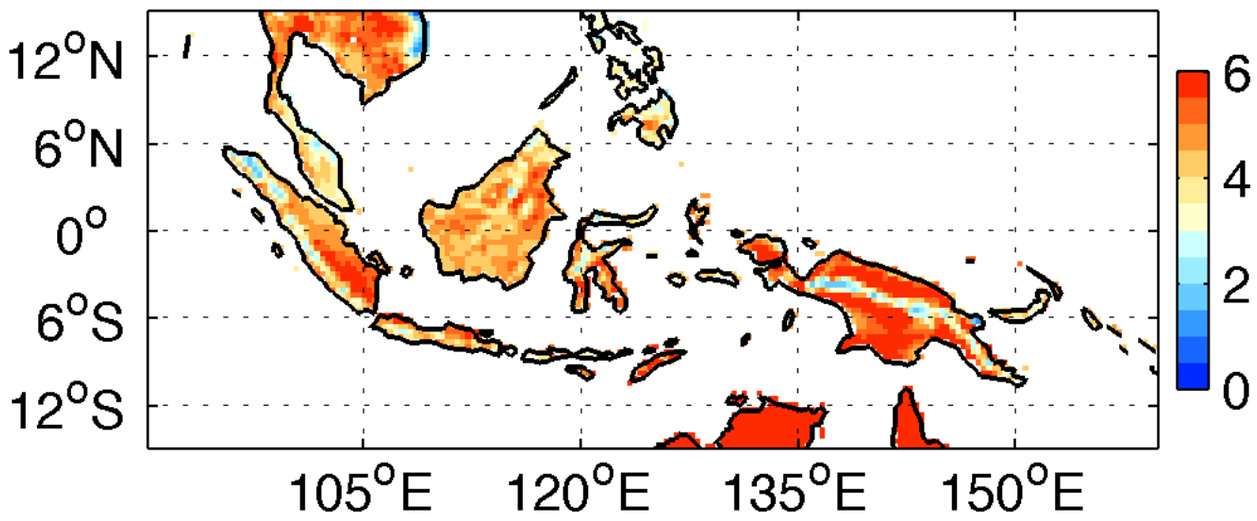



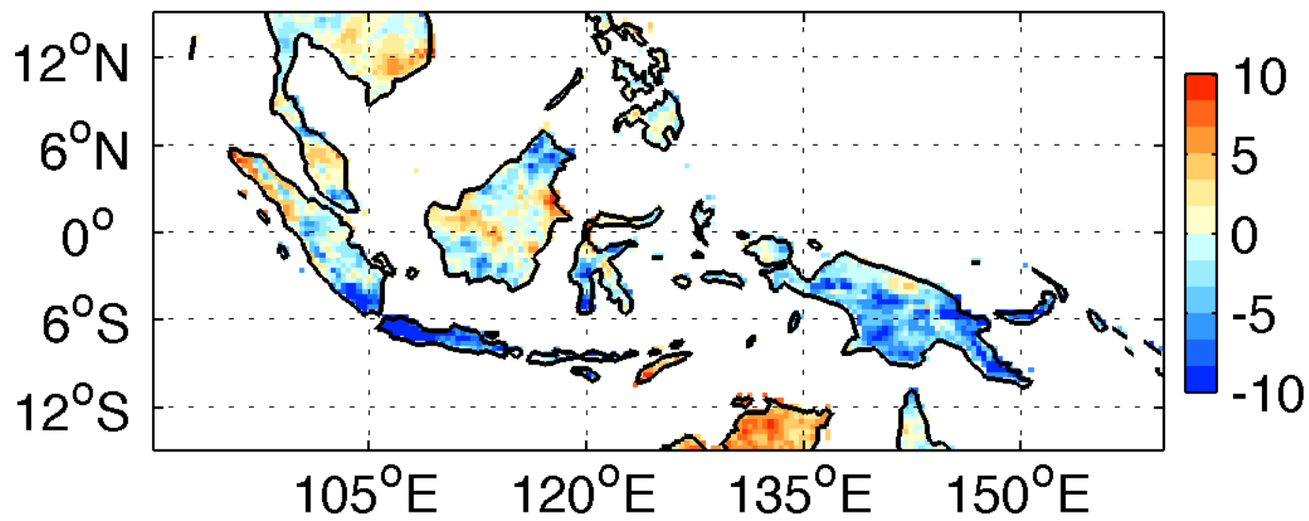



# Diurnal amplitude of land surface temperatures

CF1 D-LST Land ONLY

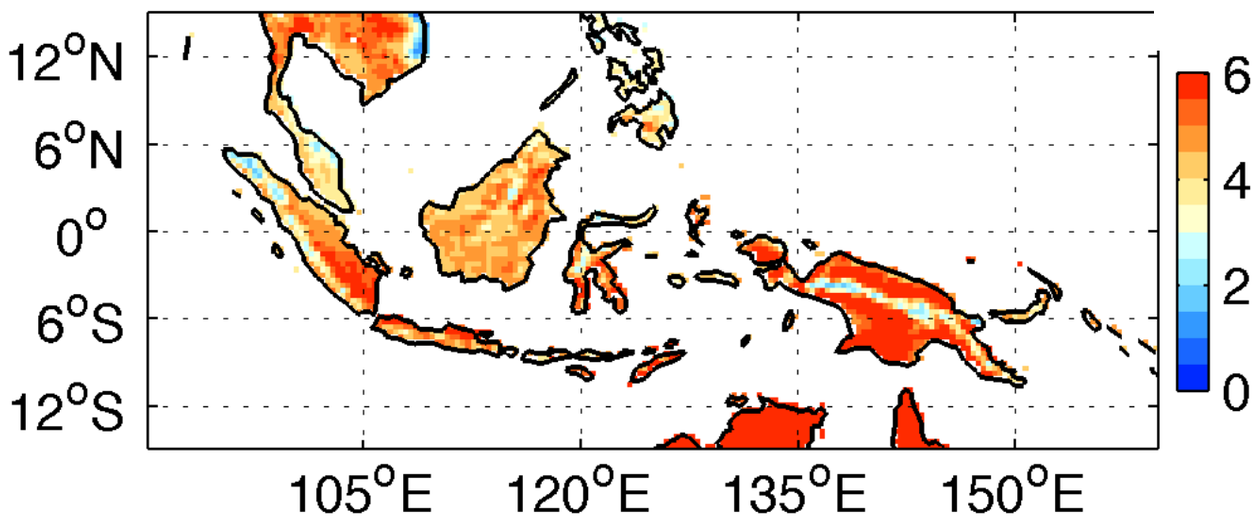



(CF1-CF1DM)/CF1 D-LST % Change %

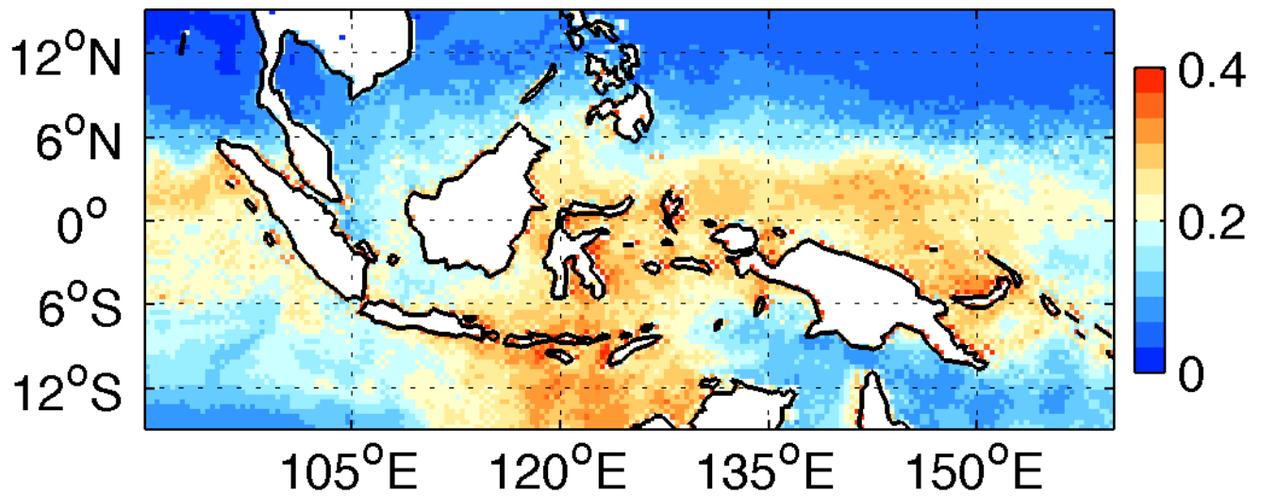



°C

CF1DM D-LST Land ONLY



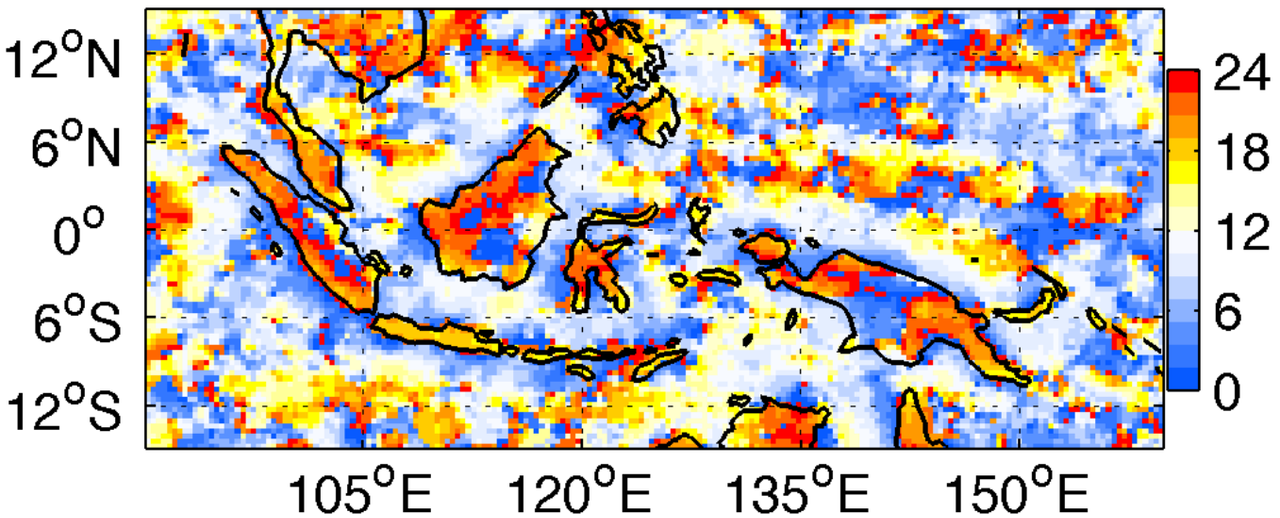

D-SST in CF1



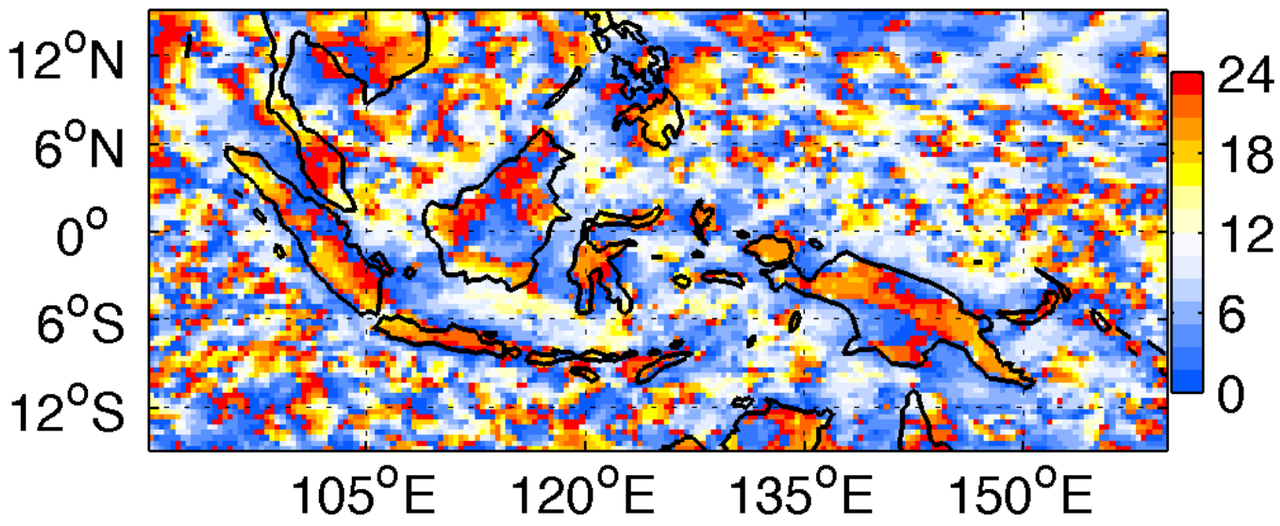
# Peak rainfall hours

TRMM Diurnal peak hour

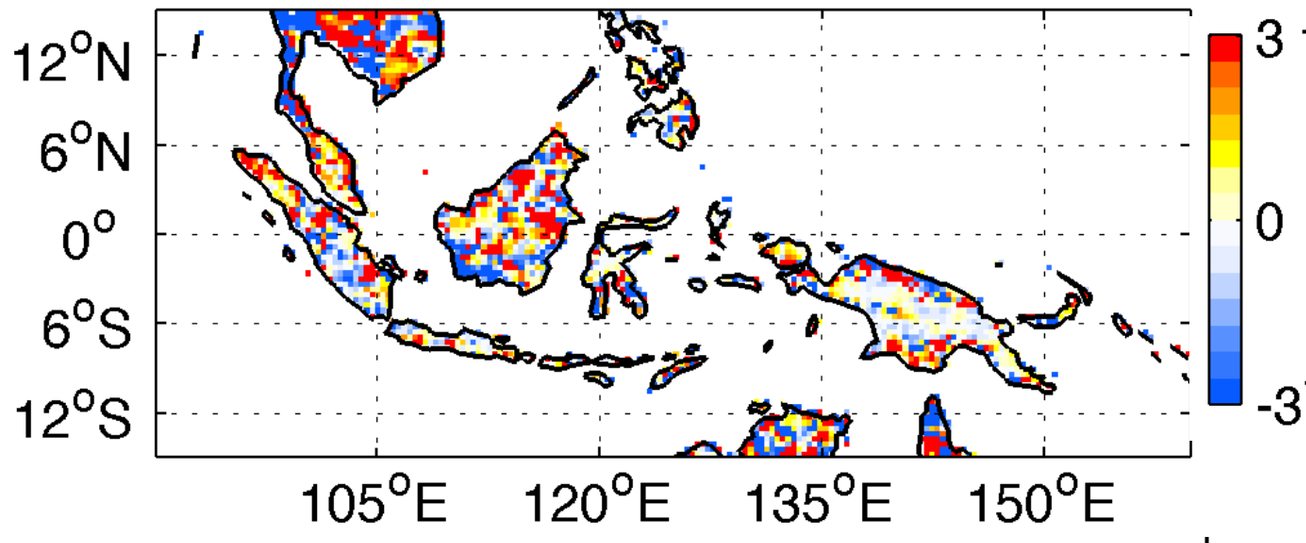
LST




CF1 Diurnal peak hours



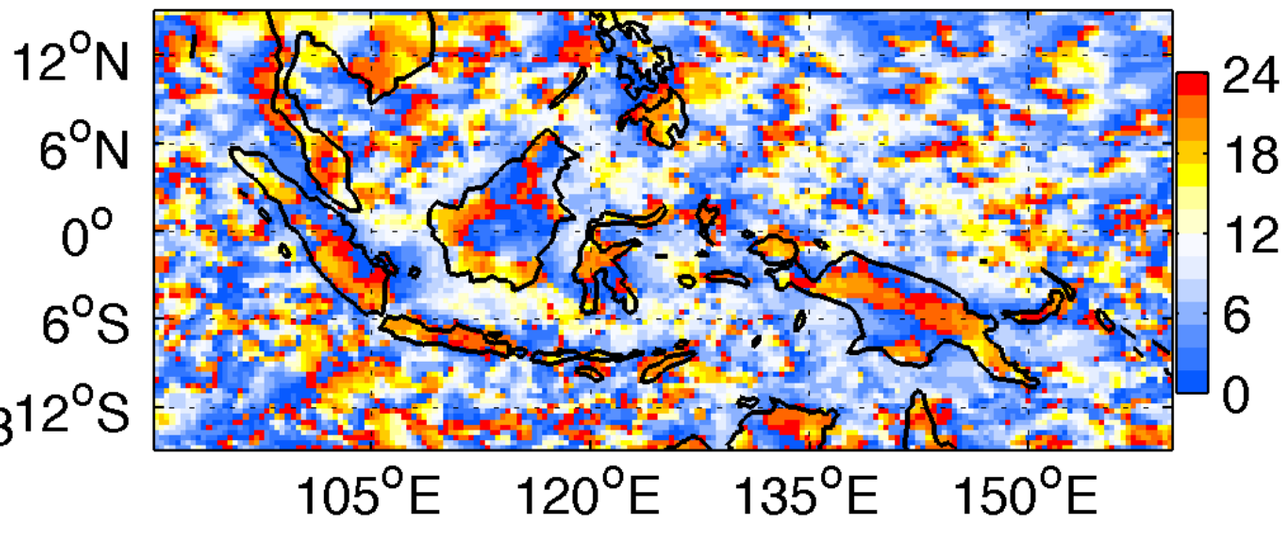

CF1-CF1DM; difference in peak hours



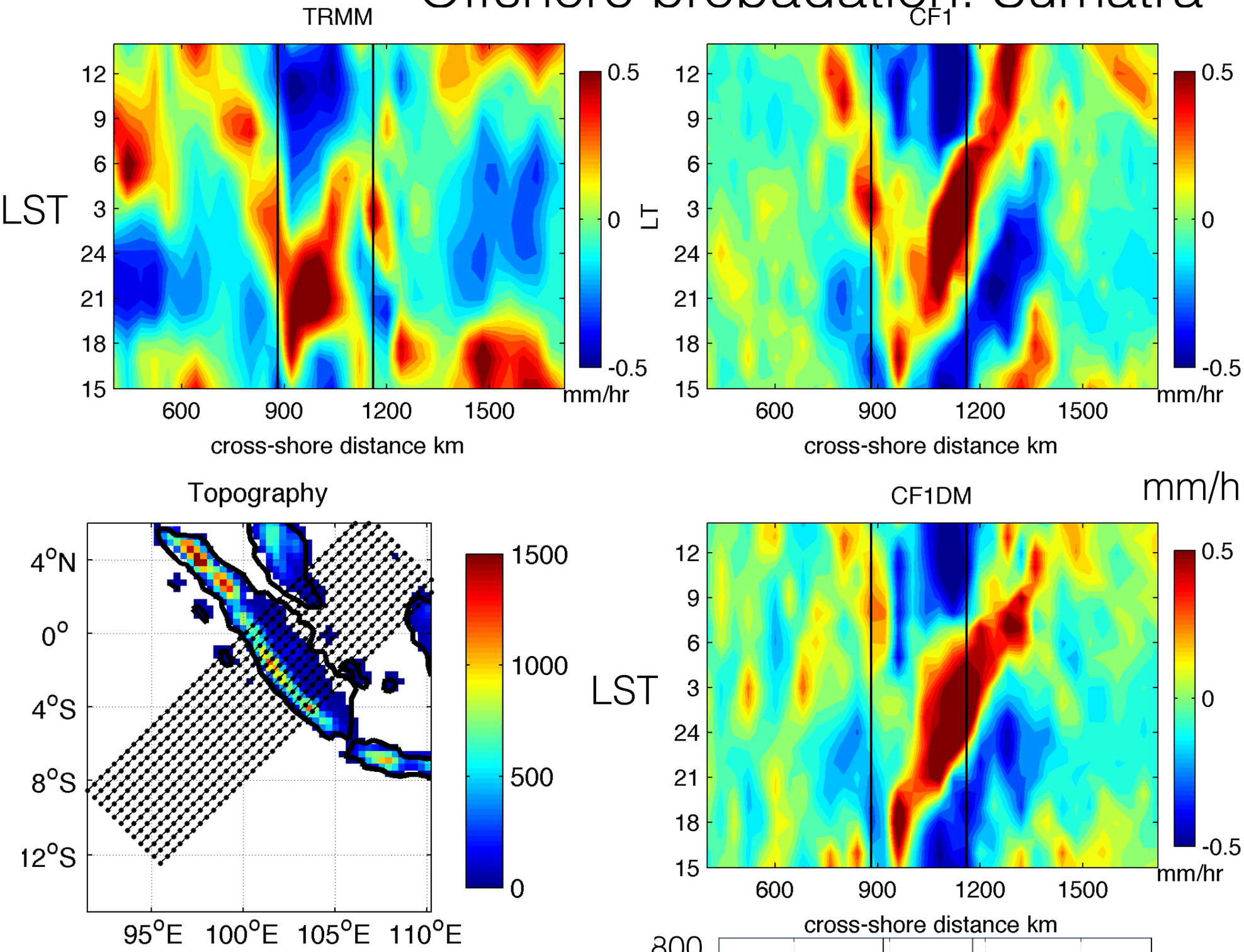

hrs

CF1DM Diurnal peak hours

LST



# Offshore propagation: Sumatra




Similar to Mori et al. 2004

# Summary

- Preliminary, 1-month integration, coarse h/v resolutions

- Diurnal fluctuation in SST (with the identical time-mean)
  - enhances the diurnal amplitude of rainfall
  - modulates the diurnal amplitude of LST as much as 10%
  - shifts the rainfall peak by up to ±3 hrs throughout the MC islands
  - offshore march of the diurnal rainfall stronger and more coherent

- Plan to use an explicit convection regional coupled model with one-way and two-way nesting
  - To represent the land-diurnal convection, gravity wave response to convective heating, and land-sea breezes.
  - To examine the resulting air-sea interaction and the influence on the MCS formation, the MC-wide rainfall, and the MJO propagation.