



RGMA Project: “Representation of the interactions between the MJO and the Maritime Continent in the Regionally-refined SCREAM”

A critical role of the land-atmosphere interaction for the MJO damping effect over the Maritime Continent

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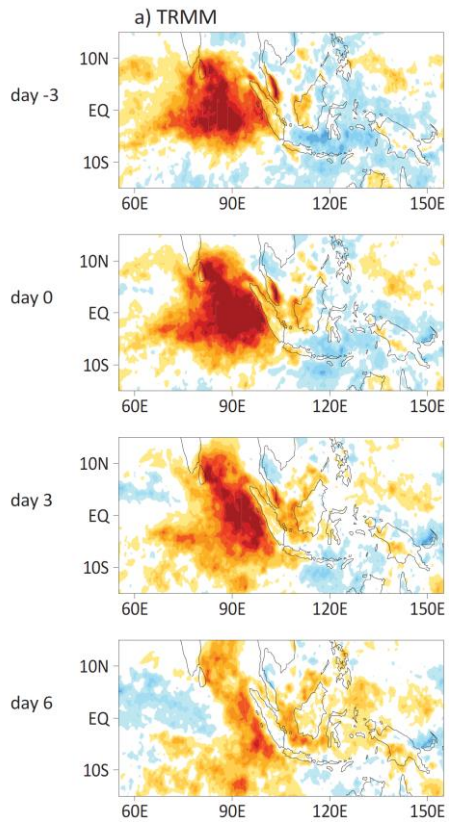
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2024 EESM PI Meeting, August 6-9 2024, Maryland



The Regional & Global Model Analysis (RGMA) Program / U.S. Department of Energy

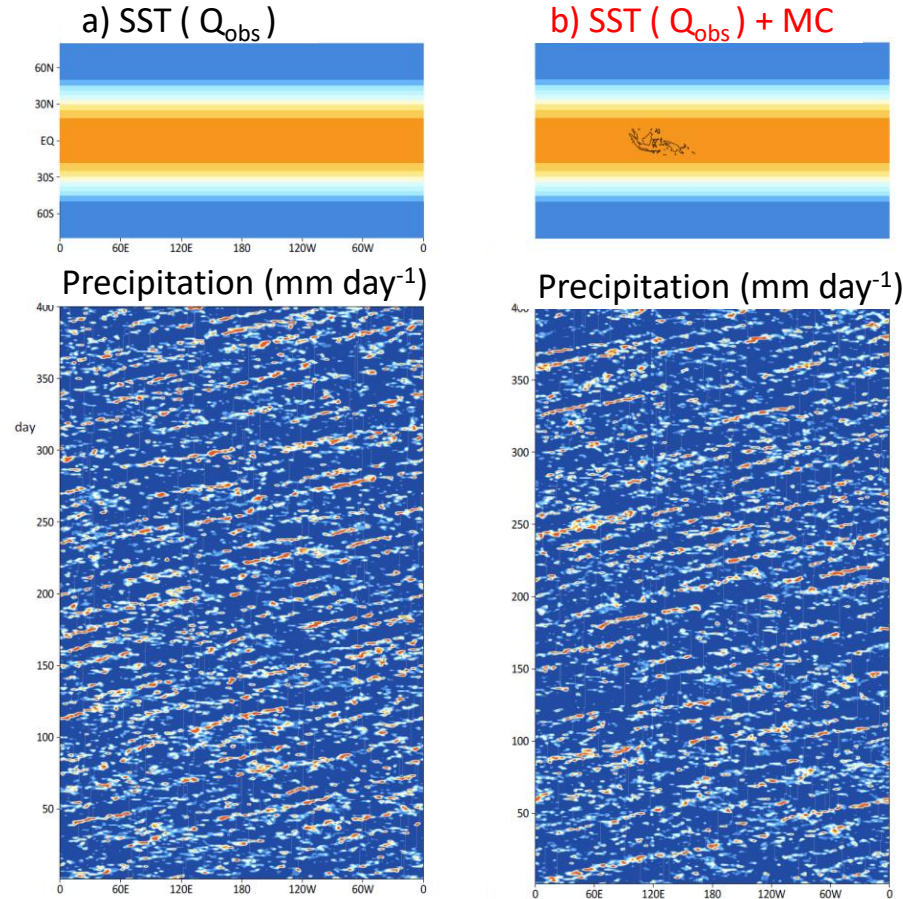
The MC Barrier Effect on MJO propagation



Jiang et al. (2019)

- Poor understanding of the underlying physics
- “MC MJO prediction barrier”

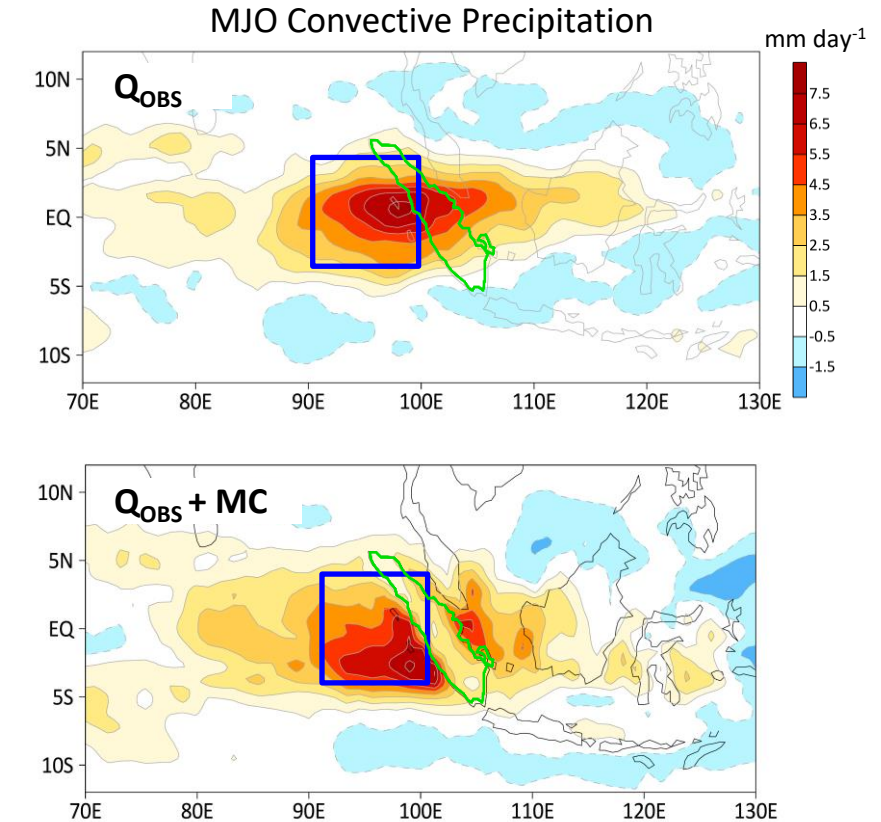
Idealized aqua-planet AGCM simulations



Jiang et al. (2020)

- ECHAM4.6 AGCM (T106 \sim 1 deg)
- Forced by idealized SST pattern (Q_{OBS})
- Perpetual March runs
- Realistic MC islands (land-sea, topography, & vegetation, and land-atmosphere coupling)

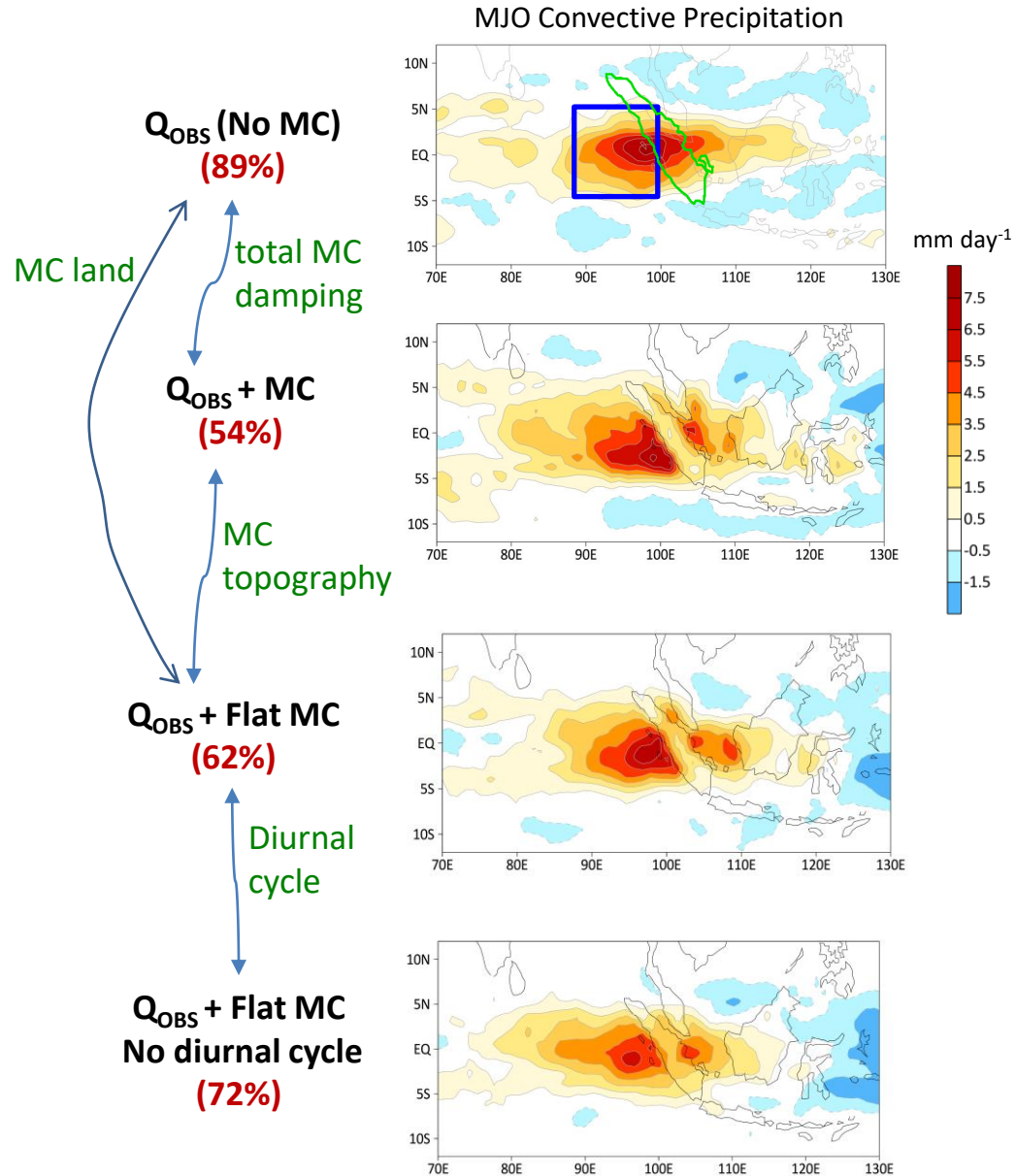
Simulated MC damping effect on the MJO



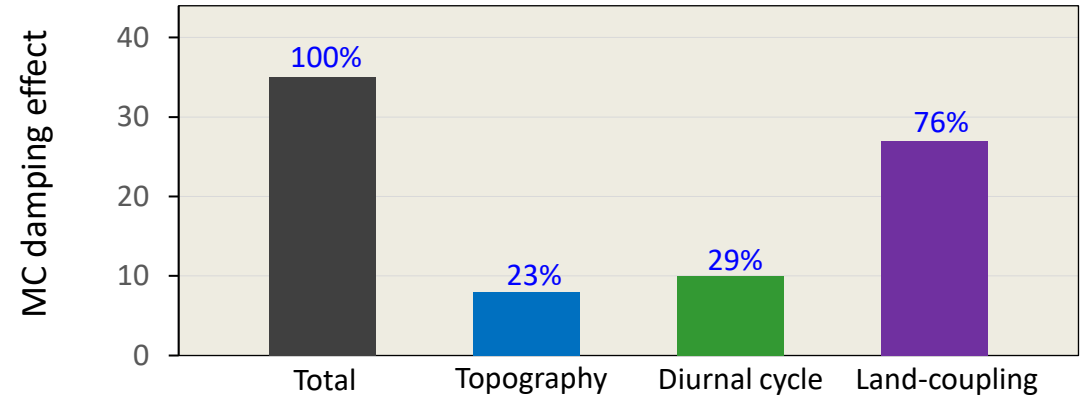
$$Q_{OBS} : \frac{3.71}{4.23} \sim 89\% \quad Q_{OBS} + MC : \frac{2.15}{4.87} \sim 54\%$$

➔ Total MC damping effect:
89% - 54% = 35%

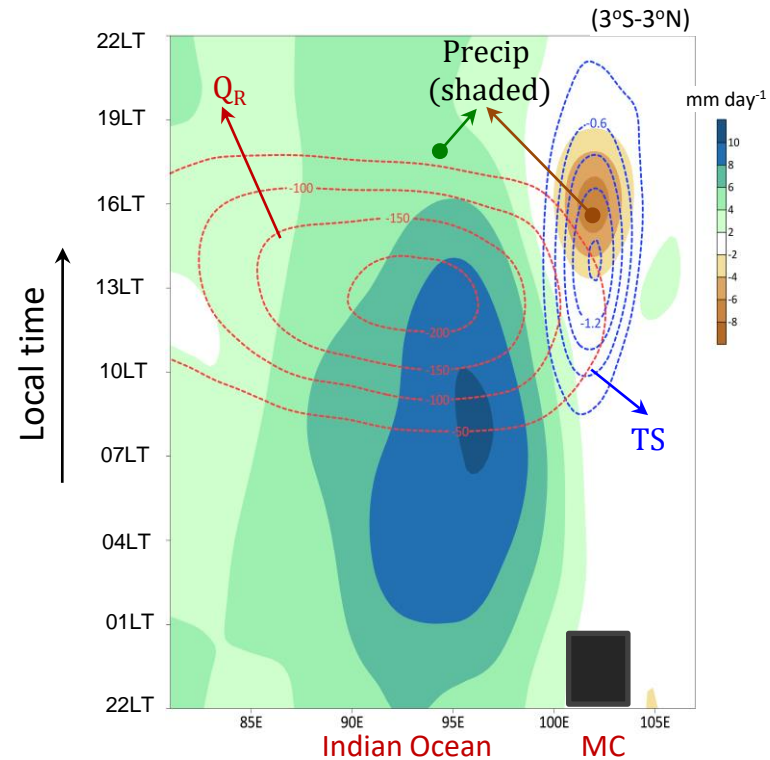
Experiments to understand the MJO damping effect over the MC



Relative roles for the MC damping effect



- Land-atmosphere interaction plays a crucial role for MJO damping over MC.

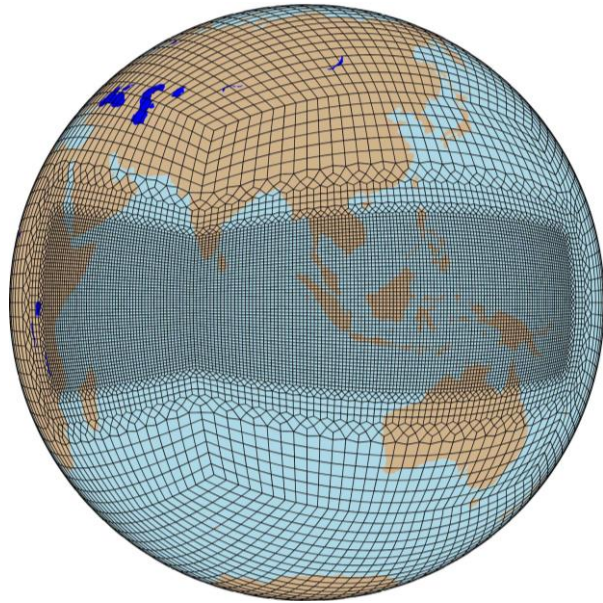


A critical role of shortwave Q_R - surface T - convection feedback in generating the MC damping effect for the MJO, which is optimized by the diurnal cycle.

Jiang et al. (2024)

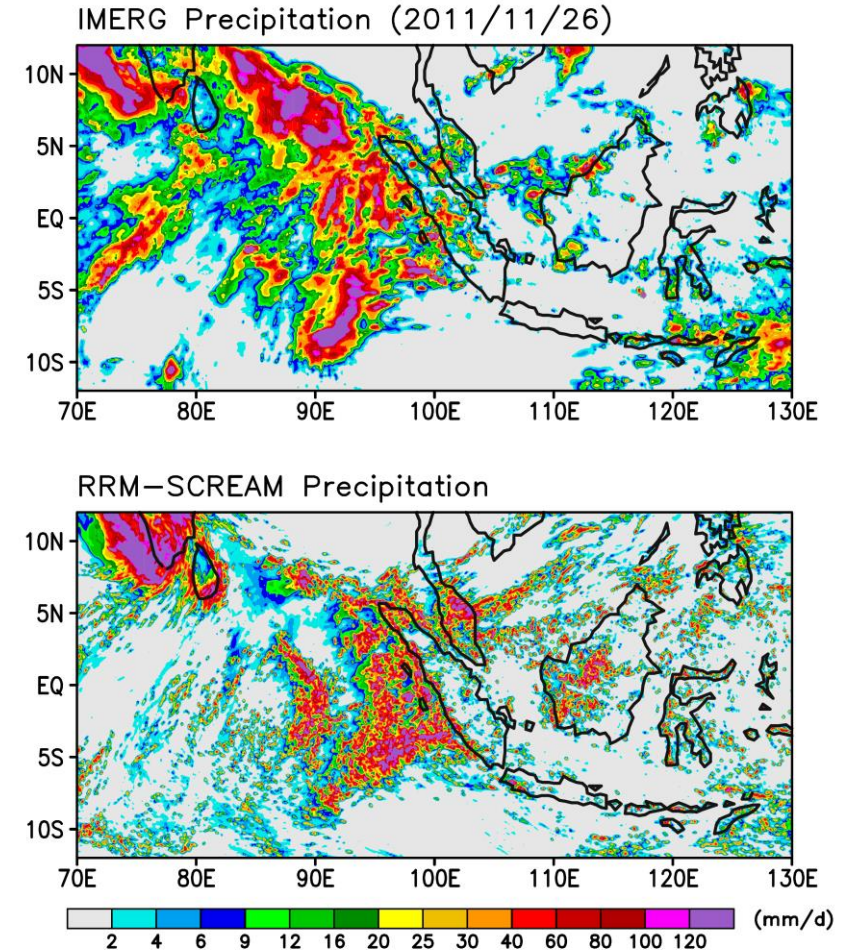
The MC barrier effect on the MJO in SCREAM simulations

Indian Ocean/MC RRM-SCREAM



- Inner domain ~ 3.25 km, free-running.
- Outer domain ~ 100 km, dynamical fields nudged toward the ERA5 reanalysis.
- Multi-scale convection organization, e.g., the MJO over the MC region.

A case study during the DYNAMO period (2011.11.24-2011.12.02)



See “Methodological Breakout Session: Local/Regional Testbeds” for details (Hsi-Yen Ma, Thursday 1:12–1:19 pm)