# WGNE MJO Task Force

**Co-chairs: Daehyun Kim (University of Washington); Charlotte DeMott (Colorado State University)**

- New members as of Fall 2019:
  - Stephanie Henderson (U. Wisconsin): observational and theoretical studies of MJO teleconnections
  - Matthew Janiga (Naval Research Lab): MJO forecasting and multiscale interactions

- Departing members as of Fall 2020:
  - Nicholas Klingaman rotating off in December 2020 (private sector position focused on S2S forecasting and commodities trading).
  - Matt Wheeler rotated off in August 2020 to focus on WMO Research Board and WMO-IOC Joint Collaboration Board.

- August 2020 “face-to-face meeting” held virtually (2 sessions to accommodate multiple time zones).

# Major Accomplishments

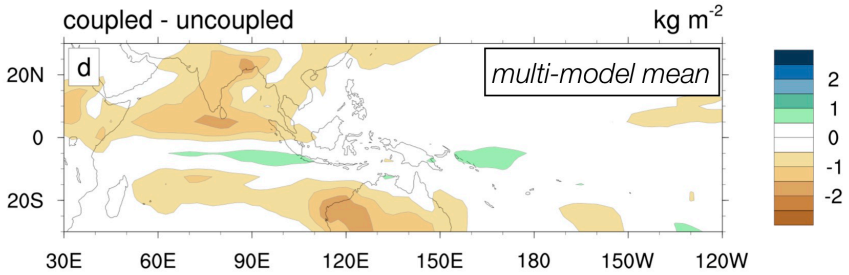
- Review article on MJO for AGU Special Collection on “Grand Challenges”
  - **Jiang, X**., A. Adames, **D. Kim**, E. Maloney, H. Lin, **H., Kim**, C. Zhang, **C. DeMott**, and **N. Klingaman**, 2020: Fifty Years of Research on the Madden-Julian Oscillation: Recent Progress, Challenges, and Perspectives. *Journal of Geophysical Research-Atmosphere*, 125, e2019JD030911, 10.1029/2019JD030911.

- Significant progress on understanding mean state moisture effects on the MJO, including the role of ocean coupled feedbacks to mean state moisture.

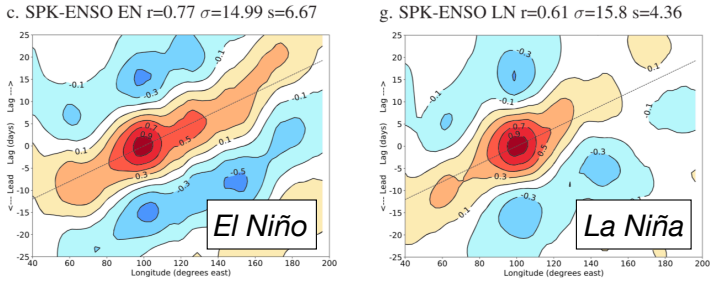
- New development and refinement of metrics to assess MJO simulation and teleconnections.

# Research Highlights: ocean feedbacks - mean state connections

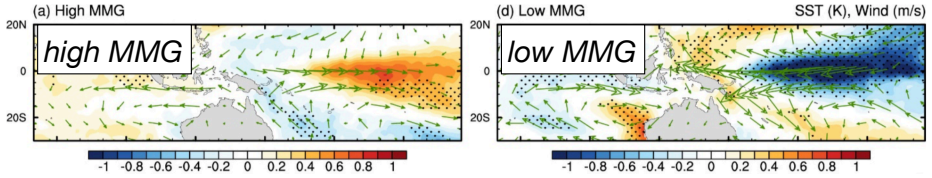
- **DeMott**: ocean coupling improves MJO simulation by sharpening meridional moisture gradients




- **Klingaman**: perceived MJO propagation in models is strongly affected by El Niño simulation

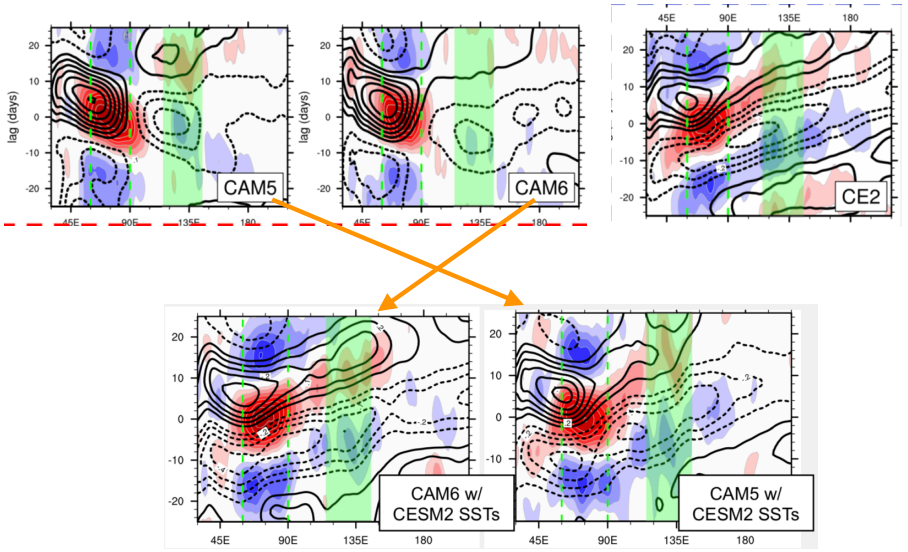


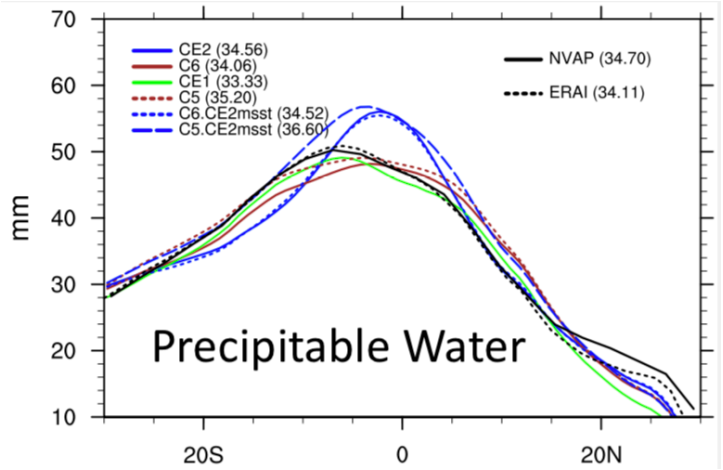

- **D. Kim**: strong (weak) meridional moisture gradient (MMG) conditions resemble El Niño (La Niña) conditions.



# Research Highlights: ocean feedbacks - mean state connections

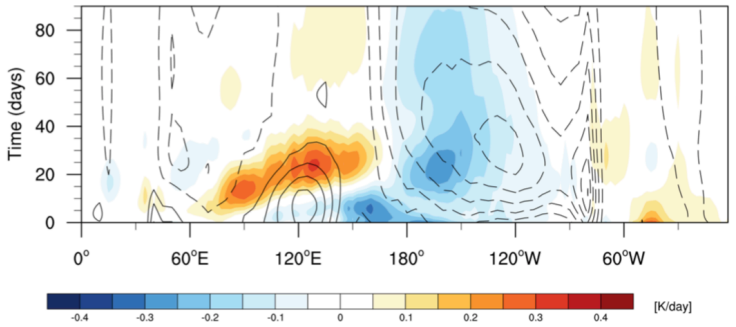
- **Neale**: in CAM6, MJO *only* develops with coupling. Mean state SST biases induce MMG favorable for MJO propagation. CESM2 SST biases more important than CAM6 model physics.



# Research Highlights: MJO teleconnections

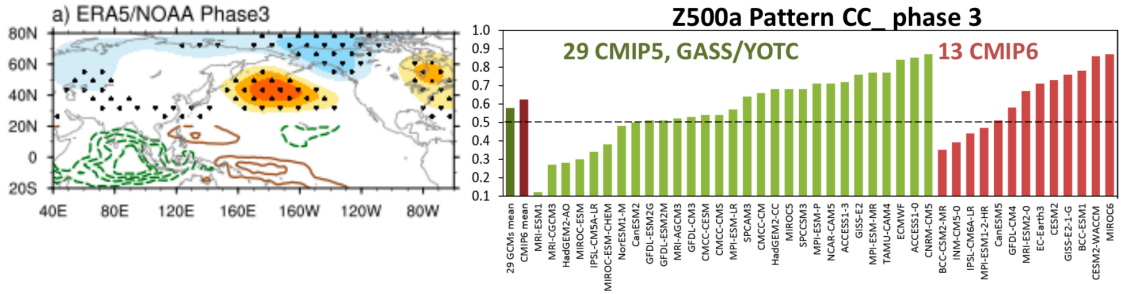
- **Henderson**: LIM study suggests PNA growth rooted in tropics, governed by ENSO and MJO.




Optimal growth from tropics comes from *concurrent* MJO & ENSO

- **Woolnough**: ENSO modulates MJO teleconnections to Europe; MJO source of S2S predictability over Africa, South America

- **H. Kim**: lead development of MJO teleconnection metrics (joint activity with MJO TF, S2S teleconnection subproject.

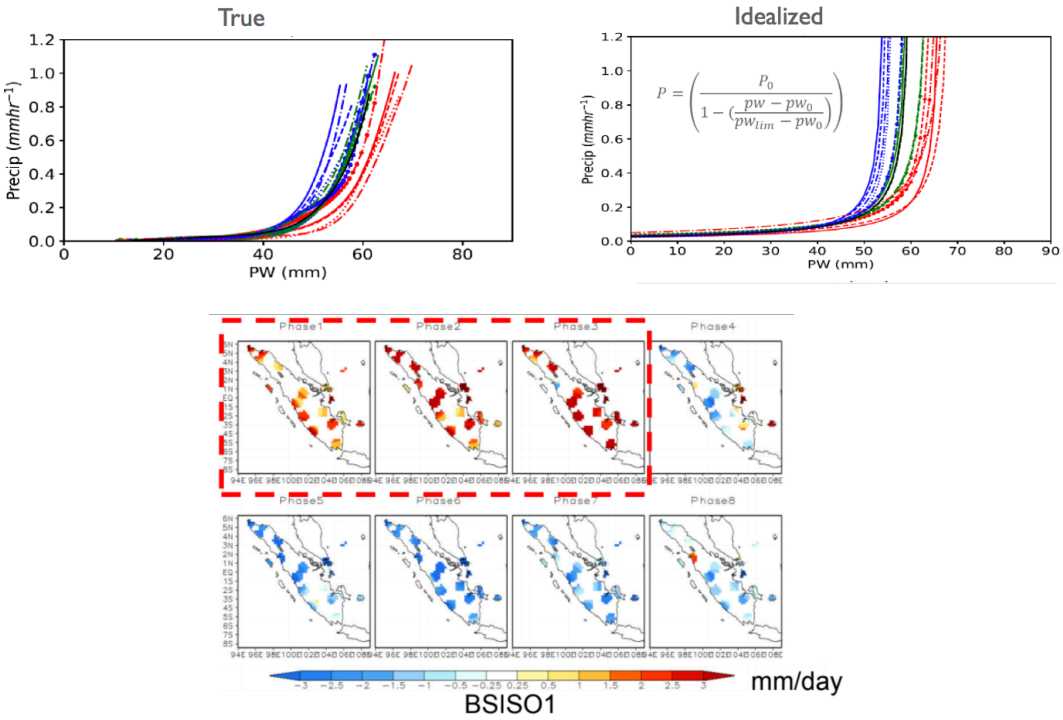


# Research Highlights: MJO-Maritime Continent interactions

- **Hagos**: Precipitable water (PW) biases in CMIP6 models: drizzle controlled by surface fluxes; heavy rainfall controlled by moisture convergence.

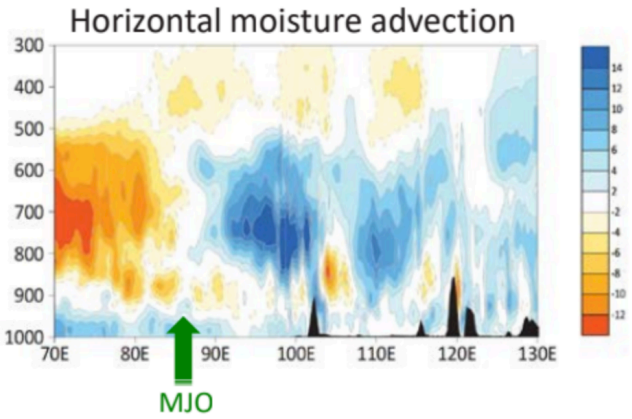
- **Parmana, Xavier**: MJO, CCEW influence on extreme precipitation and floods over Indonesia

- **Woolnough, Klingaman**: TerraMaris field campaign near Java island; regional modeling studies.



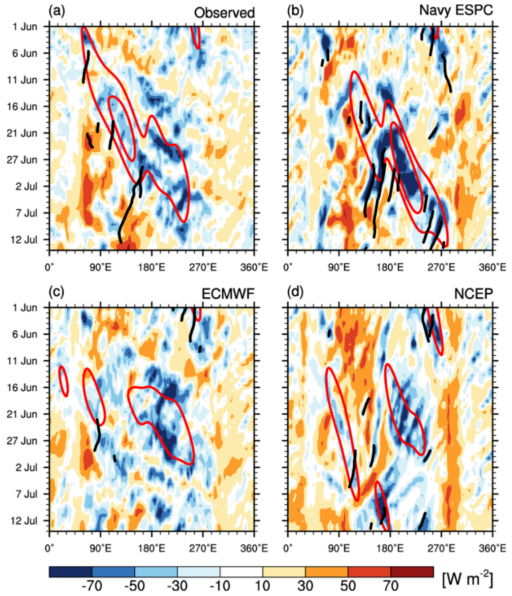
# Research Highlights: MJO-Maritime Continent interactions

- **Jiang**: Damping effect of MJO over MC is linked to topography-induced drying over lee side of islands during convective buildup



# Research Highlights: MJO forecasts

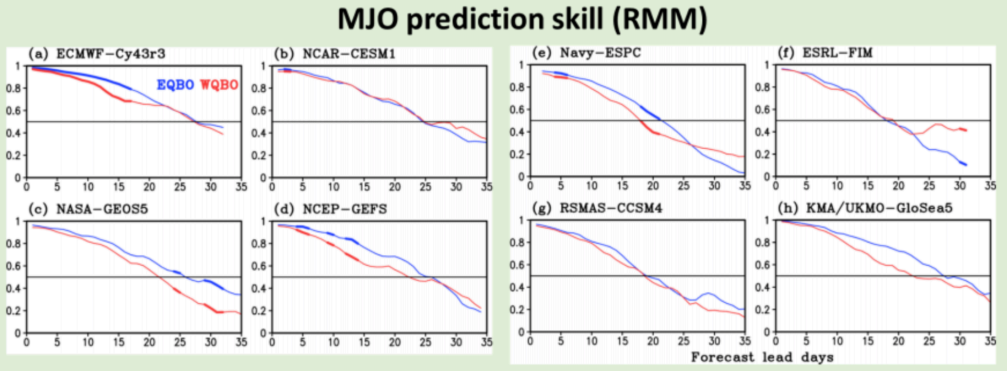
- **Janiga**: Multi-model prediction skill evaluation of MJO, CCEW, and MJO-driven extreme precipitation events; participating in and/or leading community efforts (ECWMF Realtime Pilot Project; UFS Verification and Validation WG)




- **Miyakawa**: Global seasonal prediction with NICAM; DYAMOND (global storm-resolving MIP) targeting EUREC4A campaign

# Emerging Topics: MJO-QBO connections

- **H. Kim**: MJO is more predictable during EQBO than WQBO




- **D. Kim**: MSE budget analysis of MJO during EQBO, WQBO

## Questions

- Is MJO-QBO relationship robust? Seasonal dependence, limited to past ~3 decades.
- What is the physical mechanism?

## Emerging Topics: MJO in reanalyses and CMIP6 models

- **MJO-RAP (reanalysis project)**:
  - assess mean state difference
  - assess processes for MJO maintenance and propagation

- **MJO in CMIP6 models**:
  - simulation skill, process evaluation
  - relationship to QBO
  - surface flux feedbacks

## Membership: maintaining the pipeline of MJO research

- two vacancies for remaining three years of charter
- **option 1**: invite two new members to join TF
- **option 2**: invited presentations by early-career MJO researchers at upcoming TF meetings
  - more pipeline “throughput” with greater opportunities to hear from researchers from under-represented groups