

Observations of the Madden Julian Oscillation for Cloud Modeling Studies

**Chuck Long, Sally McFarlane,
Courtney Schumacher, Peter May,
Bill Gustafson, Yi Wang, Xiaohong Liu**

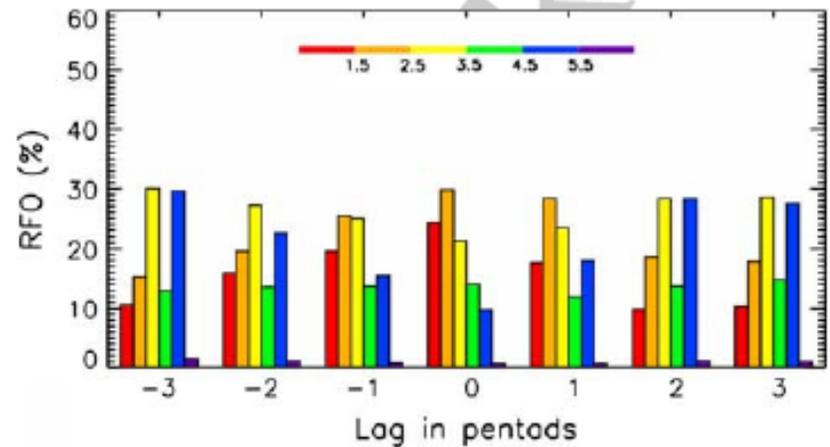
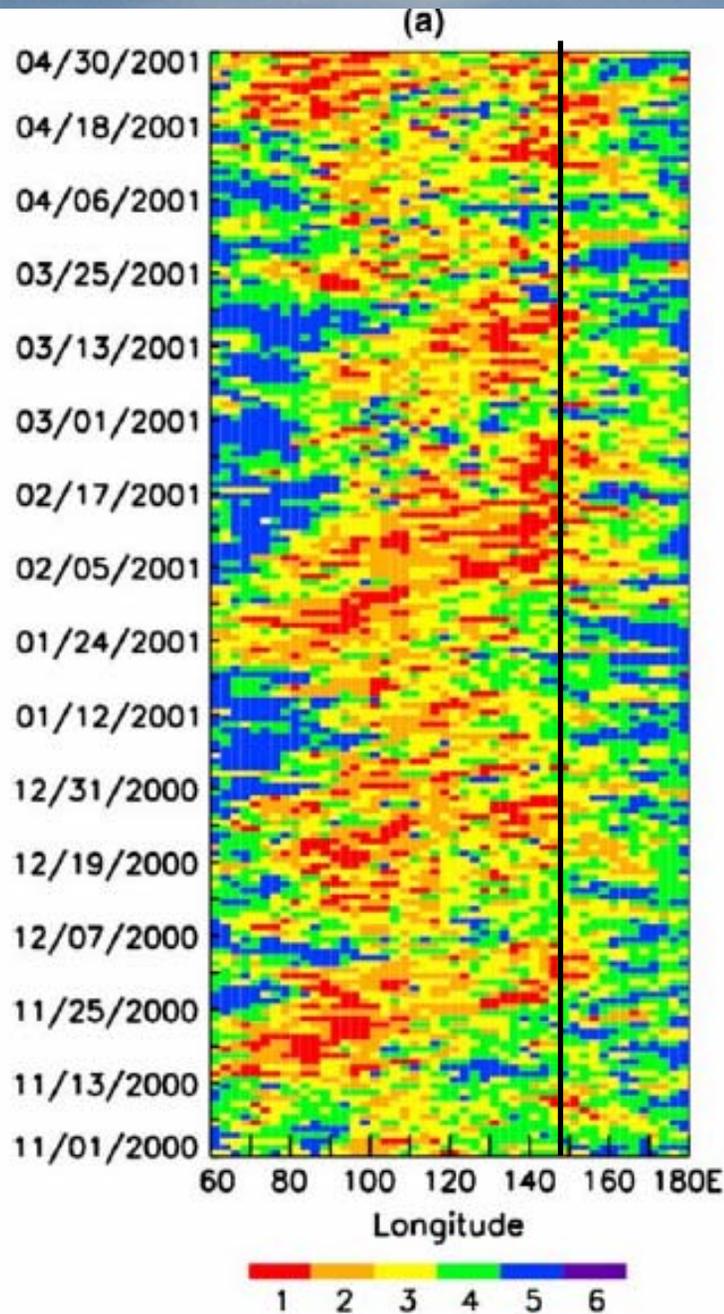


Fig. 10 Relative frequency of occurrence (*RFO*) of each cloud regime at seven lag periods in pentads of eight MJO events in 4 November–April periods from 1999 to 2003. The color scheme for the cloud regimes is the same as in Fig. 9

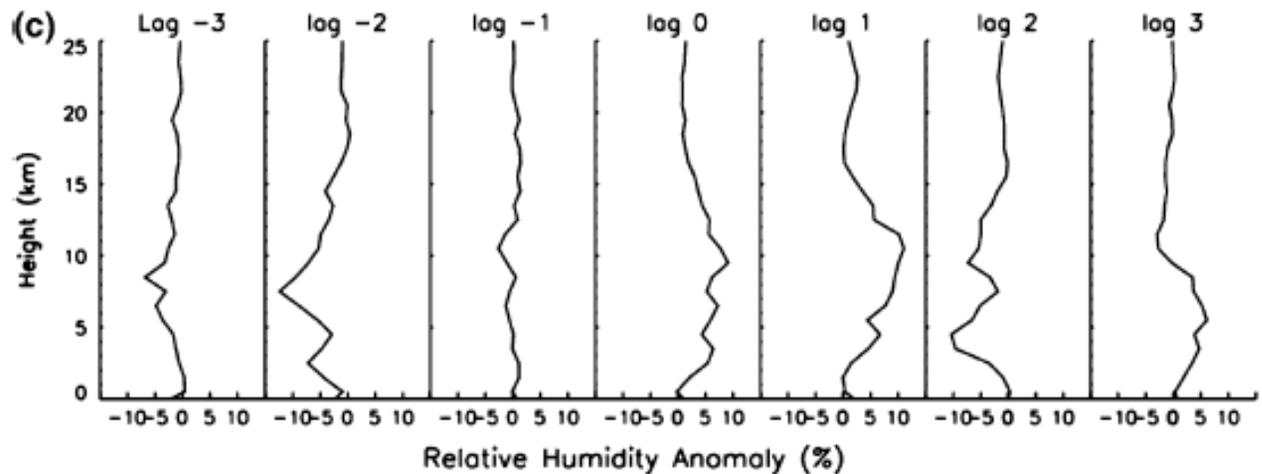
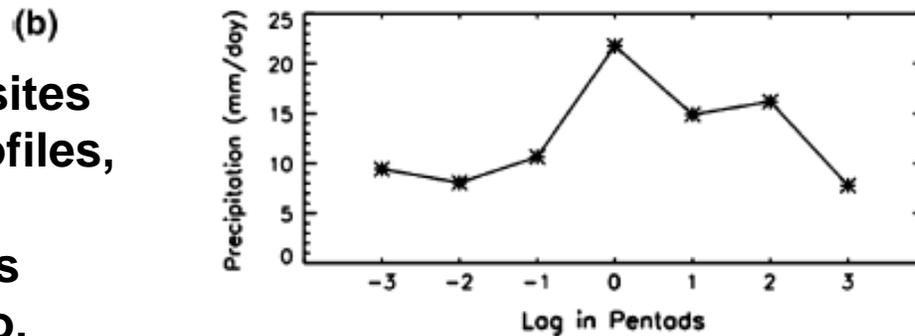
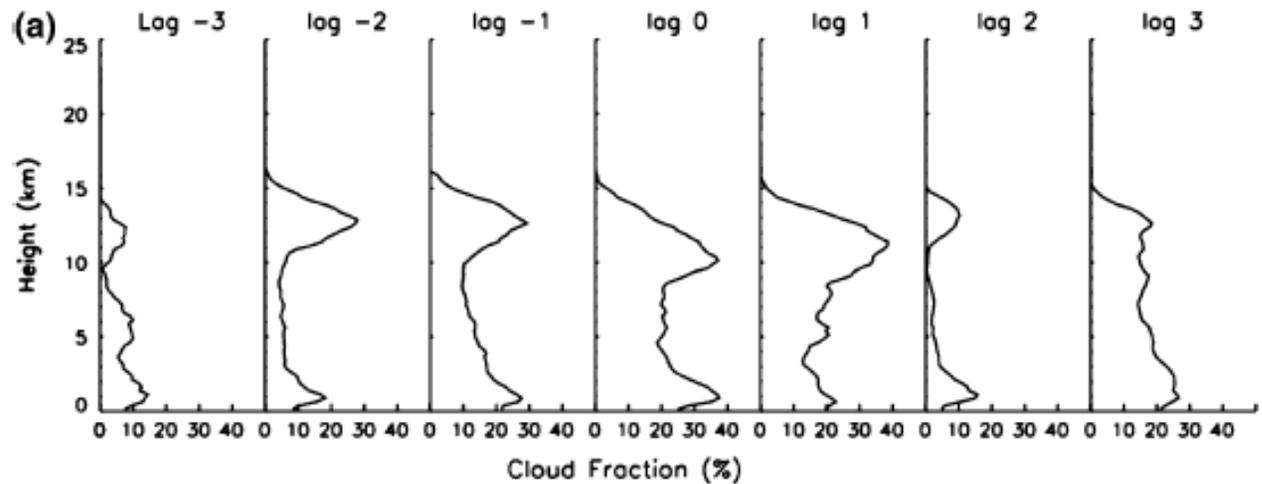
Cluster analysis of ISCCP cloud regimes
(red = deep convective, orange = anvil, yellow = congestus, green = thin cirrus, blue = trade Cu, violet = marine Sc)

Left: TWP Hovmöller diagram of regime occurrence

Right: Composite regime occurrence vs. MJO phase (peak = 0)

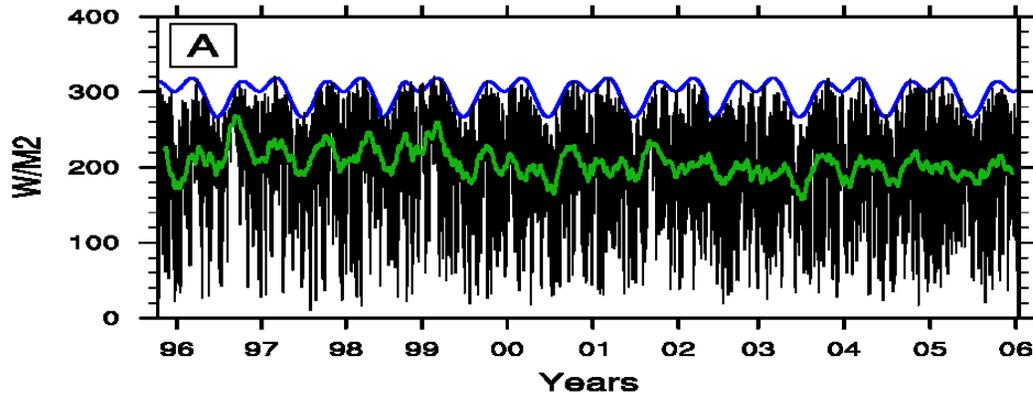
(Chen and Del Genio, 2008, Clim. Dyn.)

Fig. 11 MJO composites at seven lag periods in pentads at Manus for a vertical cloud fraction profiles from ARSCL based on four MJO events; **b** precipitation and **c** relative humidity (*RH*) profiles based on all available MJO events in Fig. 10

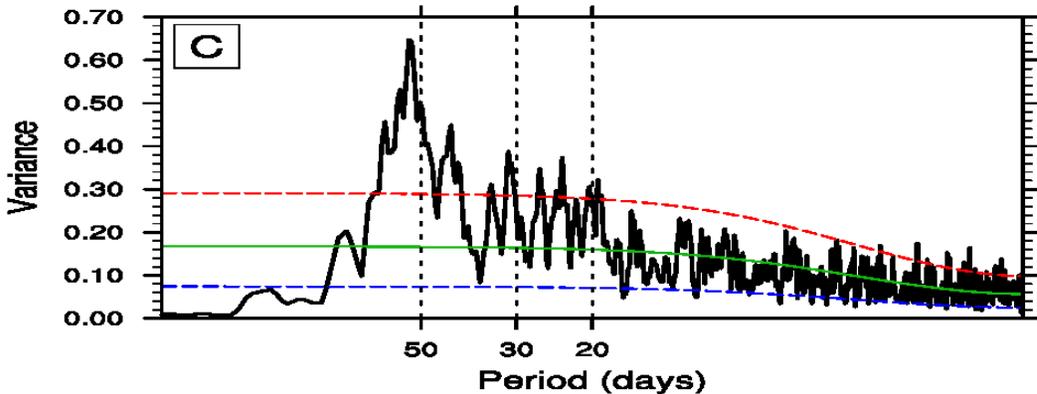
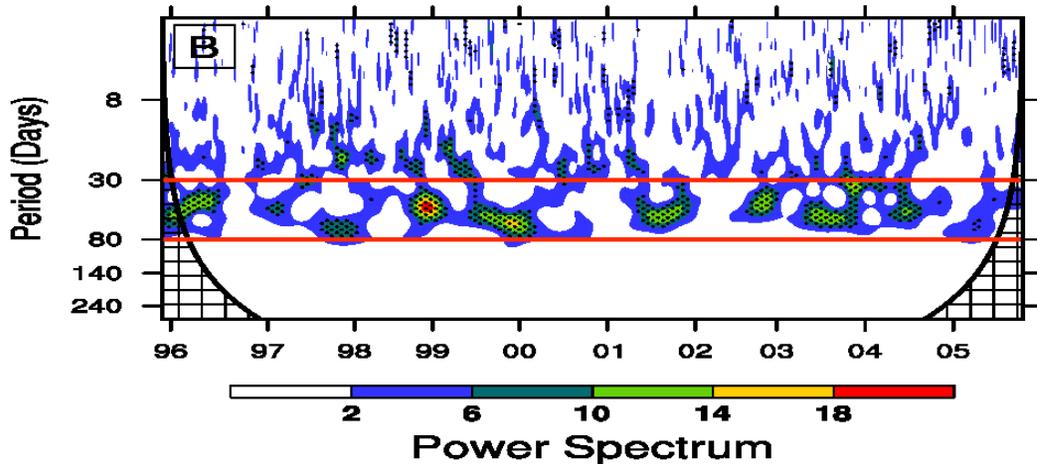


**Manus MJO composites
Of ARSCL cloud profiles,
precipitation, and
RH anomaly profiles
(Chen and Del Genio,
2008, Clim. Dyn.)**

Manus Shortwave Downwelling Fluxes



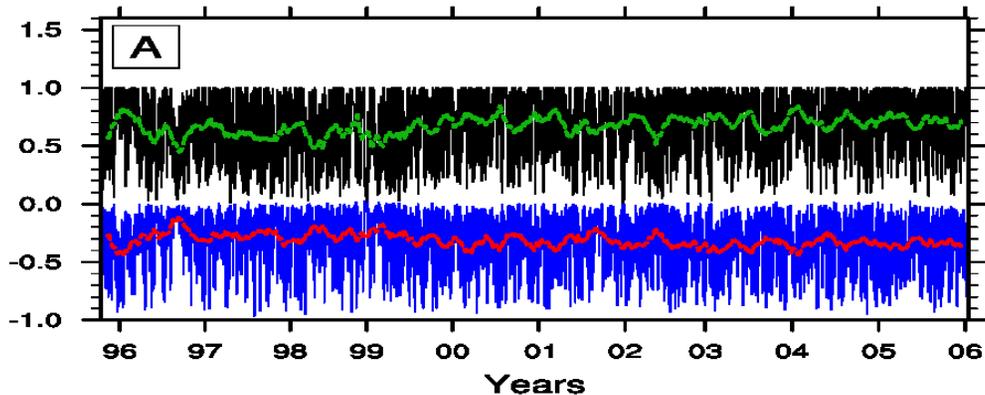
CRF Wavelet Power



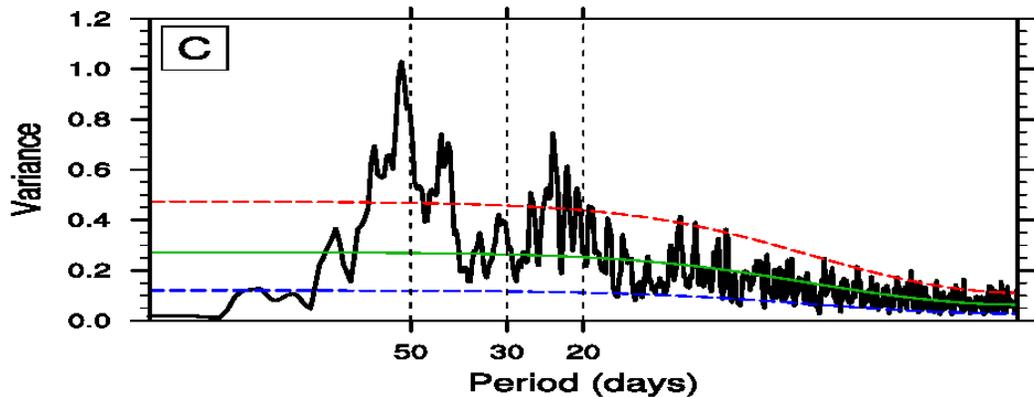
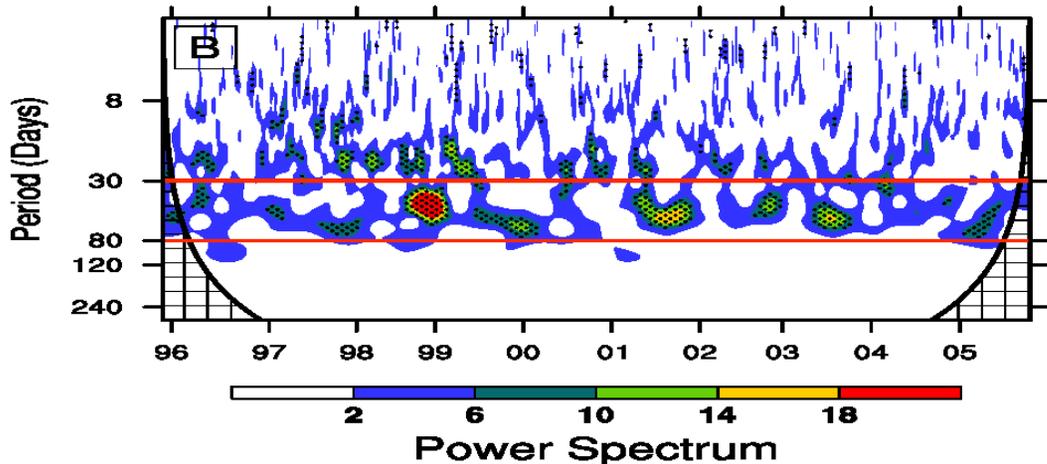
Manus MJO
signal in
downwelling
SW cloud
radiative
forcing

GRL paper submitted
Y. Wang, C. Long,
and J. Mather

Manus FSC (black) and CRF (blue)



FSC Wavelet Power



Manus MJO signal in retrieved cloud amount

GRL paper submitted
Y. Wang, C. Long,
and J. Mather

Manus MJO IOP

- **Objective**
 - **Collection of a data set useful to improve understanding and modeling efforts with respect to the Madden-Julian Oscillation (MJO) in the tropical western Pacific area.**

Manus MJO IOP

- **Scientific Focus**
 - What are the primary cloud, precipitation, and thermodynamic property differences between the active and suppressed phases of the MJO, including variations linked to interactions with the diurnal cycle, topography, and surface flux variability?
 - Can an enhanced characterization of precipitation and thermodynamic fields during the active and suppressed phases of an MJO cycle provide new understanding and better model validation for improved simulations of the MJO?
 - How well do the Manus ARM site measurements capture the local scale variability and characteristics of the Manus area?

Manus MJO IOP

- **Proposed for FY2010, October 2009 through end of February 2010**
- **Deploy the SMART-R C-band radar at Manus ARM site**
- **Increase sondes to 4/day**
- **Deploy small radiometer system and ceilometer at Lombrum Naval Base**
 - **About 6 km from ARM site**
- **Estimated cost ~\$250K**

Shared Mobile Atmospheric Research & Teaching Radar

~ 150 km range



- **SMART-R PIs include:**
 - Dr. Courtney Schumacher, Texas A&M University



Basic Radiative Flux Analysis System



- **System includes downwelling SW and LW, Total and Diffuse SW, T/RH**
- **Small footprint, low power, robust (no moving parts), inexpensive**



Interested participants welcome!

Comments and discussion?