

# MJO Diabatic Heating Model Inter-comparison Project

WCRP-WWRP/THORPEX MJO Task Force & YOTC  
GEWEX/GCSS

Diabatic heating lies at the heart of prevailing MJO mechanisms. The detailed vertical heating structures of the MJO, e.g., a transition from shallow, to deep, and then to stratiform component during its evolution, however, still need observational evidences. Meanwhile, the role of these different heating components for the MJO, also needs to be confirmed, e.g., through this model inter-comparison effort.

# 1. Numerical experiments

## a) Long-term GCM simulations

Either AGCM (with climatological SST specified for simplicity) or CGCM run, or both, will be integrated for 20 years based on each participating model.

## **b) Hindcast experiments during YOTC periods**

- i)** Either SST specified or coupled;
- ii)** Focus on one or both of the two strong, successive MJO events during 2009/11 to 2010/02 (see next slide);
- iii)** Initialized with ECMWF-YOTC analysis;
- iv)** For selected MJO event(s), conduct a series of 6 hindcast runs initialized every 5 days to cover the initiation, developing, and propagating phases of the MJO. Each run will be integrated for 30 days. (Is this too much for high-resolution runs?)

# MJO-related six cases during YOTC periods (Courtesy Matt Wheeler)

Data : NOAA-OLR (using 1979-2009 climatology)

(a) May-June 2008

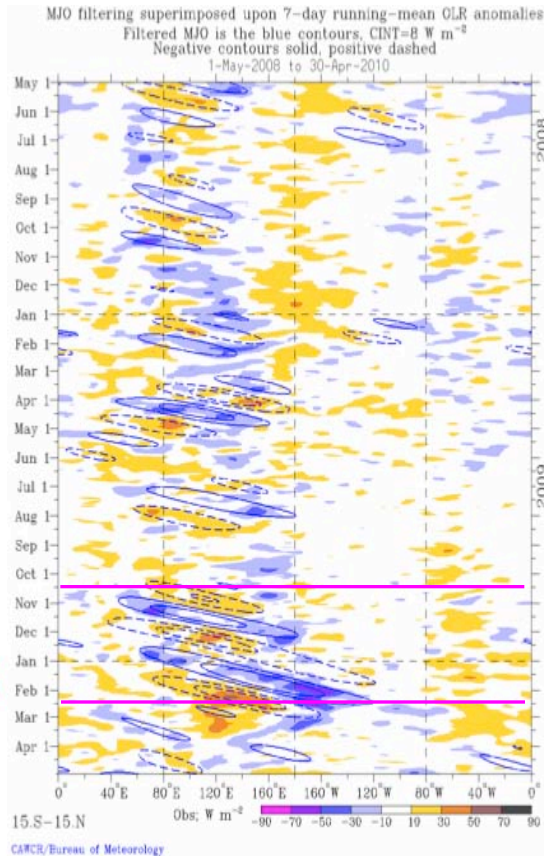
(b) August-October 2008

(c) January-February 2009

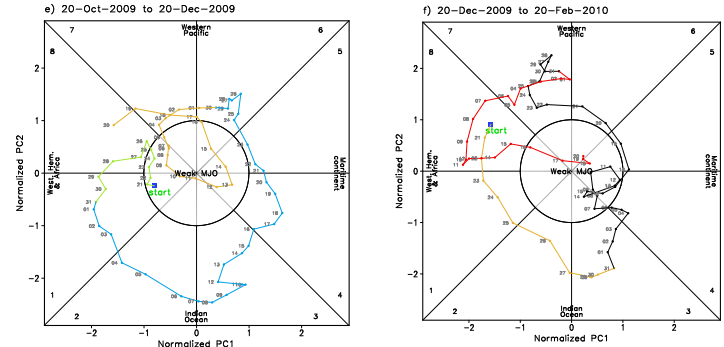
(d) April-May 2009

(e) October-December 2009

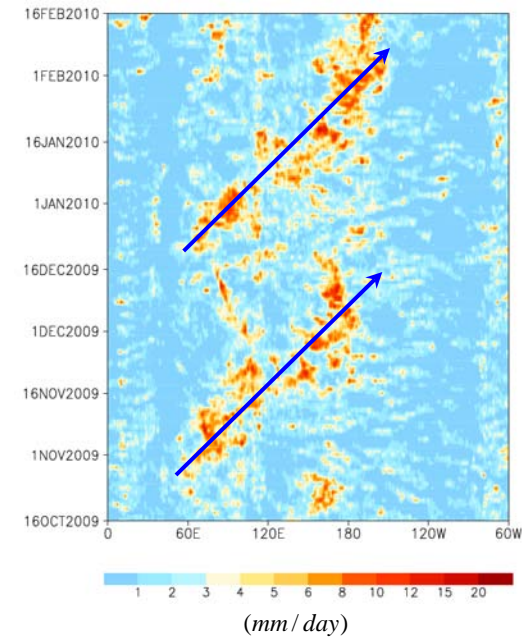
(f) December 2009-February 2010



## MJO Cases e) & f)



## Rainfall



Suggested hindcast period:

Case e): Oct. 20, 2009-Nov. 19, 2009

Case f): Dec. 20, 2009-Jan. 19, 2010

## 2. Requested output and model information

### (a) Model description

A brief description of each participating model, including model name, atmospheric/oceanic components, horizontal and vertical resolution, cumulus parameterization schemes, coupling techniques (if coupled), etc.

For hindcast runs, also include how they are initialized.

## **(b) Outputs from both GCM long-term runs**

Recommend output intervals: 6 hourly.

### i) 2-D FIELDS:

- Total precipitation rate;
- Precipitation rate due to convective, large scale condensation, and/or shallow convection if available;
- OLR;
- Surface heat fluxes (latent, sensible, shortwave and long-wave radiation);
- SST;
- Surface winds;
- Surface (2m) air temperature;
- Surface pressure;
- ?cloud (low, middle, high cloud fractions)?

## ii) 3-D FIELDS:

Recommend to be archived on standard levels (see following section iii).

- Total diabatic heating;
- Diabatic heating due to deep convection / large scale condensation module, and/or shallow convection;
- Longwave radiative heating;
- Shortwave radiative heating;
- Humidity;
- Temperature;
- Horizontal and vertical winds.

### iii) Recommended data formats

- *Resolution*: 2.5x2.5 degs over global domain (144x73 grids)
- *Vertical levels (27levels)*: 1000 975 950 925 900 875 850 825 800 775 750 700 650 600 550 500 450 400 350 300 250 225 200 175 150 125 100hPa
- *Writing order*: Eastward from 0° to 2.5°W, southward from 90°N to 90°S
- *Writing format*: NetCDF or GRIB format (including data control file, such as \*.ctl) are highly recommended.



## (c) Suggested output from hindcast runs

Recommend output intervals: 3 hourly or hourly.

In addition to have variables as in GCM long-term runs, the following additional output are also suggested:

### i) 2-D FIELDS:

- Detailed surface flux budget;
- ?

ii) 3-D FIELDS:

- Cloud liquid & ice water content;
- 3D Cloud fraction;
- Precipitation flux;
- Budget terms for T, q, momentum?
- ?

iii) Output Format

Suggest output on native hindcast model grids to take advantage of high-resolution runs?

## **(d) Place for data archive**

TBD

## **(e) Suggested deadline**

September, 2011?

### 3. Participating Modeling Groups for long-term simulation

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