

# YOTC MJO Task Force – 8th Telecon

**Meeting time:** 21:00 GMT, 4<sup>th</sup> March 2011.

## **Participants**

Task Force:

Matt, Duane, Ken, Harry, Frederic, Daehyun, Rich, Prince, Masaki, Augustin, Frederic, Chidong, Eric, Joshua

Others:

Xianan Jiang from JPL

## **Proposed Agenda**

1. Process-oriented diagnostics. How do we create one-number metrics from these?
2. CMIP5 plans/metrics
3. MJO Diabatic Heating MIP
4. Northern summer forecast metrics

## **Meeting Minutes** (by Matt and Duane)

### **1. Process-oriented diagnostics**

Our main topic of discussion was focussed on the construction of one-number metrics from the various process-oriented diagnostics that have been discussed so far.

Prince had 3 slides to show.

Slide 1: Composites of RH as a function of precipitation rate (mm/day) and pressure-level. Shown for obs and many models.

Slide 2: His idea to construct a metric as the RH averaged over the box defined by a precipitation rate of 10-30 mm/day and pressure levels 925-500 hPa. The idea is that this is an important indicator for low-mid level moisture preconditioning.

Slide 3: Scatter diagram of new RH process metric versus the MJO east/west power ratio metric.

Result: There is some indication of a linear relationship between the two, i.e., models with greater RH in that box have stronger MJOs.

Eric asked about sensitivity of the RH metric to mean humidity. Should it be done with RH anomalies instead?

Ken asked how slide 1 may look if it was done as a function of MJO phase. Could the RH respond differently depending on phenomenon? Response was that an intraseasonal convective event could be defined, and the lead/lag behaviour could be computed based on such an event.

Duane wondered whether it was the absolute value of the RH in the box that mattered or whether it was the gradient of RH across the box that is important.

Daehyun's 10 slides. Continuing on from Prince's metric, Daehyun had slides examining 3 different aspects of the "processes" involved:

1. Moisture-recharge relationship
2. Wind-induced surface heat exchange (WISHE)
3. Cloud-radiation interaction (CRI)

Slide 3 of Daehyun's, showing the same process metric as proposed by Prince, generated a lot of discussion. The linear relationship between the RM-metric and MJO strength (as measured by the east/west power ratio) approximately holds. All models with 2 different versions followed the relationship, although not the AM2 model. Large differences also exist in where the reanalysis "observations" sit within this scatter plot.

Matt noted that Daehyun's RH box used 7mm/day as the lower threshold, whereas Prince used 10 mm/day. Daehyun said this difference was not intentional.

Harry noted that there was nothing in the top left-hand portion of the figure, which suggests that high RH-metric is a necessary but not sufficient condition for a strong MJO.

Slides 5 and 6 showed Daehyun's attempt to define a metric from the precipitation versus saturation fraction curves. The metrics appear okay, but there certainly don't explain everything.

Slides 7/8 for two WISHE metrics, and 9/10 for two CRI metrics. Perhaps the 1<sup>st</sup> WISHE metric shows the best linear relationship with MJO strength.

The biggest concern was whether the east/west precipitation power ratio is the best indicator of MJO fidelity. Models with a high east/west ratio also tend to have high intraseasonal (20-100 day) variance. Harry suggested ways that this may be corrected in spectral space. East/west power ratio times East power, or  $\text{Coh}^{**2}$  (prcp vs. u850) times power in the east waves (in either u850 or prcp).

Duane: It is obviously difficult coming up with "process metric" until we are comfortable with a corresponding MJO metric.

Ken: Perhaps the metric being considered for CMIP5 (to be discussed next) is a suitable alternative?

Prince: Described a metric that he and JP Duvel developed for boreal summer ISV around India using CEOFs computed in a 120-day running window. It is complicated, but provides a way to measure model realism and reproducibility, which may be able to be applied to the eastward propagating MJO. Reference is Xavier et al. (2010, J. Climate).

**Any ACTIONS?**

## **2. CMIP5 plans/metrics**

Ken has been working hard on a MJO metric suitable for application to the CMIP5 model runs. He has been testing these ideas on the CMIP3 models. Ken sent a pdf document of tables and figures for us to look at. He has tried two similar approaches:

1. Projection of model output onto the combined EOFs (CEOFs) of Wheeler and Hendon (2004) from observations.
2. Projection of model output onto the OLR spatial EOFs after Sperber (2003).

All model input is bandpass filtered for 20-100 days prior to the projections. Each technique results in daily time series of a pair of projection coefficients (PC1 and PC2). The “metric” can then be defined as the maximum correlation between the PCs and its corresponding lag.

Overall, the 2 approaches yield similar results. For obs, only one model (CSIRO Mk3.5) gets a higher correlation for the OLR EOF approach, and no models beat the obs for the CEOF approach.

Ken suggested that the OLR EOFs may be preferable because they result in a wider range of correlation coefficients among models, so it may be more discriminating. However, Duane pointed out that the WH CEOF approach yields a wider range of “day of maximum lag”.

Eric asked about the PC amplitude information.

**ACTION:** Ken to look at the PC amplitude information as well.

Later e-mails from Duane and Harry suggest ways of analysing all 3 pieces of information that come from the EOF projection technique:

1. The maximum lag correlation
2. The lag of this maximum correlation
3. The PC amplitude (or  $PC1^2+PC2^2$ ).

Duane suggests measuring the distance to obs in a 3-d space.

Harry suggests making a 2-d plot (corr versus amplitude) and colouring the lag.

### **3. MJO Diabatic Heating MIP**

Xianan Jiang discussed progress on the MJO Diabatic Heating MIP. It is still in the planning stage. Both long-term GCM and short-term hindcast runs are planned. For the short-term hindcasts, the current plan is to focus on the two MJO events occurring during late 2009 to early 2010 during YOTC. Six 10-day integrations starting 5 days apart with the ECMWF YOTC analyses as ICs.

Chidong asked whether doing these YOTC runs could limit the ability to do similar runs for DYNAMO. No one left on the phone was in a position to answer this. Duane has subsequently sent an e-mail about this for further discussion.

**ACTION:** Xianan to e-mail everyone in the TF the draft plan.

### **4. Northern summer forecast metrics**

June-Yi Lee has e-mailed Duane and Matt saying that she can provide input on this at the next Telecon.