The MMF's MJO: Examining CRM Behavior for Clues to better Parameterization

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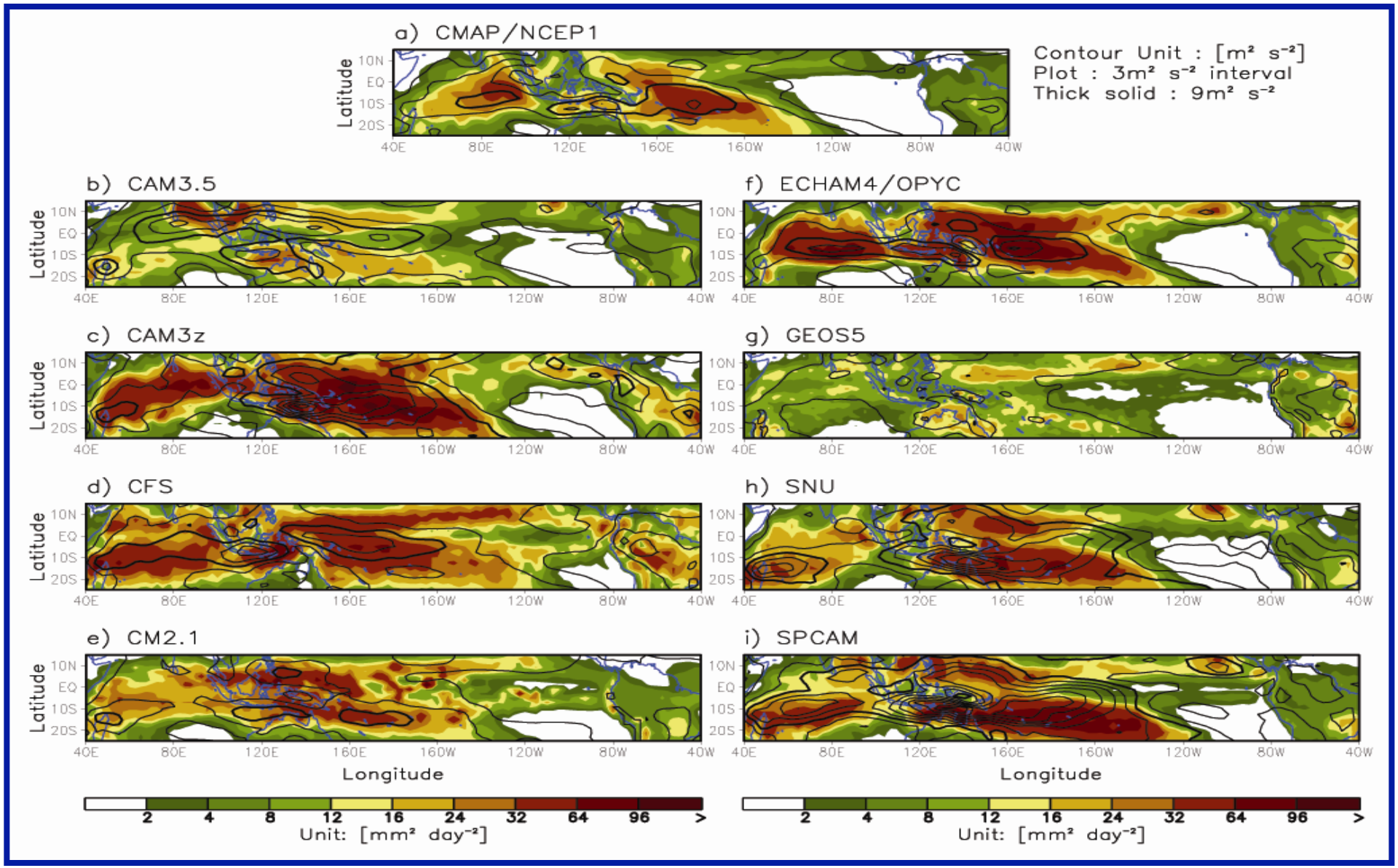
Questions that we will be addressing are as follows:

- MMF shows relatively good MJO features (Kim et al, 2009, JOC). Why is it so?

- The MJO is known to have Multi-Scale Organization- Are the MMF's subgrid scale modes related to its resolved multi-scale organization?

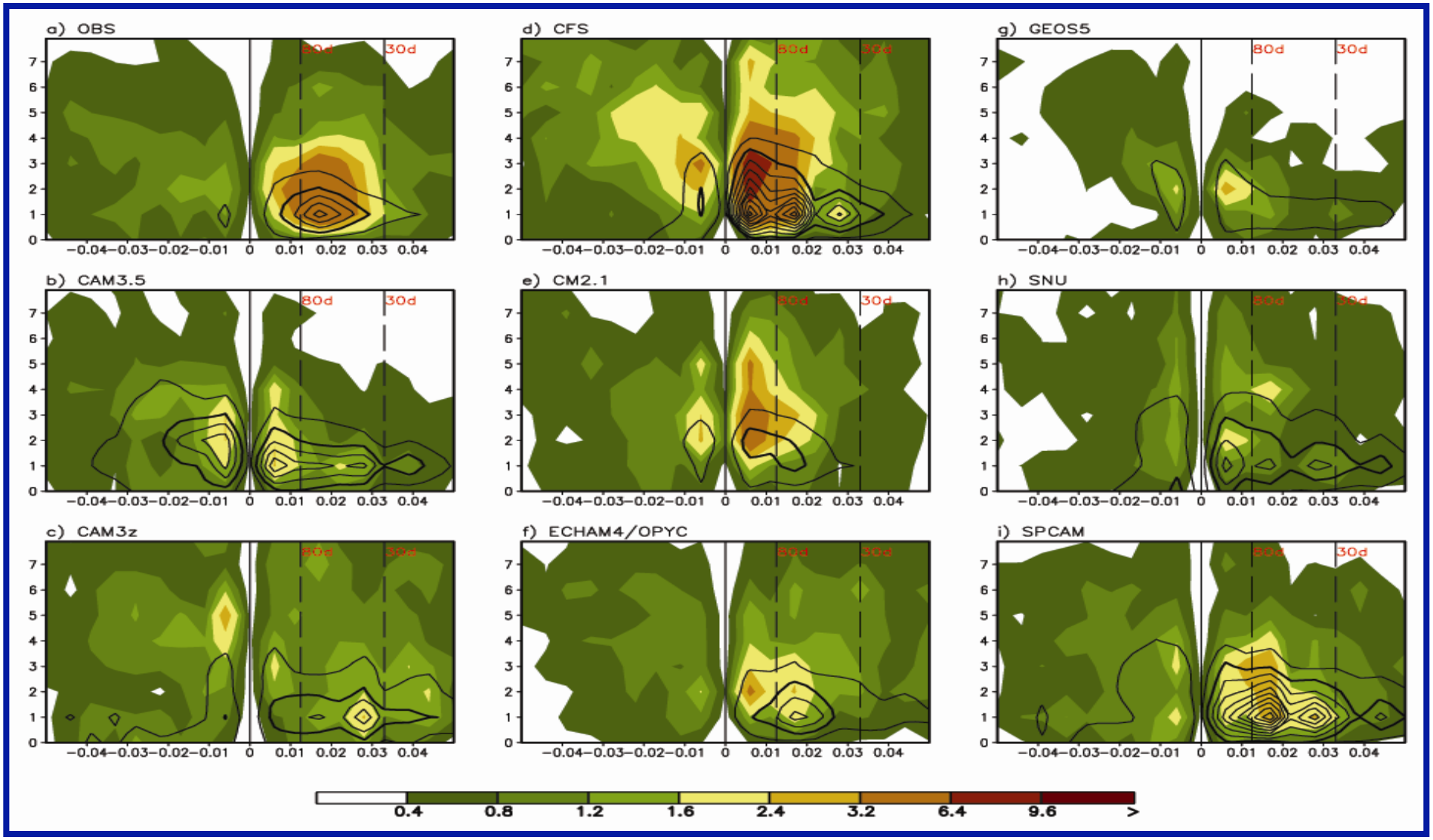
- What sort of subgrid scale mode of variability are present in MMF?

MJO Simulation Diagnostics: Variance Precip & U850



Kim et al. 2009, Jour. of Cli.

MJO Simulation Diagnostics: W-F Precip & U850



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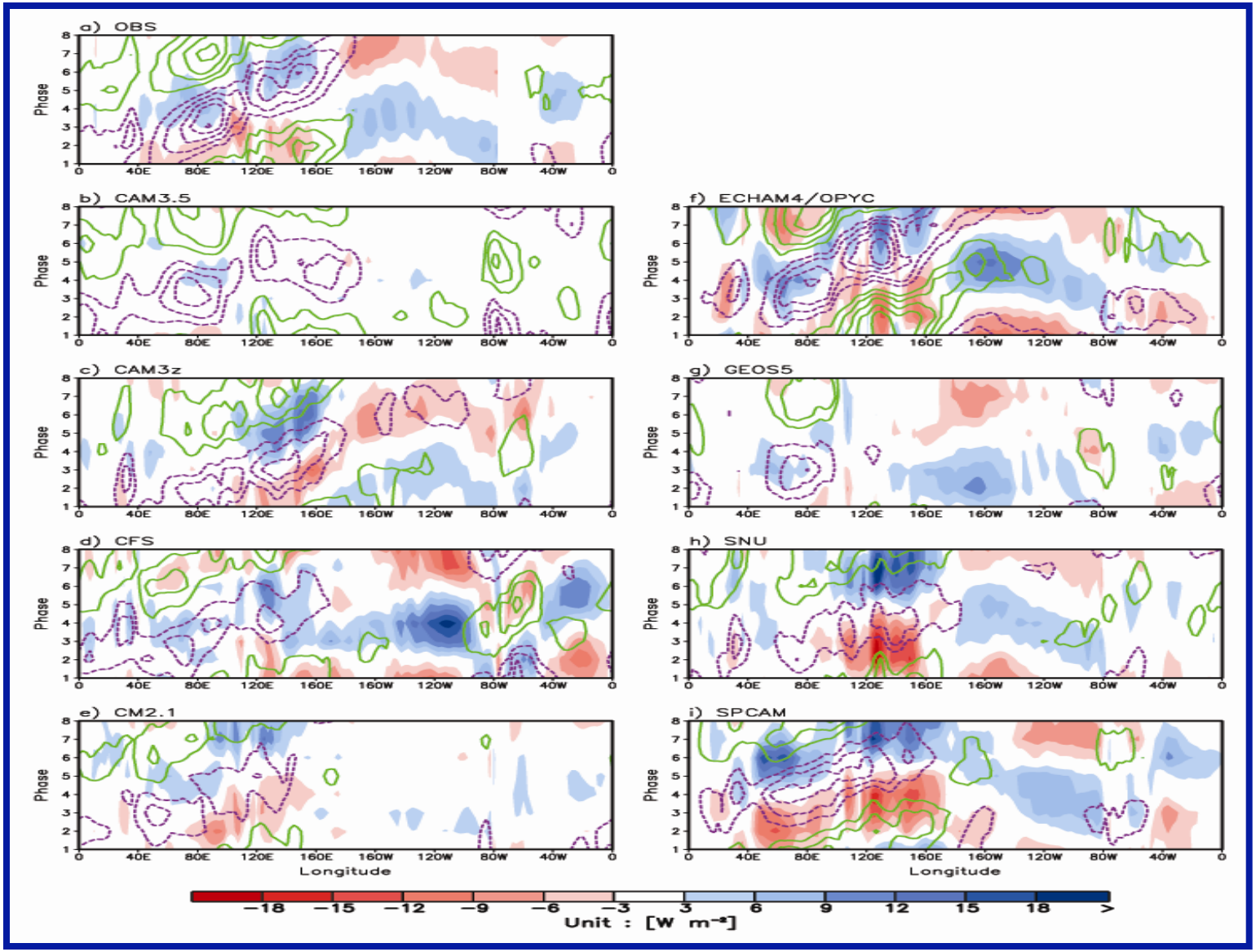
MJO Simulation Diagnostics: Precip & LH Flux



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Aims and Objective

✓The idea is to take the CRM (we wish we had diabatic heating) cloud field presently, constructed from combining liquid + ice clouds and doing an EOF on the CRM vertical profiles to see if dominant vertical structures are evident.

✓Then to look, where in time and space the projections on these modes are greatest to see how the MMF is producing organized convection and how these relate to mean patterns as well as variability such as the ITCZ, monsoon or ISO/MJO phases, Kelvin wave etc.

✓Does the model develop shallow heating, ahead of congestus, then deep and then stratiform? How does muli-scale organization influence the simulation of northward propagating BISO?

Data and Procedure

- Presently we have initiated the work with a sample dat
  a set of 24 hours of SP-CAM forecast (for 1 day forecast)

- The CRM fields are having dimension of GCM Long, GCM Lat, CRM X values of
  these dimensions are respectively 128, 14, 32, 1, 28 and 24.

- GCM Long covers from 0°E to 357.1875°E with a resolution of 2.8° a
  32
  P
  oints and resolution ~4 km, with CRM Z top at ~ 14.35 hPa

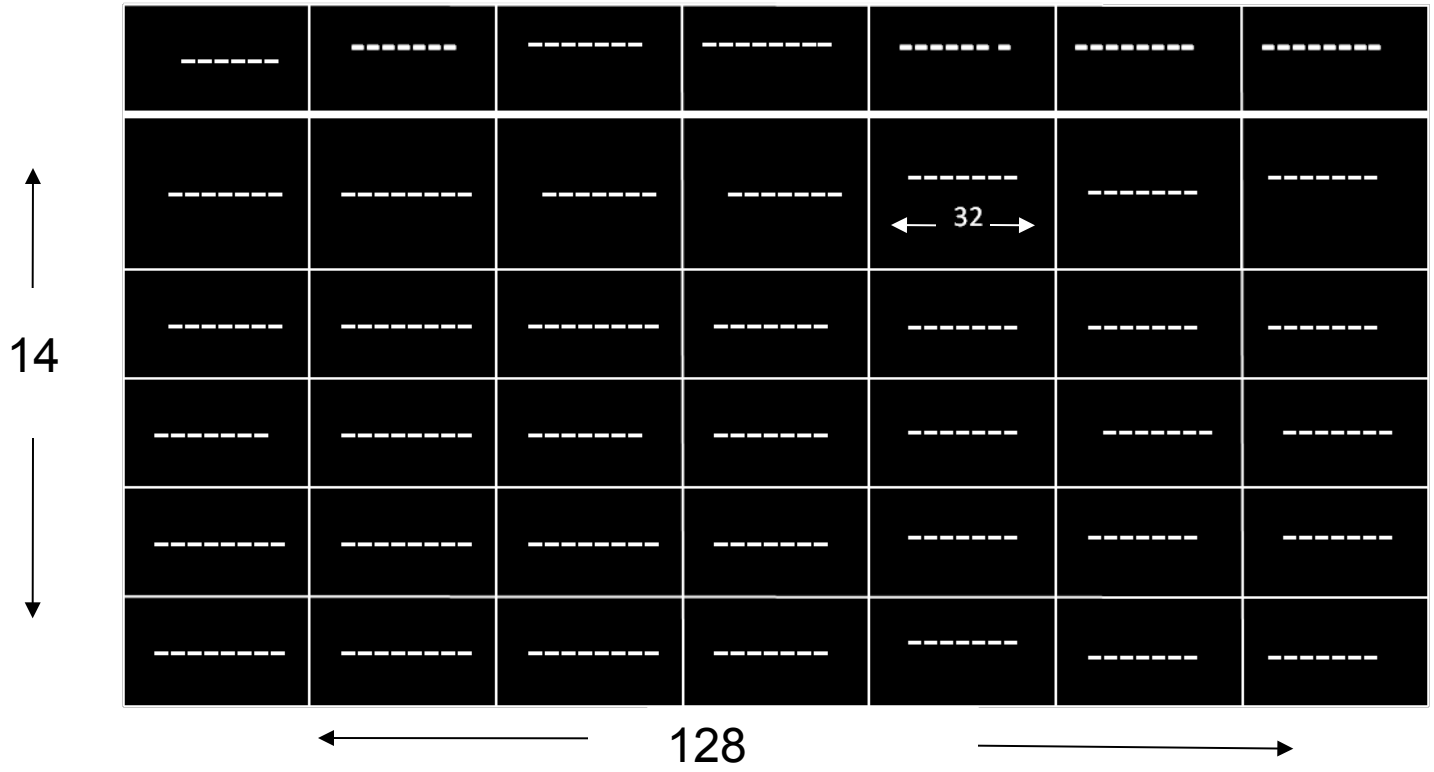
Data and Procedure (contd)

- The vertical profile of EOF of Cloud water in all the CRM grids are computed first. The dominant vertical modes are examined.

- For the dominant modes, the time averaged spatial plots of variances are generated to see the global distribution of the dominant modes of the EOF of CRM clouds in MMF

- Presently a sample data of one day (at every one hour) are analysed. The plan is to analyse the whole data set and study the MJO phases and its evolution and interaction with tropical waves.

Schematic representation of procedure

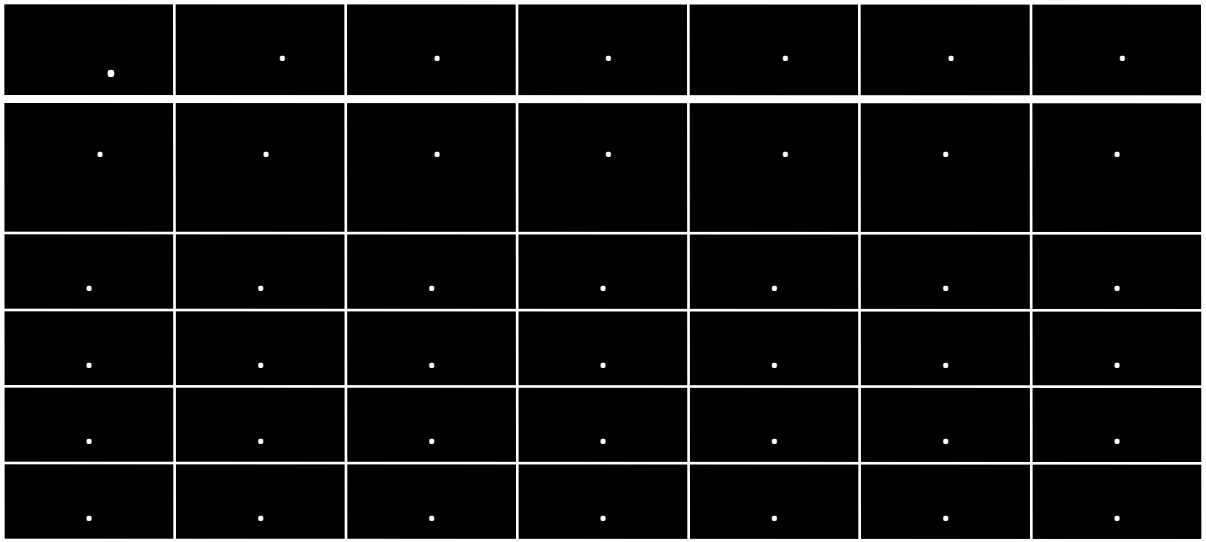


The function f(xgcm, ygcm, x crm, ycrm, z crm, t) is converted to a function of generic dimension f(x', z crm) and transpose of this gave a matrix of f with dimension (z, x').

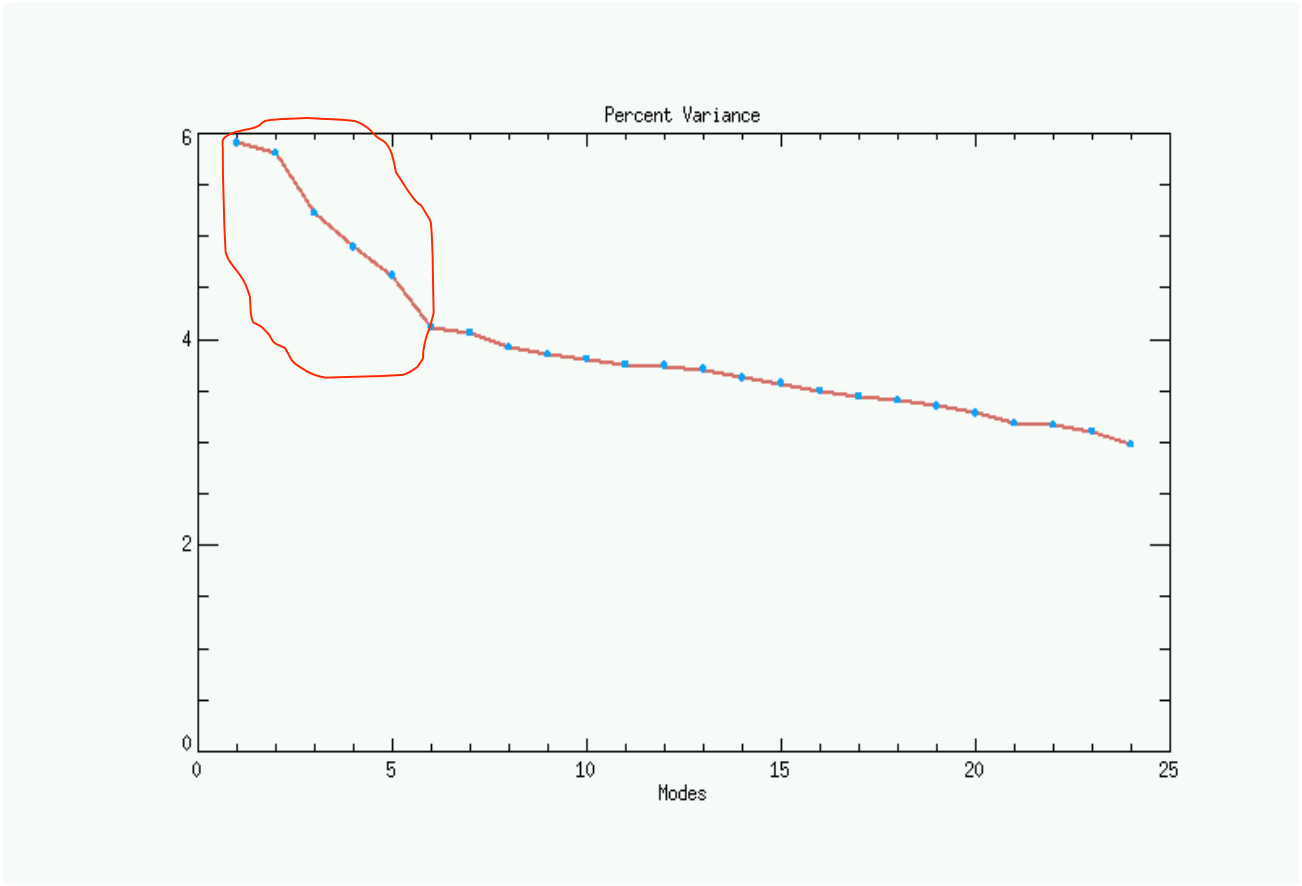
Further the EOF is computed of this function and vertical dominant modes are selected.

•Subsequently, for those dominant mode
s, the matrix of dimension Z, x' are remapped to (gcm lon, gcm lat, x crm, t)

- Further the mean square of the cloud variable along x crm is done $\frac{1}{32}\sum_{i=1,32} x_i^2$ and each is put in each GCM grid as follows.
- This will give a matrix of (gcm lon, gcm lat, time) for all the modes
- Finally we take mean of time to get the distribution in global lat-lon grid of the dominant modes



Each dot represents = $\frac{1}{32}\sum_{i=1,32} x_i^2$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6
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5
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15
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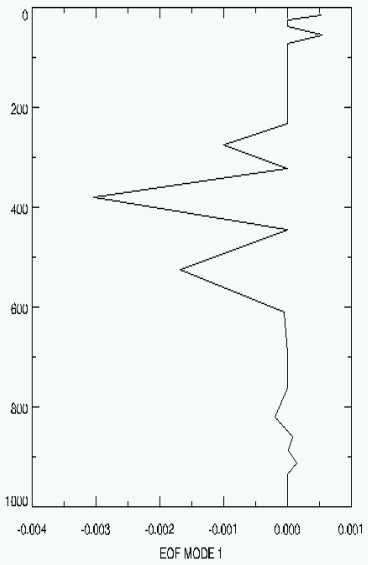
25
Modes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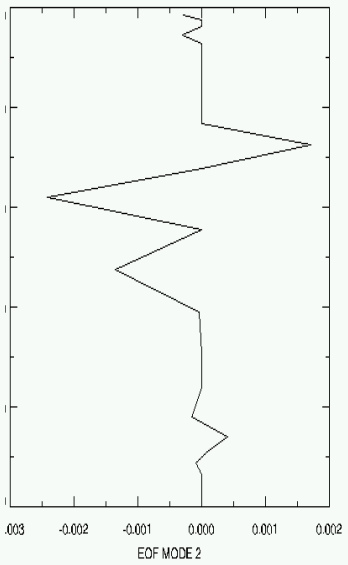
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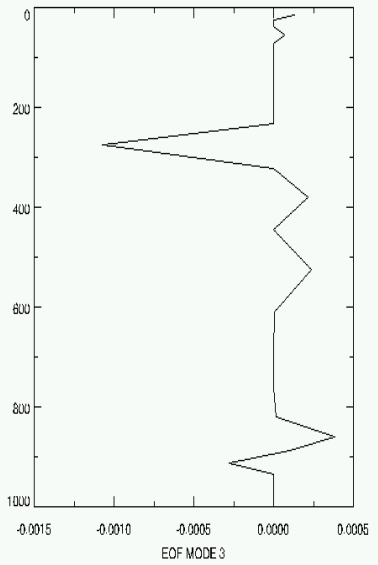
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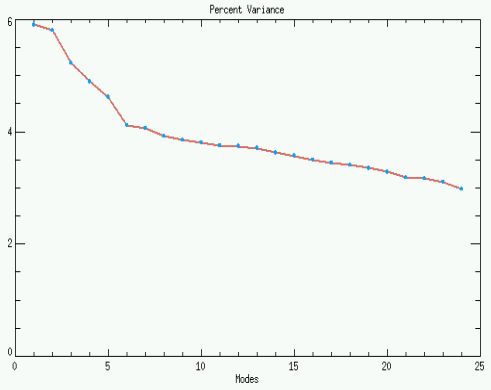
Percent Variance
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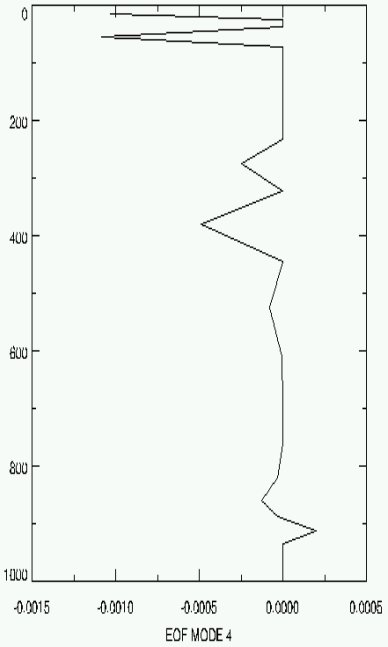
Modes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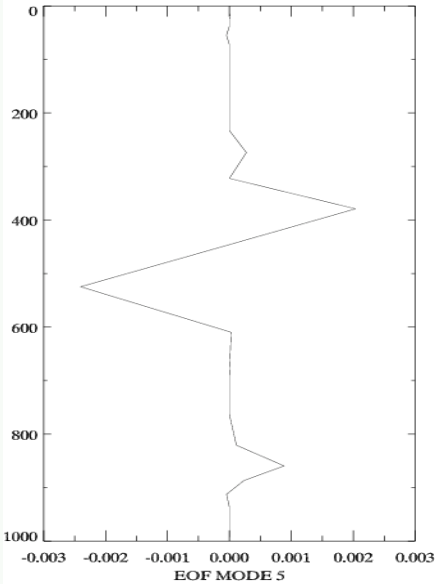
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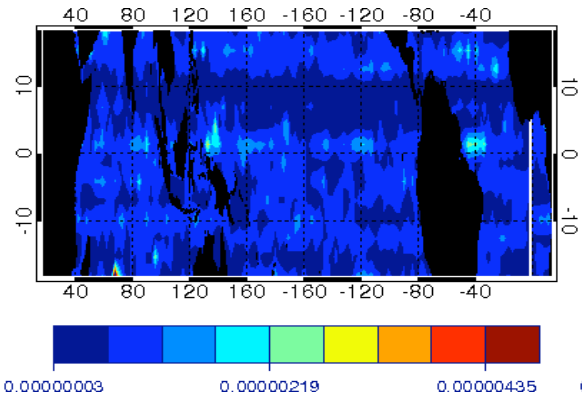
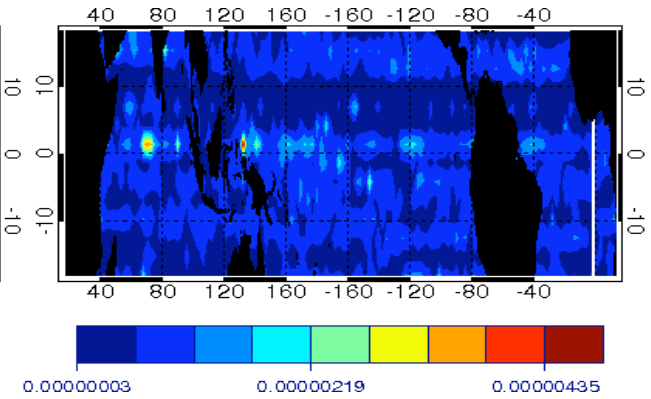
EOF MODE 5

MODE 1



MODE 2



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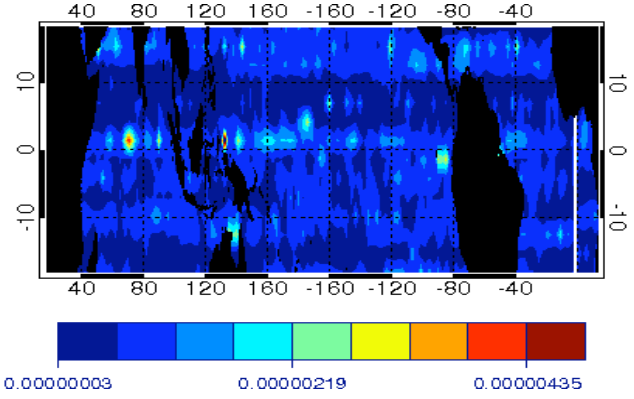

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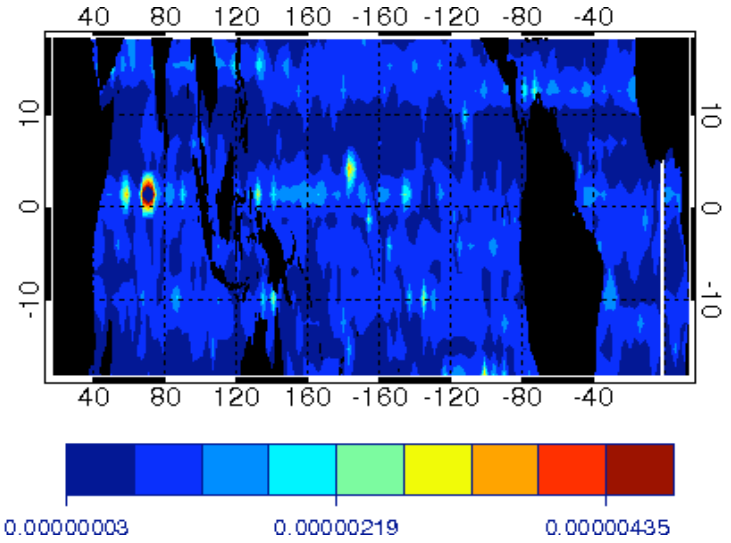

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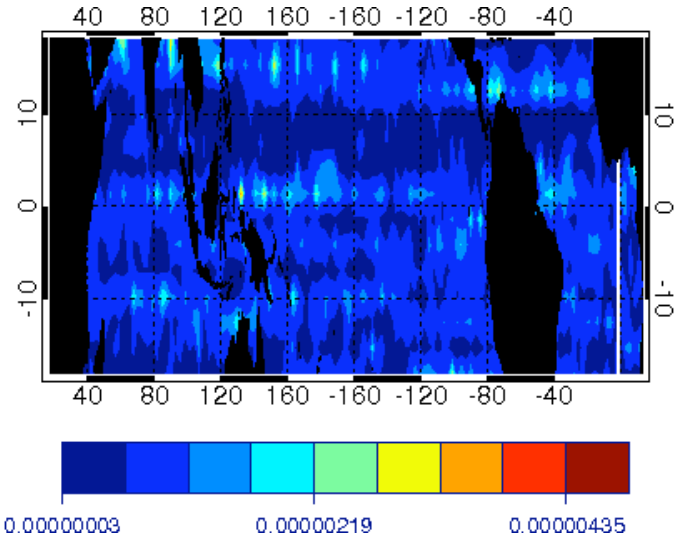

Work to be carried out

1)Get more data from the simulation.

2)Apply EOF to as large a sample as possible.

3)Project the EOF structures on entire simulation data.

4)Compute the mean variance structures of the different modes and examine how they vary for large-scale modes of tropical variability (e.g., MJO).

5)Seek to do similar analysis with diabatic and/or latent heating if it can be made available with a new simulation.


Thank You