Main Accomplishment:

(1) Recommended standardized diagnostics for MJO simulations


(2) Initiated multi-model dynamical MJO forecast (in collaboration with WGNE)
Overall goal:
Facilitate improvements in the representation of the MJO in weather and climate models in order to increase the predictive skill of the MJO and related weather and climate phenomena

Objectives:
• Further development and promotion of process-oriented diagnostics/metrics that facilitate improvements in parameterizations relevant to the MJO
• Develop, coordinate, and promote analyses of the multi-scale interactions and vertical structure associated with the MJO using observations and high-res and multi-scale modeling frameworks.
• Promote the ongoing evaluation of real-time MJO forecasts and multi-model ensemble forecast development
• Expand a boreal summer focus
• Develop and analyze an MJO hindcast experiment to assess predictability as well as forecast skill of the MJO and related phenomena
• Organize workshops and meetings of opportunity to further the work of the Task Force
# Membership

(represented by 5 countries)

(Initial term of 3 years 2009 - 2012)

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
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<tbody>
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<td>Chidong Zhang</td>
<td>RSMAS, University of Miami, USA</td>
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</table>
Approach

• Quasi-bimonthly teleconferences; emails
• Annual meetings (first in Busan, Korea, June 2010, joint with CLIVAR AAMP, 15+ graduate students/postdocs participated with support by NSF )

Themes

• Process-oriented diagnostics
• Northern Summer monsoon ISV diagnostics/metrics
• Dynamical model MJO/ISO hindcasts
• Real-time forecast of the MJOand its impacts (including TCs and higher latitude effects) and operational verification metrics

Website

http://www.ucar.edu/yotc/mjo.html
(supported by Pam Johnson via the US THORPEX Executive Committee)
Process-Oriented Diagnostics
– to help identify and correct model deficiencies

• precipitation-moisture relationship

Composite of Relative Humidity
Process-Oriented Diagnostics
– to help identify and correct model deficiencies

• precipitation-moisture relationship

(Zhu et al 2009)
Process-Oriented Diagnostics
– to help identify and correct model deficiencies

• diabatic heating profile

TRMM  |  Reanalyses  |  Models

[Images of data plots for TRMM, Reanalyses, and Models]
Northern Summer Monsoon ISV Diagnostics/Metrics
– characteristic northward propagation

(Annamalai and Sperber 2005)
Dynamical Model MJO/ISO Hindcasts
(January 1 1989-Oct 31 2009)
led by Bin Wang (UW)

Objectives:
– understand the physics of the MJO/ISO and their prediction;
– assess intraseasonal predictability;
– help model improvement;
– develop multi-model ensemble (MME) prediction

Experimental Design:

Exp 1: Climate simulations (CGCM or AGCM)

Exp 2: Hindcasts
• start on the 1st, 11th, and 21st of each calendar month
• integrate for $\geq 45$ days
• include $\geq 5$ ensemble members

Participation: 19 models from 10 countries
Dynamical Model MJO Forecasts

U.S. CLIVAR International CLIVAR
WCRP - WWRP/THORPEX YOTC MJO Task Force

Led by Jon Gottschalck (NCEP/CPC)

Center Participation

US – NCEP
ECMWF
United Kingdom
Brazil
US – NRL
India
Taiwan
Australia
Japan
Canada – CMC

10 operation centers, 20 data streams, 13 ensemble forecasts (with 4 – 51 members)
Dynamical Model MJO Forecasts
GEFS MJO Index Forecast Skill

Keyed to MJO Initial Phase

Keyed to MJO Forecast Phase
Dynamical Model MJO Forecasts

Verification

Bivariate Correlation for MJOTF Models

\[
COR(\tau) = \frac{\sum_{i=1}^{N} [a_1(t)b_1(t, \tau) + a_2(t)b_2(t, \tau)]}{\sqrt{\sum_{i=1}^{N} [a_1^2(t) + a_2^2(t)] \sqrt{\sum_{i=1}^{N} [b_1^2(t, \tau) + b_2^2(t, \tau)]}}
\]

Bivariate RMSE for MJOTF Models

\[
RMSE(\tau) = \sqrt{\frac{1}{N} \sum_{i=1}^{N} [a_1(t) - b_1(t, \tau)]^2 + [a_2(t) - b_2(t, \tau)]^2}
\]
Dynamical Model MJO Forecasts

On-going activities:
(1) Evaluate real-time MJO prediction skill
(2) Design MJO forecast metrics
(3) Assess MJO forecast impact
   – Tropical cyclone activity
   – Extreme rainfall events
   – Cold air outbreaks
   – Wet/dry monsoon periods
   – ENSO
(4) Develop multi-model ensemble forecast
MJOTF-CLIVAR Linkage

- Asian-Australian Monsoon Panel (AAMP)
- Variability of the American Monsoon Systems (VAMOS)
- Variability of the African Climate System Panel (VACS)
- Working Group on Seasonal and Interannual Prediction (WGSIP)
- CLIVAR/LOC-GOOS Indian Ocean Panel (IOP)
- Pacific Implementation Panel (PIP)
- Atlantic Implementation Panel (AIP)

MJOTF-VAMOS Synergy

- Applications of MJO TF forecast products
- Targeted assessment of forecast skill of MJO impact
- IASCLIP Forecast Forum + MJO TF forecast