

## Recommendation on the Madden-Julian Oscillation Working Group

Prepared by US CLIVAR MJO Working Group &

Asian-Australian Monsoon Panel (AAMP)

January 5, 2009

The Madden-Julian Oscillation (MJO) Working Group was formed by US CLIVAR in spring of 2006 as a targeted working group with a 2 year term, consistent with other working groups established by the US CLIVAR program. The terms of reference were as follows:

- Develop a set of metrics to be used for assessing MJO simulation fidelity and forecast skill.
- Develop and coordinate model simulation and prediction experiments, in conjunction with model-data comparisons, which are designed to better understand the MJO and improve our model representations and forecasts of the MJO.
- Raise awareness of the potential utility of subseasonal and MJO forecasts in the context of the seamless suite of predictions.
- Help to coordinate MJO-related activities between national and international agencies and associated programmatic activities.
- Provide guidance to US CLIVAR and Interagency Group (IAG) on where additional modeling, analysis or observational resources are needed.

The initial membership was: D. Waliser (JPL/co-chair), K. Sperber (PCMDI/co-chair), S. Schubert (GSFC/NASA), K. Weickmann (PSD/NOAA), B. Wang (U.Hawaii), W. Wang (NCEP/NOAA), C. Zhang (U. Miami), M. Moncrieff (NCAR), E. Maloney (CSU), L. Donner (GFDL, since replaced by B. Stern). In the meantime, the group has grown through the active participation of a number of additional scientists, including H. Hendon (ABOM), M. Wheeler (ABOM), J. Gottschalck (NCEP/NOAA), S. Woolnough (U. Reading), N. Savage (UKMO), F. Vitart (ECMWF), and D. Kim & I. Kang (SNU). In addition, the [mjo-atlarge@usclivar.org](mailto:mjo-atlarge@usclivar.org) email list has many other interested participants, and in total numbers about 40 (checking on this).

For working group meetings and the workshop mentioned below, International CLIVAR provided travel support for a number of key international participants.

The accomplishments to date of the MJOWG include:

- Development of a web site (<http://www.usclivar.org/mjo.php>) that includes general reference material on the MJO, theme pages on its interactions with other weather and climate phenomena, and a cataloguing of the telecons and relevant meetings.
- A workshop on **New Approaches to Understanding, Simulating, and Forecasting the Madden-Julian Oscillation**, held at the Beckman Center in Irvine, CA in November 2007. See meeting summary, [Sperber and Waliser, 2009, Bull. Am. Meteor. Soc., In Press.](#)
- Development of a set of diagnostics for evaluating model simulations of the MJO. This includes diagnostics for all-season, summer, and winter, includes a number

of relevant variables and multivariate diagnostics, both simple and relatively sophisticated diagnostics, the plots to use for model-data comparisons, and the code to calculate the diagnostics. See MJOWG website or posted on the MJOWG web site or direct link at: [http://climate.snu.ac.kr/mjo\\_diagnostics/index.htm](http://climate.snu.ac.kr/mjo_diagnostics/index.htm). This effort has recently been published, with reference: CLIVAR Madden-Julian Oscillation Working Group, MJO Simulation Diagnostics, *J. Climate*, In Press. These diagnostics have recently been incorporated into the next release of the NCAR/NCL analysis software.

- Application of the above diagnostics to a contemporary set of coupled and uncoupled climate model simulations, including GFDL CM2, ECHAM/OPYC, NASA GEOS5, NCAR CAM3.5, NCAR (experimental) CAM3.z, SNU, SuperParameterized-CAM, and NCEP CFS. This effort has recently been submitted, with reference: Kim, Sperber, Stern et al., Application of MJO Simulation Diagnostics to Climate Models, *J. Climate*, Submitted.
- Development and operational implementation of an MJO forecast metric for application to extended-range deterministic and ensemble forecasts. Through the support and collaboration of WGNE, participation in this activity includes ECMWF, UKMO, CMA, BMRC, NCEP, JMA and CPTEC. At this time, the centers are sending their MJO forecast data to CPC/NOAA for uniform, real-time web presentation and potential use and development of a multi-model ensemble MJO prediction (contact [Jon.Gottschalck@noaa.gov](mailto:Jon.Gottschalck@noaa.gov)). See October 2008 CLIVAR Exchanges article by Gottschalck et al. for more information. A journal article is presently being prepared for BAMS.

The initial term of the working group has now expired and it is time to consider formation of a new working group with a refined focus. The 9<sup>th</sup> session of the AAMP received a briefing on the above accomplishments and is strongly supportive of the formation/continuation of the MJOWG because the proposed focus (continued development of MJO diagnostics and metrics for improved simulation and prediction of the MJO) is fully aligned with the scientific program that the AAMP is trying to advance. From the perspective of the AAMP, the original MJO WG was a success because

- 1) The MJO WG had a focused, targeted mission with a fixed 2 yr term.
- 2) The MJO WG had strong and enthusiastic leadership and participation from more than a dozen international experts.
- 3) The mission/focus of the MJO WG was extremely timely and relevant to improved prediction and simulation of the monsoon, and the tropics in general.
- 4) The MJO WG delivered precisely what it proposed: a set of diagnostics for assessment of the simulation of the MJO, and further applied these to a set of contemporary GCMs relevant to CLIVAR as well as developed/refined a MJO forecast metric that has since been adopted by a number of operational centers.
- 5) The MJO WG was financially supported by the US CLIVAR program, with contributions from the International CLIVAR office.

This modest level of financial support allowed for one Working Group meeting and one scientific workshop, where the scientific basis, utility, and progress of the development of the MJO simulation diagnostics and forecast metrics were discussed and refined. The one-on-one contact at the workshops clearly impacted the group's commitment to the project, which is reflected in the scientific papers and web site developed by the WG.

Looking forward, the AAMP would like to see a new MJO WG formed that has a similar 2 year term, tight focus, and international participation that might possibly sit across WWRP (THORPEX) and WCRP (CLIVAR). The MJO WG has already had success in getting WGNE to support their activity of forecast verification of the MJO at operational centres worldwide. This sort of activity needs to be further developed and coordinated to ensure uptake of the products developed by the WG. Moreover, the activities of the MJOWG are closely aligned with objectives of the CLIVAR Pacific Panel and the Working Group on Seasonal to Interannual Prediction (WGSIP). From this perspective, the proposed foci of the new group includes the following:

- Further development of process-oriented diagnostics/metrics that improve our insight into the physical mechanisms for robust simulation of the MJO and that facilitate improvements in convective and other physical parameterizations relevant to the MJO.
- Analysis of the multi-scale interactions within the context of convectively-coupled equatorial waves, both in observations and by exploiting recent advances in high-resolution modeling frameworks, with particular emphasis on vertical structure and diabatic processes. (synergies with YOTC, CMMAP, CASCADE, AMY, etc).
- Expand efforts to develop and implement MJO forecast metrics under operational conditions, including boreal summer focus and multi-model ensemble development.
- Develop an experimental modeling framework (e.g., hindcast experiment/dataset) to assess MJO predictability as well as forecast skill of the MJO and closely related phenomena from contemporary/operational models.

Support from the WWRP/WCRP would be required to host a working group meeting (late 2009) and a workshop (late 2010). Both these venues greatly contributed to the success of the MJOWG's past activities. The AAMP is willing to act as the host of the new MJO WG if that is appropriate. However, the AAMP would strongly urge CLIVAR to push this activity as a cross-cutting activity in WWRP/WCRP, with connections to the Pan-WCRP monsoon activity, the CLIVAR Pacific Panel, WGSIP and YOTC.