

Recommendation for a Task Force on Intraseasonal Variability / Madden-Julian Oscillation

Prepared by US CLIVAR MJO Working Group &

Asian-Australian Monsoon Panel (AAMP)

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SUMMARY

A recommendation for the continuation/renewal of the (formerly US CLIVAR) MJO Working Group as a Task Force, with a two-year focused agenda on model simulation and forecast improvements, and assessments of MJO predictability and forecast skill, with international participation and sponsorship from both WWRP and WCRP/THORPEX – namely via WGNE, YOTC and WCRP’s pan-monsoon cross-cut activity, which includes CLIVAR/AAMP/IOP/VAMOS/WGSIP and GEWEX.

The Madden-Julian Oscillation (MJO) Working Group (hereafter MJOWG) 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), D. Kim (SNU) and I.-S. Kang (SNU). In addition, the mjo-atlarge@usclivar.org email list has many other interested participants, and in total numbers about 40.

For working group meetings and the workshop mentioned below, International CLIVAR provided travel support for a number of key international participants. This modest level of financial support provided the opportunity to synthesize and refine the scientific basis, utility, and progress of the development of the MJO simulation diagnostics and forecast metrics. Additionally, the support clearly impacted the group’s commitment to the project, which is reflected in the scientific papers and web site developed by the WG.

The accomplishments to date of the MJOWG include:

- I. 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 cataloging of the teleconferences and relevant meetings.
- II. 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, 2008, Bull. Am. Meteor. Soc., 89, 1917-1920 (DOI: 10.1175/2008BAMS2700.1).
- III. 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. 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.
- IV. Application of the above diagnostics to a contemporary set of coupled and uncoupled climate model simulations, including GFDL CM2, ECHAM4/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.
- V. 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, CMC, 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). 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 expired. However, there have been strong recommendations for follow-on activities stimulated by the MJOWG and the MJO Workshop (see item II above). Coordination of such activities would greatly benefit from the continuation of an MJOWG, in some form, with a refined focus.

In addition, the 9th session of CLIVAR's Asian Australian Monsoon Panel (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 MJOWG was a success because

- 1) The MJOWG had a focused, targeted mission.
- 2) The MJOWG 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.

Looking forward, a new MJO-focussed activity would benefit a number of WCRP+WWRP components would like to see a new MJOWG formed. It has been suggested that this be in the form of a Task Force, with a similar 2 year term, tight focus, and international participation through sponsorship from both WWRP and WCRP. The MJOWG 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 and follow-on Task Force. Moreover, one of the five target phenomena identified by the YOTC Science Plan is the MJO and this Task Force would serve a valuable purpose in helping to shepherd the MJO research activities of YOTC. For example, it is proposed that the Asian Monsoon Year (AMY) and THORPEX programmatic/scientific entities perform similar functions for the monsoon and tropical-extratropical target phenomena of YOTC; having a similar entity for the MJO will be very valuable to YOTC. Moreover, the activities of the Task Force will contribute to the objectives of the WCRP monsoon cross-cut activities, the Working Group on Seasonal to Interannual Prediction (WGSIP), and the GEWEX Modeling and Prediction Panel. **From this perspective, the proposed foci of the Task Force 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). For this item, the MJOWG would help design modeling experiments in the context of YOTC, CMMAP, and/or CASCADE to best utilize the available data resources with focus on multi-scale and vertical processes.
- 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.
- Interaction with the proposed activity to simulate monsoon ISOs under the WCRP monsoon cross cut activity led by T Yasunari, including application of MJO diagnostics to outputs and integration of these simulations with the overall MJO experimental modeling framework.

Support for the formation of this Task Force is requested from WCRP and WWRP. The only significant funding support would be for workshop/group meetings late 2010 and late 2011. Both these types of types of event greatly contributed to the success of the MJOWG's past activities.