

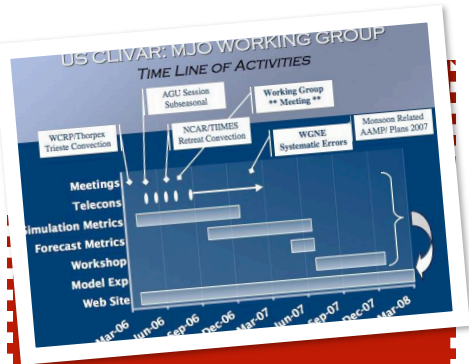
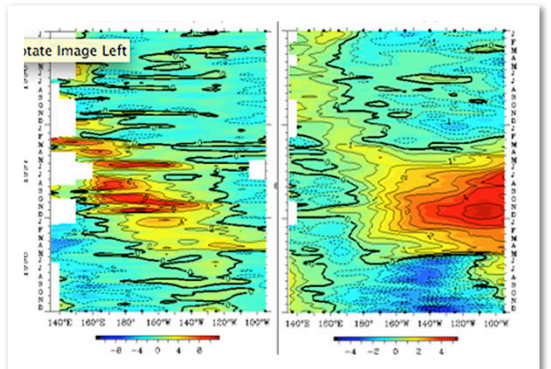
The Role of the MJO in Climate

U.S. CLIVAR - CLIMATE VARIABILITY AND PREDICTABILITY

There is a growing interest in the bridge between weather (hours to days) prediction and seasonal climate prediction. The Madden-Julian Oscillation (MJO) represents a repeatable, low-frequency phenomena and encompasses the weather-climate connection. The MJO's importance among the subseasonal phenomena is similar to that of El Niño - Southern Oscillation among the interannual phenomena. In order to assess the MJO simulation fidelity and forecast capability in climate models, a set of metrics must be developed. From these metrics, prediction experiments will be designed to improve sub-seasonal forecast capabilities.

MJO IMPACT ON ENSO PREDICTION

Many atmospheric weather phenomena act as stochastic forcing to ENSO. The most effective one is strong episodes of surface westerly wind, often referred to as westerly wind bursts (WWB) or westerly wind events (WWE). The strongest, long-lasting and eastward moving equatorial WWE are mostly associated with the MJO. Many observations have shown anomalously strong MJO activities prior to and during the onset of ENSO warm events (see figure). But, the extent to which ENSO can be satisfactorily predicted with or without the MJO is the ultimate test of the role of the MJO in ENSO. None of current ENSO prediction models, dynamic as well as statistical, includes the MJO. It is a challenge, therefore, to improve ENSO prediction (better estimates of ENSO evolution and prediction uncertainties) by incorporating our knowledge of the MJO seasonal and interannual statistics into ENSO prediction models while developing models that can reproduce MJO-ENSO interaction.



MJO Working Group

The U.S. CLIVAR MJO working group brings together an international group of scientists interested in better understanding the MJO. This group will host a large science meeting the summer of 2007. Additional information can be found on their website:

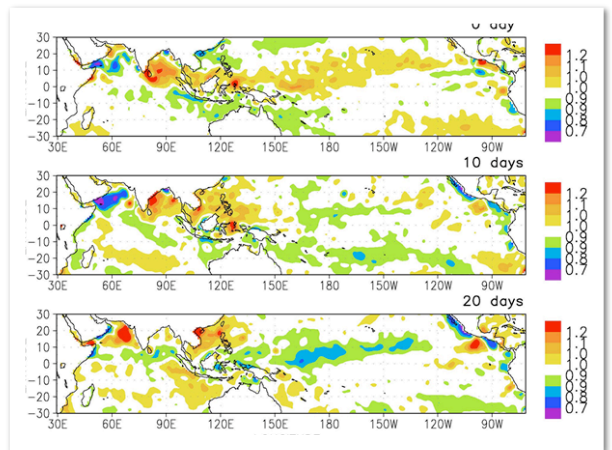
http://www.usclivar.org/Organization/MJO_WG.html

Madden Julian Oscillation Metrics

Level 1 metrics are meant to provide a basic indication of the spatial and temporal intraseasonal variability that can be easily understood and/or calculated by the non-MJO expert (e.g., graduate student, modeler). Ease

of use at this stage dictated that the analytic procedures be as similar as possible for summer and winter, with separate calculations performed for each season. Additional information available on the MJO website.

OPPORTUNITIES - Analysis of satellite ocean color and rainfall data shows that the MJO produces systematic and significant variations in ocean surface Chlorophyll (Chl) in a number of regions across the tropical Indian and Pacific Oceans. The results are seasonally dependent, with the main regions of variation in boreal summer (see figure - ocean surface chlorophyll from SeaWiFS) being the northern Indian Ocean, a broad expanse of the northern tropical Pacific Ocean and a number of regions in the far eastern Pacific Ocean. In the boreal winter, MJO-induced variations are strongest in the northwest Indian Ocean, over broad areas of the western and central Pacific, and coastal Mexico. Two avenues of further investigation include: 1) examine historical fish-catch data to determine if the influence of the MJO on Chl extends to an impact on fish abundance, and 2) use bio-physical ocean models with satellite data to determine more specifically the mechanisms responsible for the observed MJO-Chl relationship.



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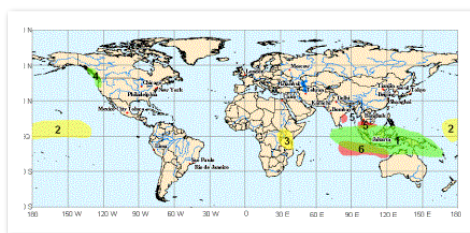
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FOR ADDITIONAL
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FUTURE PAYOFFS

GLOBAL BENEFITS AND HAZARDS

In order to exploit improved understanding of the MJO and its associated impacts in the short-term, the Climate Prediction

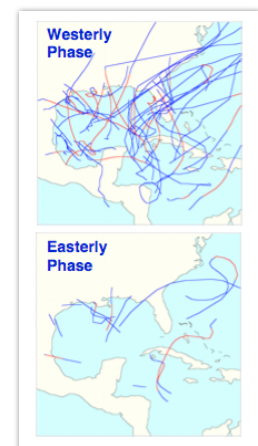


Center (CPC) has developed an experimental global tropics Benefits/Hazards Assessment and Outlook. The product is issued weekly and currently includes (i) outlooks for above and below normal precipitation, (ii) areas with favorable and unfavorable conditions for

tropical cyclogenesis, and (iii) areas with impacts from existing tropical cyclones. The experimental product bridges the gap between climate and weather and has many diverse applications in various sectors of the economy (including the financial, energy, agriculture, water resource management and fire weather sectors).

MJO AND HURRICANE FORECASTS

Given the evidence that the MJO is predictable with 2-3 week lead-times, periods of enhanced or suppressed hurricane activity may be predicted at similar lead times. Such knowledge would have implications for public



safety, energy production, recreation/tourism, among other interests. Two avenues of further investigation include: 1) understanding how the MJO modulates hurricane activity, and 2) determining whether 2-3 week predictions of the MJO can be used to predict periods of enhanced tropical cyclone activity.

