

S2S Monsoon Subproject Plan

Below is a sketch of some research elements that could form the basis of a Monsoon subproject for Sub-seasonal to Seasonal Prediction Project in the coming 5 years. This list is not meant to be exhaustive but rather highlight a small number of items that are best suited to the S2S project and more ready for immediate action.

Key resources for the S2S Monsoon project include:

- **The S2S database, including both the realtime forecasts and hindcasts as they become available. The S2S database will be suitable both for evaluation of hindcast skill and also for demonstration of provision of real-time forecast products**
- The **ISVHE archive**, which is currently the most comprehensive hindcast database targeting the sub-seasonal time scale

Project 1. Forecast Products/Metrics that target Monsoon Intraseasonal Variations at Multiweek lead times in operational sub-seasonal to seasonal forecasts. Monsoons vary strongly at intraseasonal time scales and these variations have strong societal impacts such as on agriculture, water resource management, transportation, and health. Much of the monsoon intraseasonal variability is contributed by the MJO and its northern summer counterpart (the MISO), hence multiweek prediction of the monsoons should be feasible. A set of monsoon forecast products and metrics are required that specifically target monsoon intraseasonal variability and especially are amenable to application to (multi-model) ensemble prediction systems for which forecast products will necessarily be presented as shifts in background probabilities. Many NMC maintain their own set of monsoon forecast products but a unified/seamless approach is typically lacking and there are very few available products that target multiweek ensemble (probabilistic) prediction. The initial target for the forecast products will be rainfall and temperature, especially the extreme occurrences on ~weekly time scales. The forecast metrics will necessarily target dynamical linkages so as to provide insight into model error. These new forecast products and metrics can be used both as part of a seamless prediction system (eg tying in with the Severe Weather Forecasting Demonstration project that target predictions to 5 days) and also to monitor and evaluate forecast model performance for depiction of monsoon intraseasonal variability.

The new CLIVAR-GEWEX monsoon panel can take the lead in developing the metrics/products with a necessarily unified approach across all key monsoon systems. A set of intraseasonal forecast products/metrics can be implemented and maintained when the S2S database is up and running in real time similar to the MJO prediction Project that is fostered by WGNE/MJOTF. Similar support from WGNE for implementing the experimental

products in operational systems will also be sought. Provision of expected forecast skill (and necessary calibration) can be provided based on the available hindcast sets and will necessarily link with the S2S verification subproject.

Objective and Deliverables:

1) Development of a set of societally and scientifically relevant intraseasonal forecast products/metrics that are applicable to all of the major monsoon systems and which can be maintained and monitored with operational real time forecast systems

2) Provision of some demonstration forecast products that can be produced in real time at NMC

3) Provision of the multiweek forecast skill based on hindcast evaluation.

4) Provision of assessment of monsoon intraseasonal predictability across all key monsoon systems

Calendar:

2014: The CLIVAR-GEWEX Monsoon Panel will be constituted by July 2014, at which time they can agree to take the lead role in developing a recommended set of forecast products/metrics that target monsoon intraseasonal variability in all key monsoon regions.

2015-2017: Development of suitable forecast products and metrics with focus on weekly extreme rainfall and temperatures out to lead time ~6 weeks using available ISVHE and S2S archives

2018-Provision of expected forecast skill and implementation of a few demonstration products in real time at NMC

Links with CLIVAR-GEWEX Monsoon Panel, WGNE, MJOTF, S2S Verification Project, WGSIP and SWFDP,

2. Case studies of Monsoon Onset

Monsoon onset is an important meteorological phenomenon each year and the capability to predict it weeks ahead could have broad societal benefit. In many monsoon systems, the onset is associated with intraseasonal variability, predominantly the MJO or its northern summer counterpart (the MISO), so multiweek predictability of onset should be feasible.

The S2S and ISVHE databases can be used to assess predictability of onset every year for the various monsoon systems. Insight into model capability can be assessed by examining the modulation of the monsoon by the MJO/MISO in the models.

Objectives and deliverables:

- 1) Compilation of monsoon onset every year spanning the S2S/ISVHE data base for each of the main monsoon regions and identification of key process associated with onset each year.
- 2) Evaluation of the multiweek forecast skill to predict onset for each monsoon using the multi-model ensemble
- 3) Assessment of the representation of monsoon onset in the forecast models so as to guide forecast model development

Calendar:

2014: The CLIVAR-GEWEX Monsoon Panel will be constituted by July 2014, at which time they can agree to take the lead role in identifying monsoon onset in key monsoon regions for period that spans ISVHE/S2S

2015-2017: Assessment of monsoon onset across available S2S forecast models and identification of predictable/nonpredictable events

2018-CLIVAR-GEWEX Monsoon Panel to discuss whether other key monsoon events (e.g. specific flooding episodes) could be targeted for multiweek predictability studies.

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