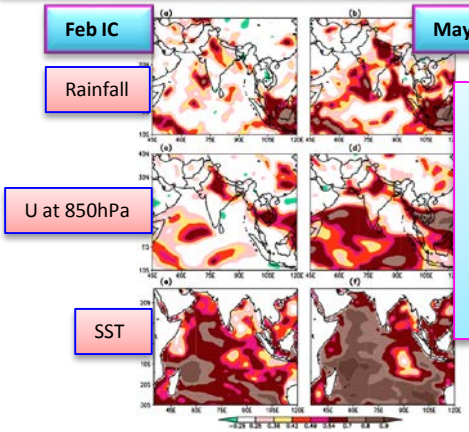
Predictability and Prediction of Indian Summer Monsoon by CFSv2: Implications of the Initial Shock Effect

Shukla RP, Huang B, Marx L, Kinter JL and Shin C.-S

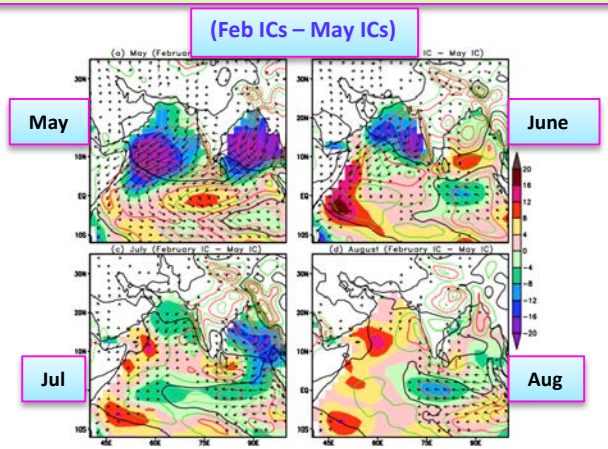
- Hypothesis: Reforecasts from May ICs are influenced more strongly by initial shock than Feb ICs leading to reduced prediction skill for Indian summer monsoon rainfall (ISMR)

Prediction skill of JJAS mean Rainfall, U850 and SST in predictability experiments

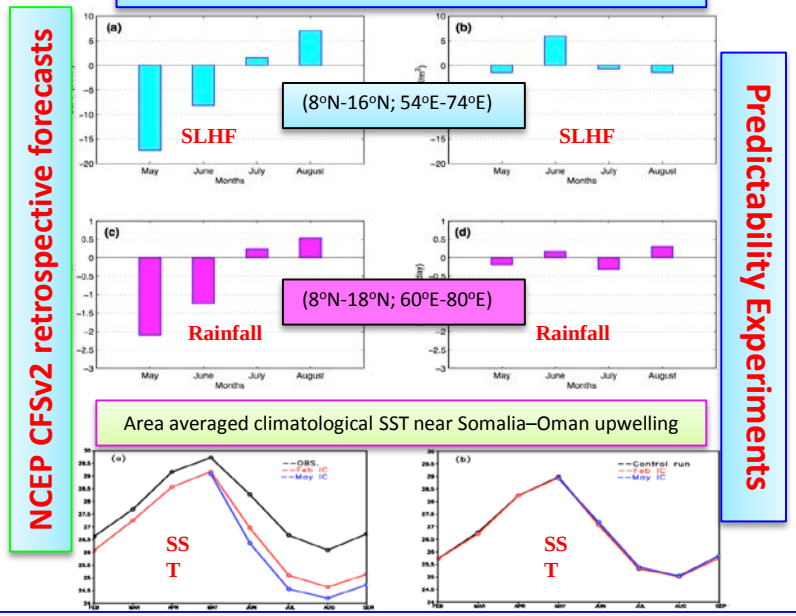


In a perfect model scenario, the skill in predicting JJAS mean Indian monsoon and the SST and circulation in the region decreases with lead time, with the initial states with the shortest lead (May ICs) having the highest skill, on average.

Climatological difference of **SLHF (shading)**, **rainfall (contours)**, **10m-wind (vectors)** between forecast initialized with Feb ICs and May ICs for 1982-2009 (**from observed ICs**).



Retrospective Forecasts vs. Predictability Experiments



Area averaged climatological SST near Somalia–Oman upwelling

Conclusions:

1. A fundamental difference between predictability runs and reforecasts is that the latter are strongly influenced by the model climate drift, including the initial shock, while those influences are practically absent in the former.
2. This analysis supports the hypothesis that the stronger influence of the initial shock in the NCEP CFSv2 hindcasts with May initial states, particularly over the Arabian Sea, inhibits prediction skill for the Indian monsoon, in comparison to those with February initial states.

Implications for Observations:

1. Initialization shock stems from model error and insufficient observations, primarily of the upper ocean, to constrain initial conditions. Addressing the first will require improved parameterizations of processes controlling tropical circulation and convection.
2. Also need more complete and accurate observations of the upper Indian Ocean and surface fluxes.

Shukla RP, Huang B, L. Marx, Kinter JL and Shin C.-S(**2017**) Predictability and Prediction of Indian summer Monsoon by CFSv2: Implication of the Initial Shock Effect. Climate Dynamics. DOI: 10.1007/s00382-017-3594-0