

Prediction Skill of North Pacific Variability in NCEP Climate Forecast System Version 2: Impact of ENSO and Beyond

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ABSTRACT

This work examines the impact of El Niño-Southern Oscillation (ENSO) on prediction skill of North Pacific variability (NPV) in retrospective predictions of the NCEP Climate Forecast System version 2. It is noted that the phase relationship between ENSO and NPV in initial condition (IC) affects the prediction skill of NPV. For the average of lead times of 0-6 months, the prediction skills of sea surface temperature anomalies (SSTA) in NPV (averaged SSTA in $(30^{\circ}\text{--}50^{\circ}\text{N}, 150^{\circ}\text{E}\text{--}150^{\circ}\text{W})$ is defined as the NPV index) increase from 0.42 to 0.63 from the cases of out-of-phase relation between the Niño3.4 and NPV indices in IC to the cases of in-phase relation (Fig. 1). Here, the in-phase (out-of-phase) variations of ENSO and NPV are referred to as SSTA having opposite (same) sign for Niño3.4 and NPV indices. It is suggested that when ENSO and NPV are in-phase in IC, ENSO plays a constructive role in the NPV development and enhances its signals. The physical coherence between North Pacific and the tropical central and eastern Pacific favors the model to consistently predict the anomaly in North Pacific. The situation is opposite when they are out-of-phase in IC. The ENSO may be disruptive to the NPV anomalies and, as a result, the intra-ensemble perturbations become more dominant.

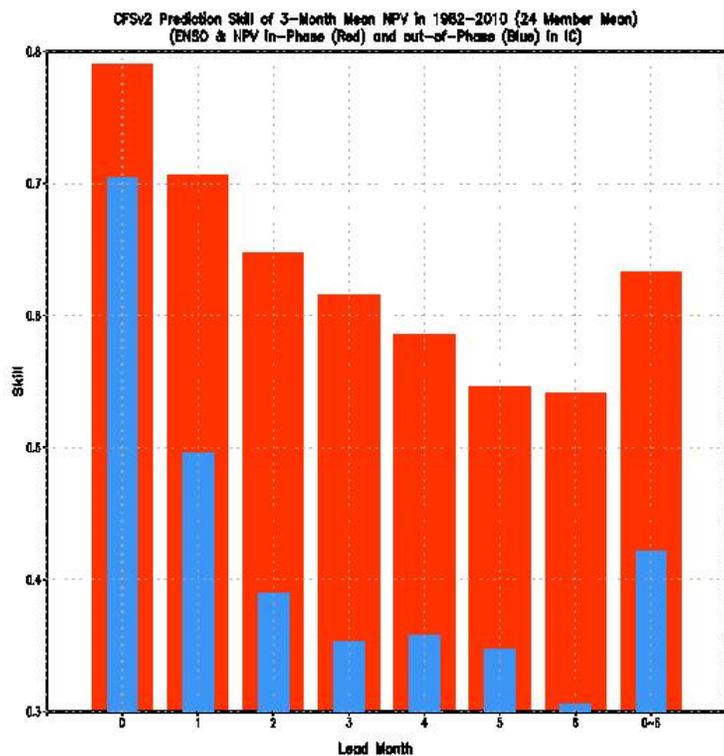


Fig. 1 Dependence of prediction skills of CFSv2 predicted NPV index with IC in January 1982-December 2010 on lead time and phase relationship between Niño3.4 and NPV indices. Red (blue) bars represent the prediction skills of NPV index for in-phase (out-of-phase) variations between Niño3.4 and NPV indices at IC. The most right-hand bar is the average of the skill for 0-6 month lead.

Nevertheless, when ENSO and NPV are out-of-phase, some pronounced positive NPV events are still predictable (Fig. 2). In these cases, North Pacific is dominated by strong positive SSTA, which may overcome the influence from the tropical Pacific and displays predictability. There are little predictive skills for negative SSTA and small positive SSTA when they are out-of-phase. This asymmetry in the prediction skill may suggest that large positive and negative SSTA in N. Pacific may be associated with different physical processes.

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References

- Hu, Z.-Z., A. Kumar, B. Huang, J. Zhu, and Y. Guan, 2014: Prediction skill of North Pacific variability in NCEP Climate Forecast System Version 2: Impact of ENSO and beyond. *J. Climate*, **27**, 4263-4272. doi: <http://dx.doi.org/10.1175/JCLI-D-13-00633.1>

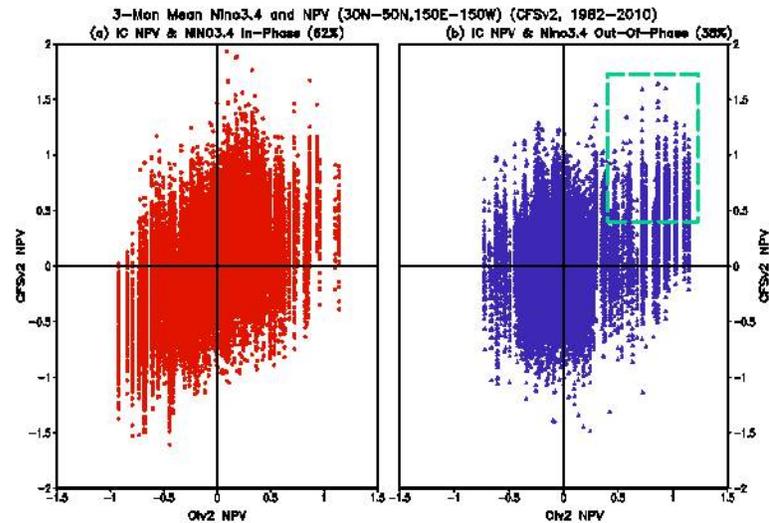


Fig. 2 Scatter of CFSv2 predicted (y-axis) and OIv2 analyzed (x-axis) NPV index for the predictions of 0-6 month lead for all in-phase (a) and out-of-phase (b) variations between Niño3.4 and NPV indices in IC in January 1982-December 2010. The green rectangle box in (b) represents NPV index larger than 0.4°C in both OIv2 and CFSv2.