La Niña impacts on global seasonal weather anomalies: The OLR perspective

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Outline

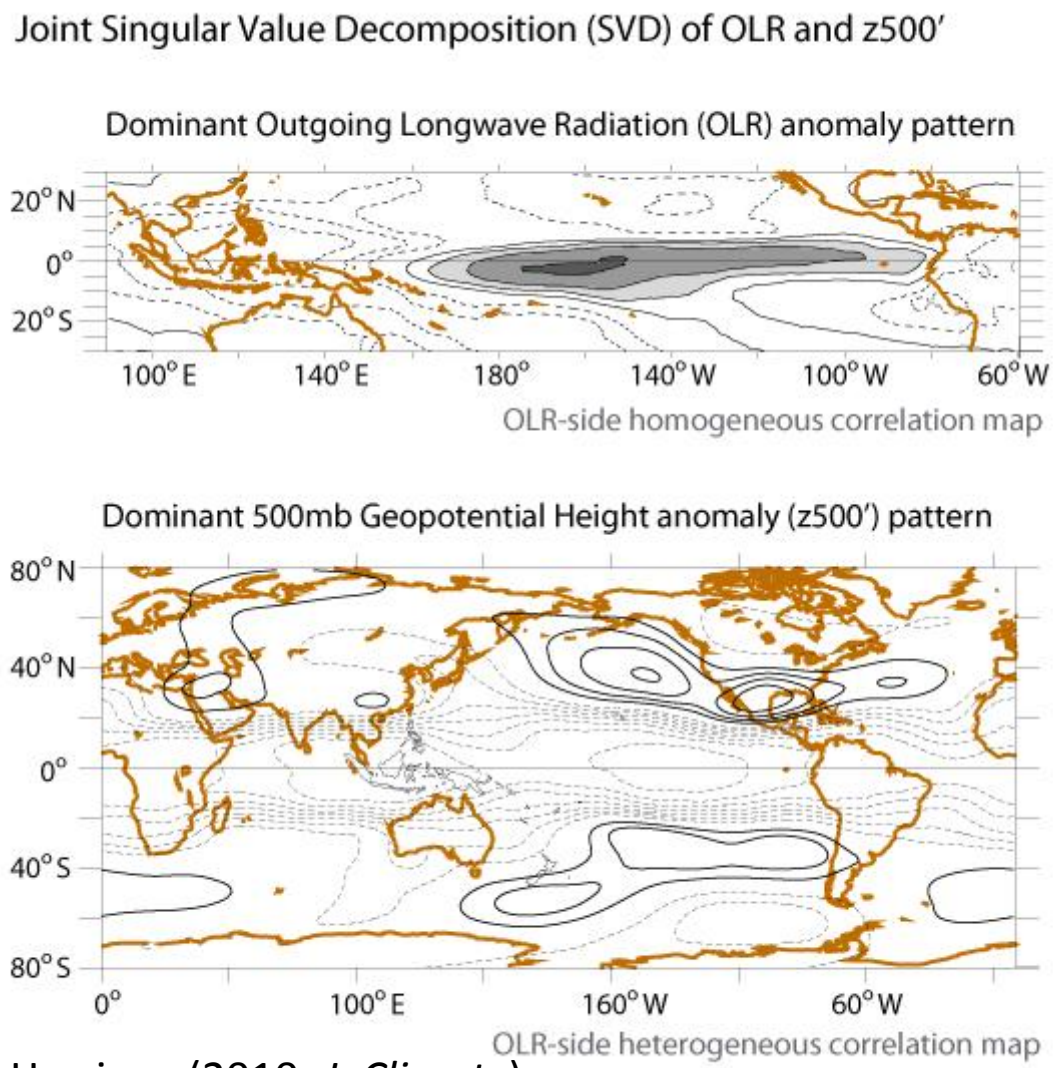
Motivation

- Impacts of the El Nino-Southern Oscillation (ENSO) on seasonal weather anomalies form the basis for skillful forecasts in affected regions around the globe
- We revisit the linkages between ENSO and global weather anomalies amidst debate about how to best identify events for the purposes of seasonal forecasting
- We have found success looking at **O**utgoing **L**ongwave **R**adiation (proxy for deep convection/atmos. heating in tropics) information in the warm-ENSO (El Niño) case

Results

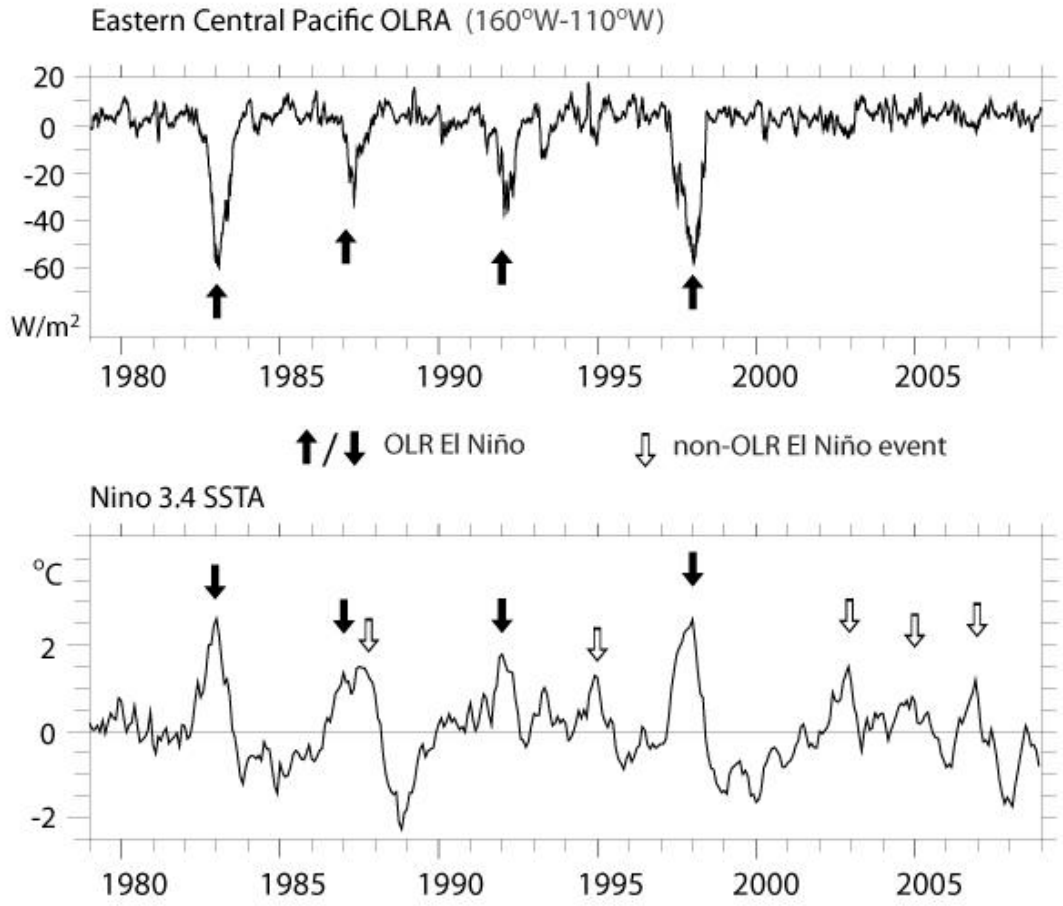
- Propose OLR-based index for cool-ENSO (La Niña)
- Examine links between OLR La Niña index and global atmos. circulation and precipitation anomalies.

The dominant mode of tropical OLR and global atmospheric circulation co-variability suggests looking at least across the full tropical Pacific for indicators of ENSO forcing



From Chiodi and Harrison (2010, *J. Climate*)

The El Niño case: OLR behavior over the eastern central tropical Pacific offers an interestingly unique perspective on El Niño

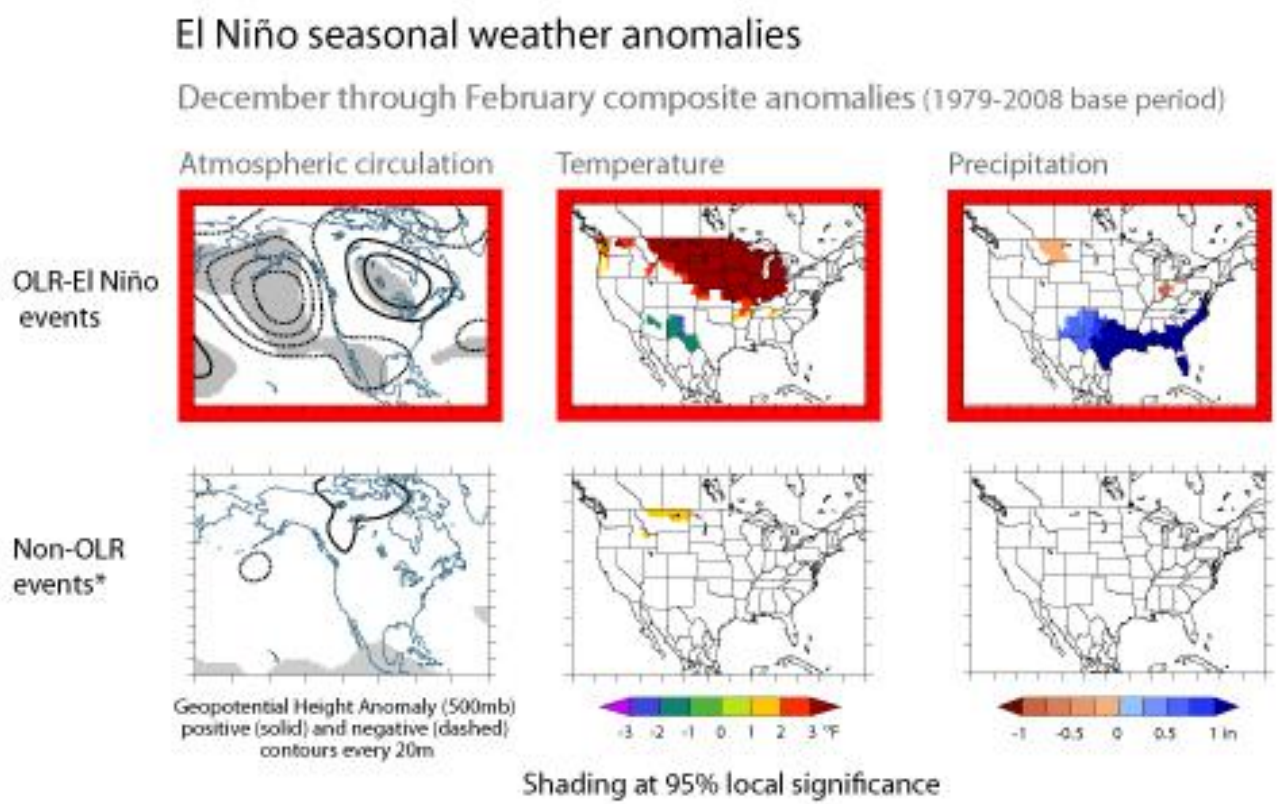


Four events in the time for which OLR information is available are unambiguously distinguished by OLR behavior over the eastern central Pacific

Other years in this period have ENSO status based on the commonly used definitions (SSTA, SOI) but are not distinct based on OLR

From Chiodi and Harrison (2012, *J. Climate*)

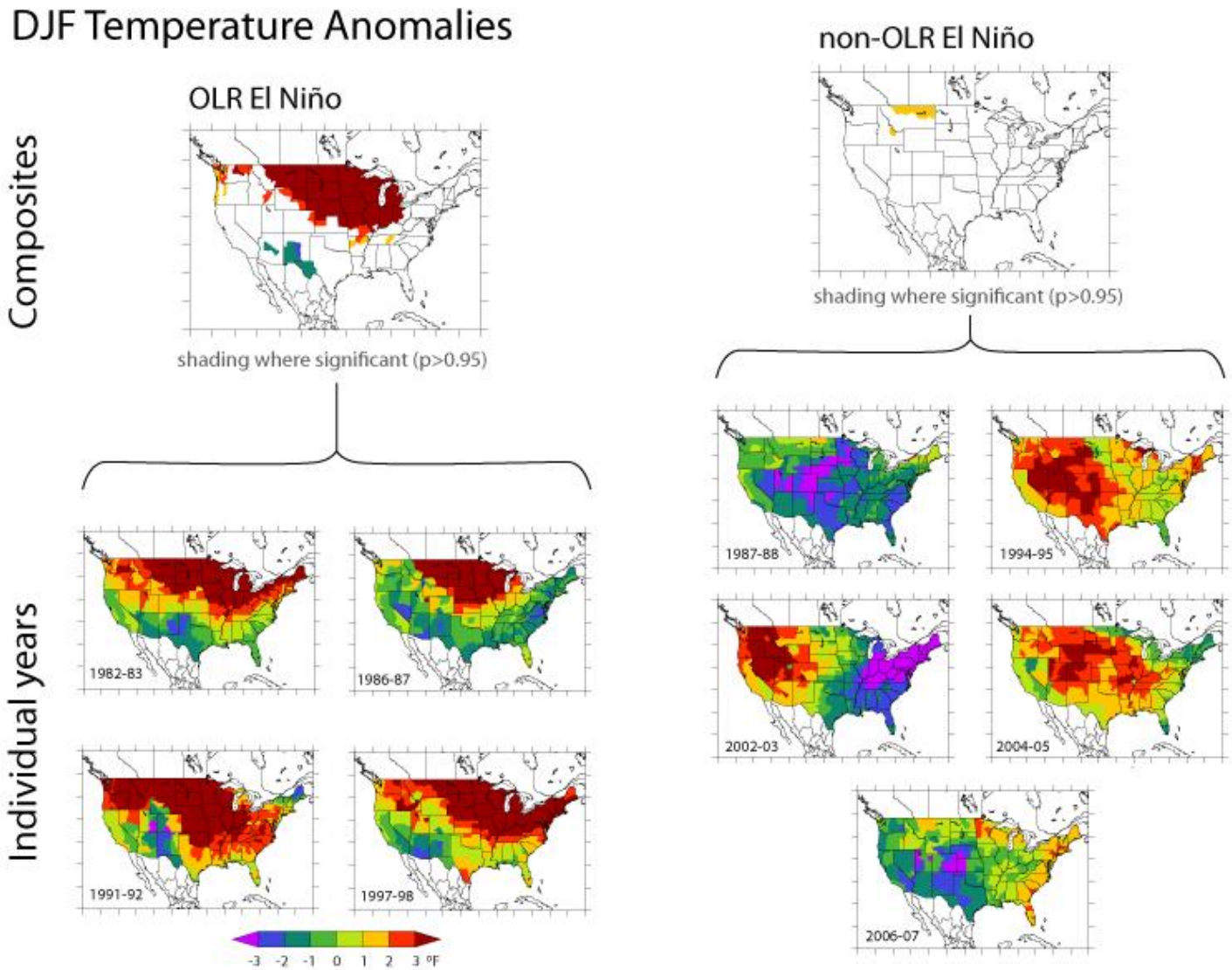
The OLR El Niño events have statistically significant impacts on U.S. seasonal weather conditions. Composites over the non-OLR years show little statistically significant anomaly



Most of the useful U.S. seasonal weather impact of El Nino is associated with the events identified by the OLR-El Nino index

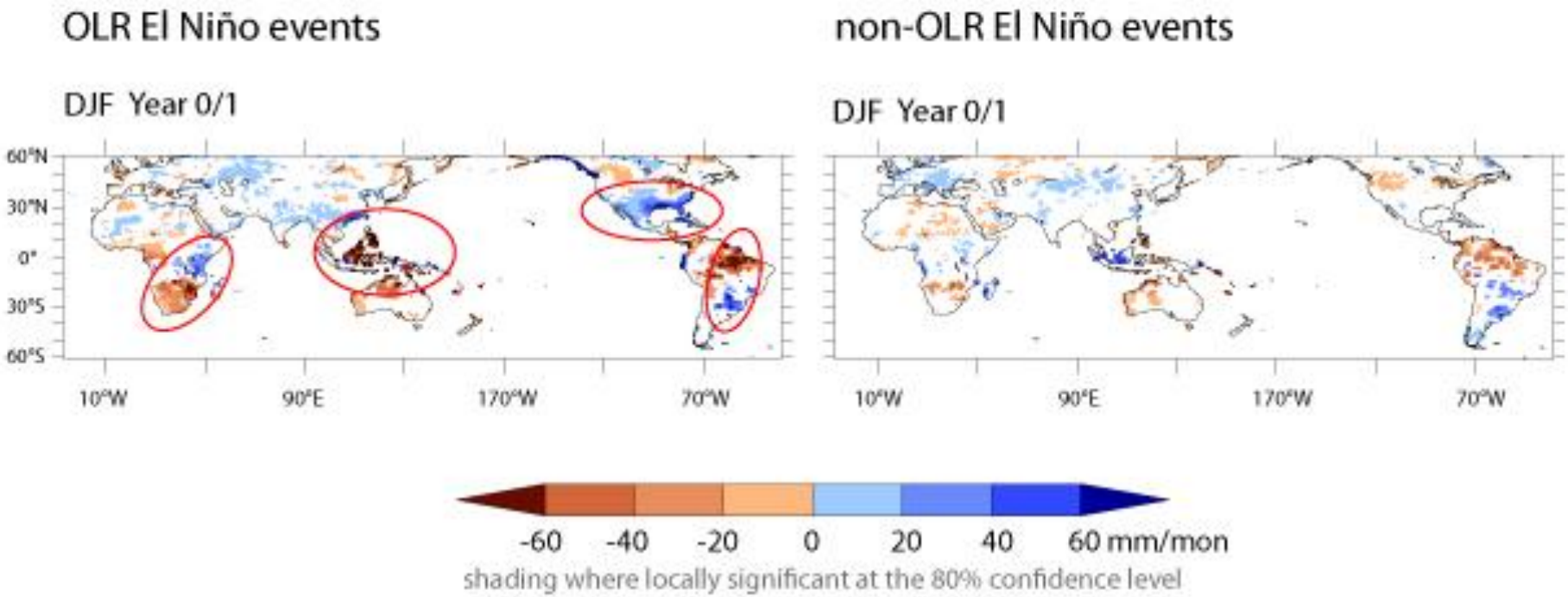
From Chiodi and Harrison (2012, *J. Climate*)

Looking at the individual years confirms that anomalies seen among the OLR-identified years are consistent from year to year; not so for the other years



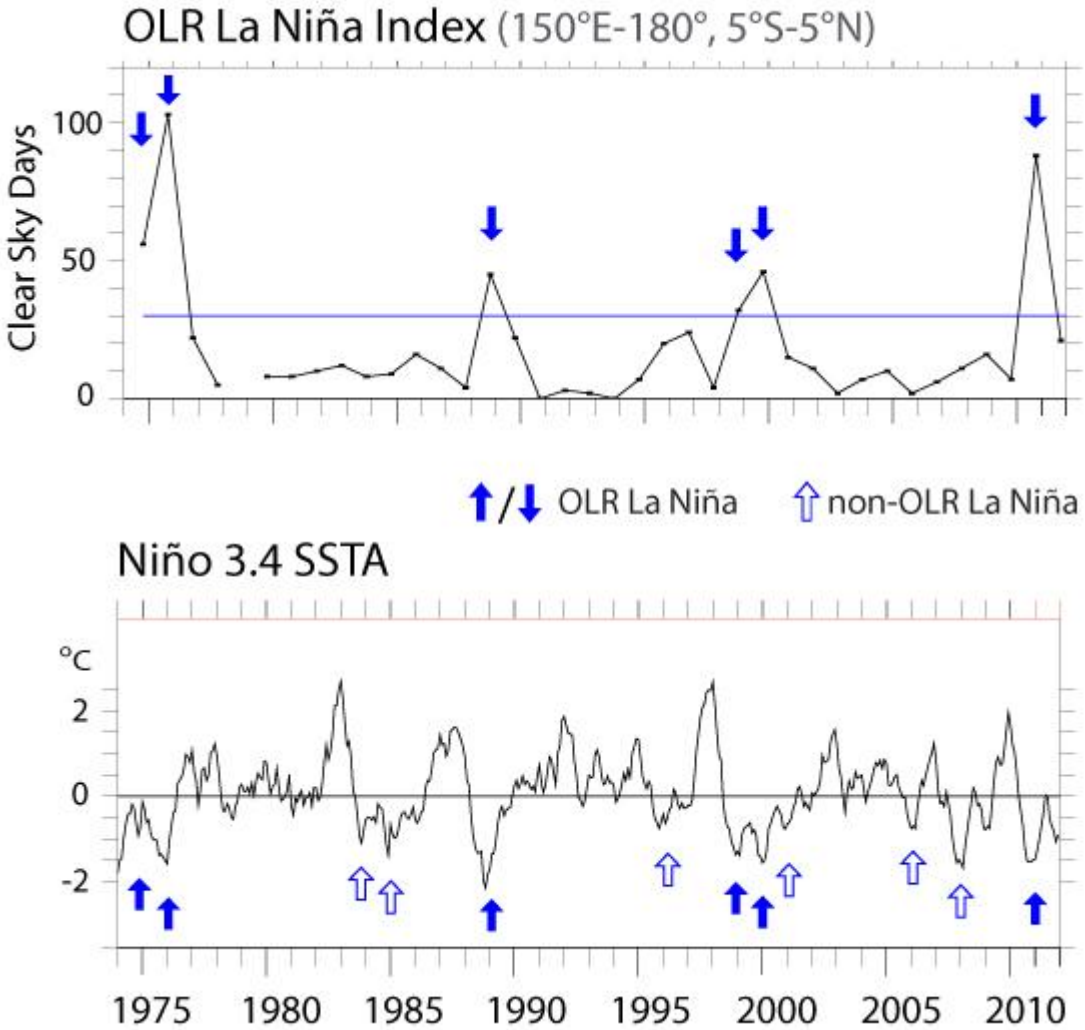
From Chiodi and Harrison (2012, *J. Climate*)

We suggest that distinguishing OLR El Niño events from others will directly benefit seasonal forecasting efforts in many ENSO affected regions around the globe (OLR observations typically do this by the end of November Year 0)



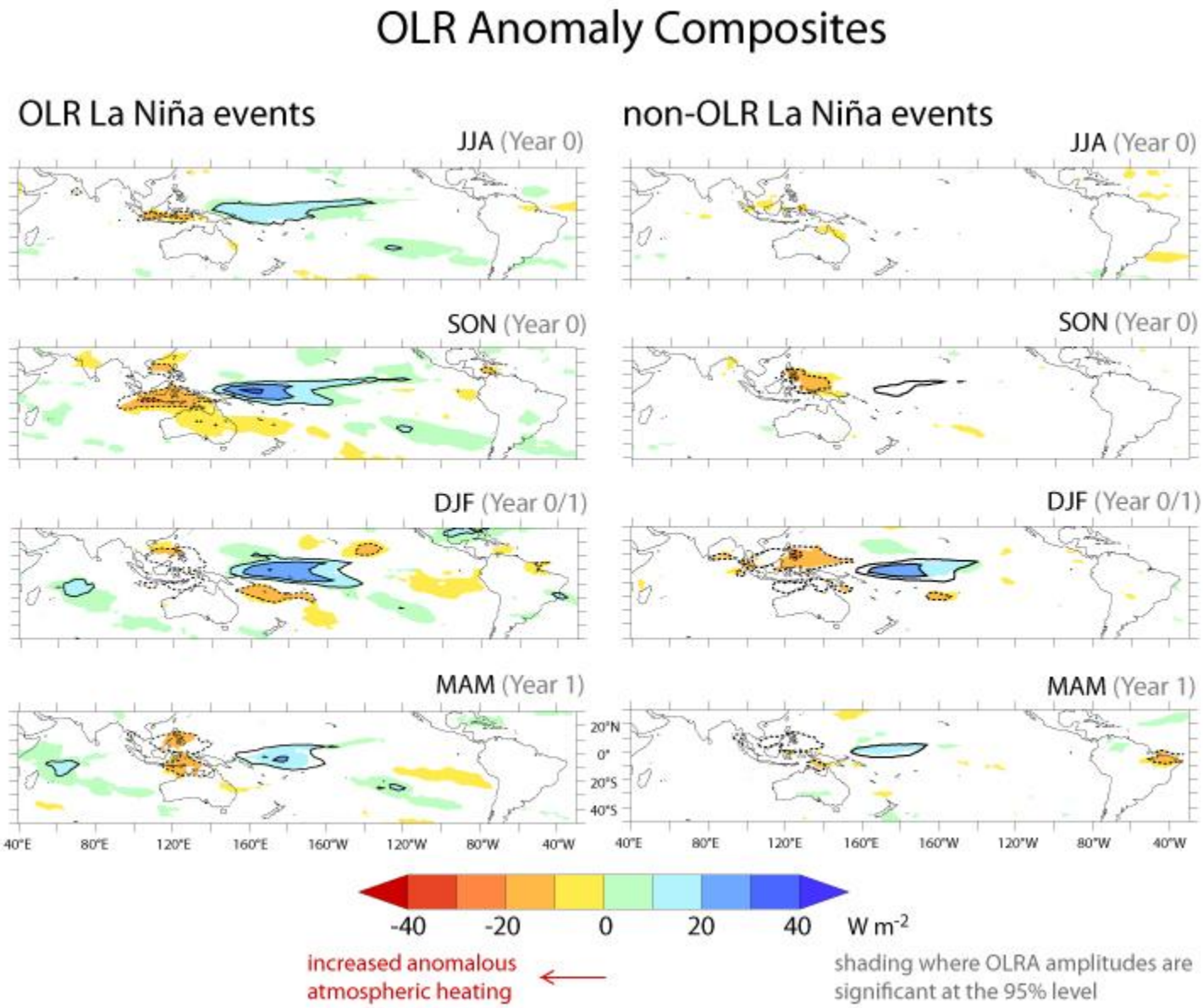
Most of the useful impacts on global precipitation are due to the OLR El Niño events

The La Niña case: We propose a separate OLR La Niña index based on OLR behavior in the western tropical Pacific

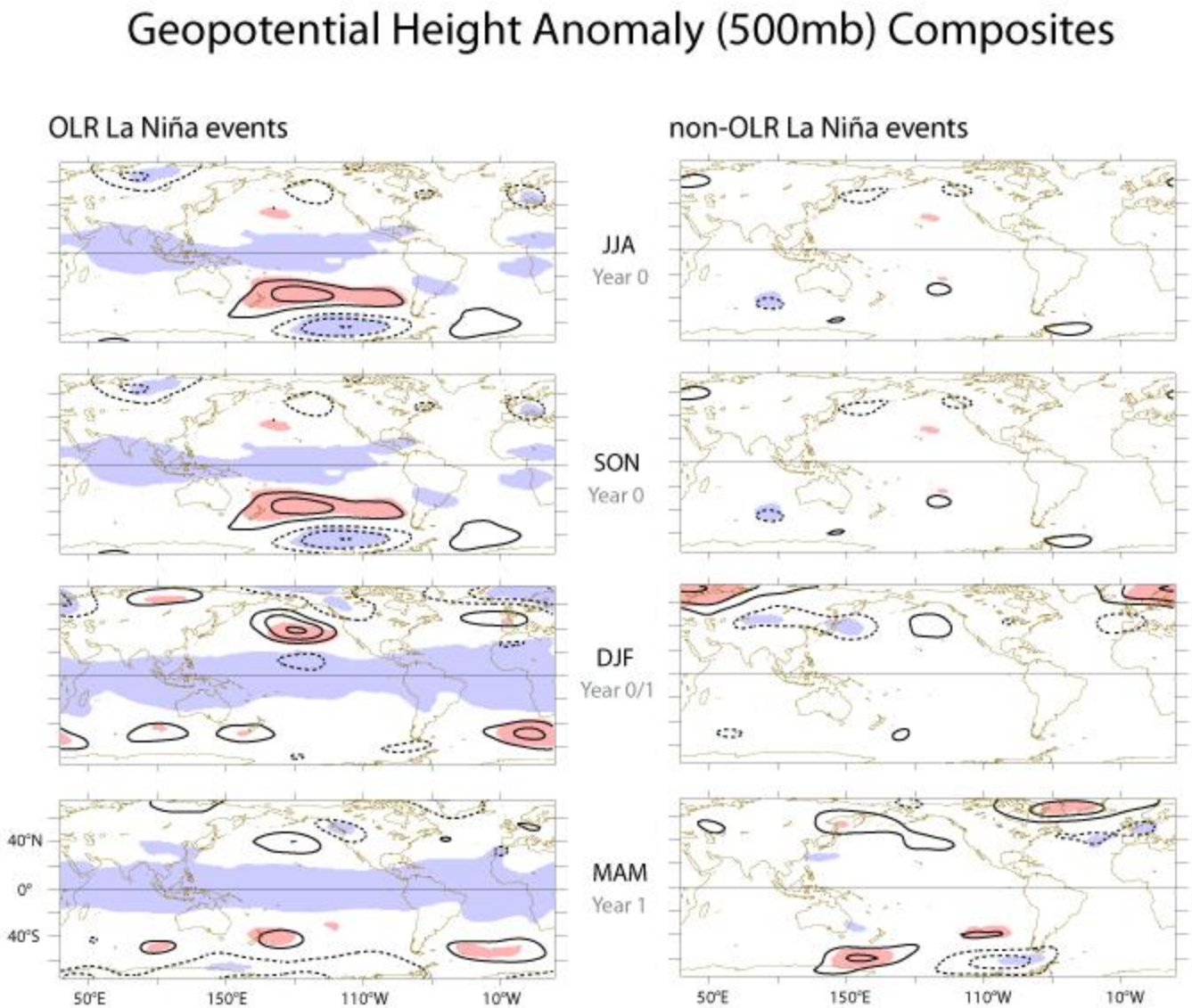


A running-count of the number of days with clear sky-type OLR conditions (OLR > 265 W/m²) in the western Pacific leads to an event-like index with peaks in some (6), but not all of the years identified by the current NOAA definition.

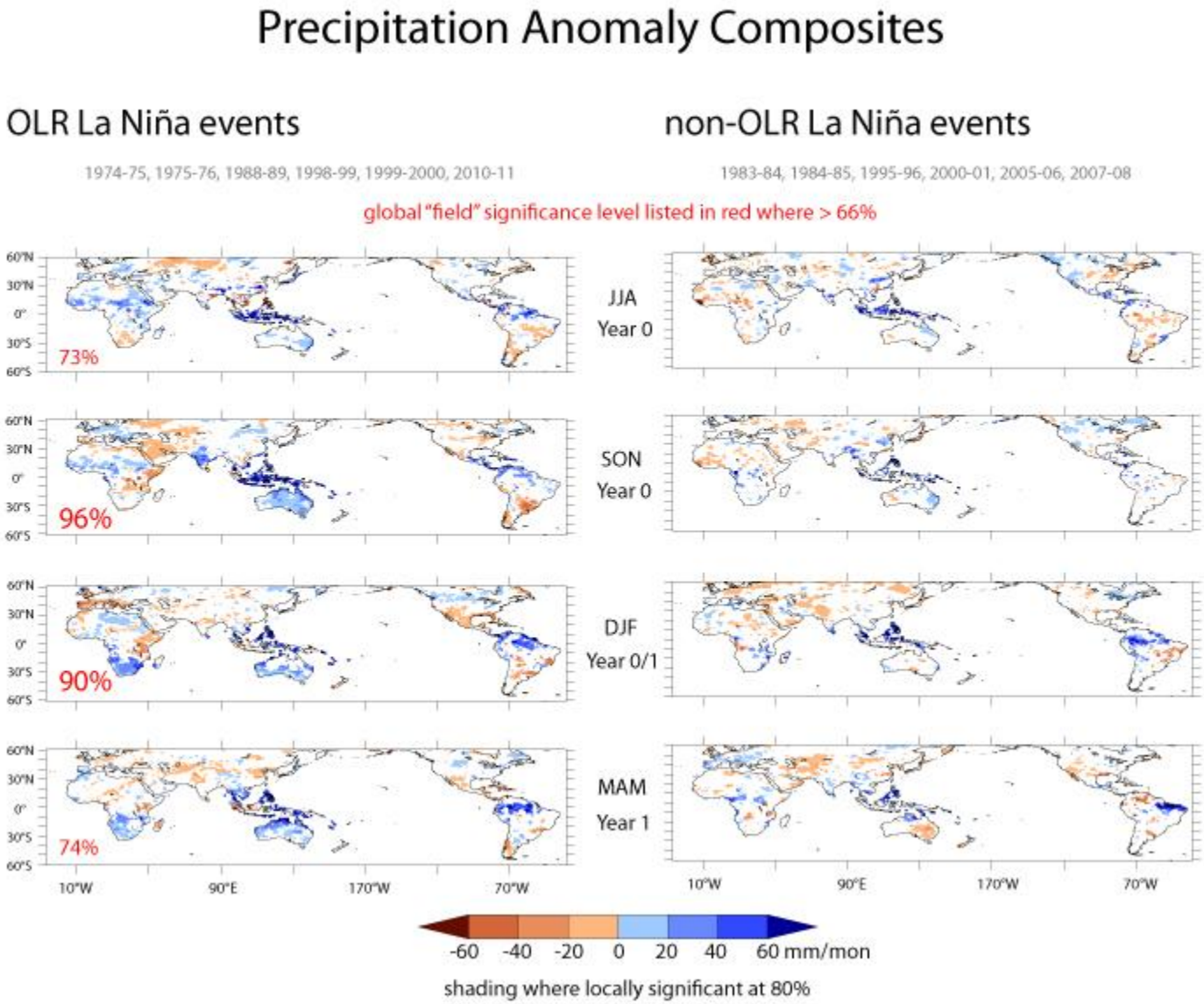
Composites of OLR anomaly in the 6 identified years have stronger amplitudes than in the other years



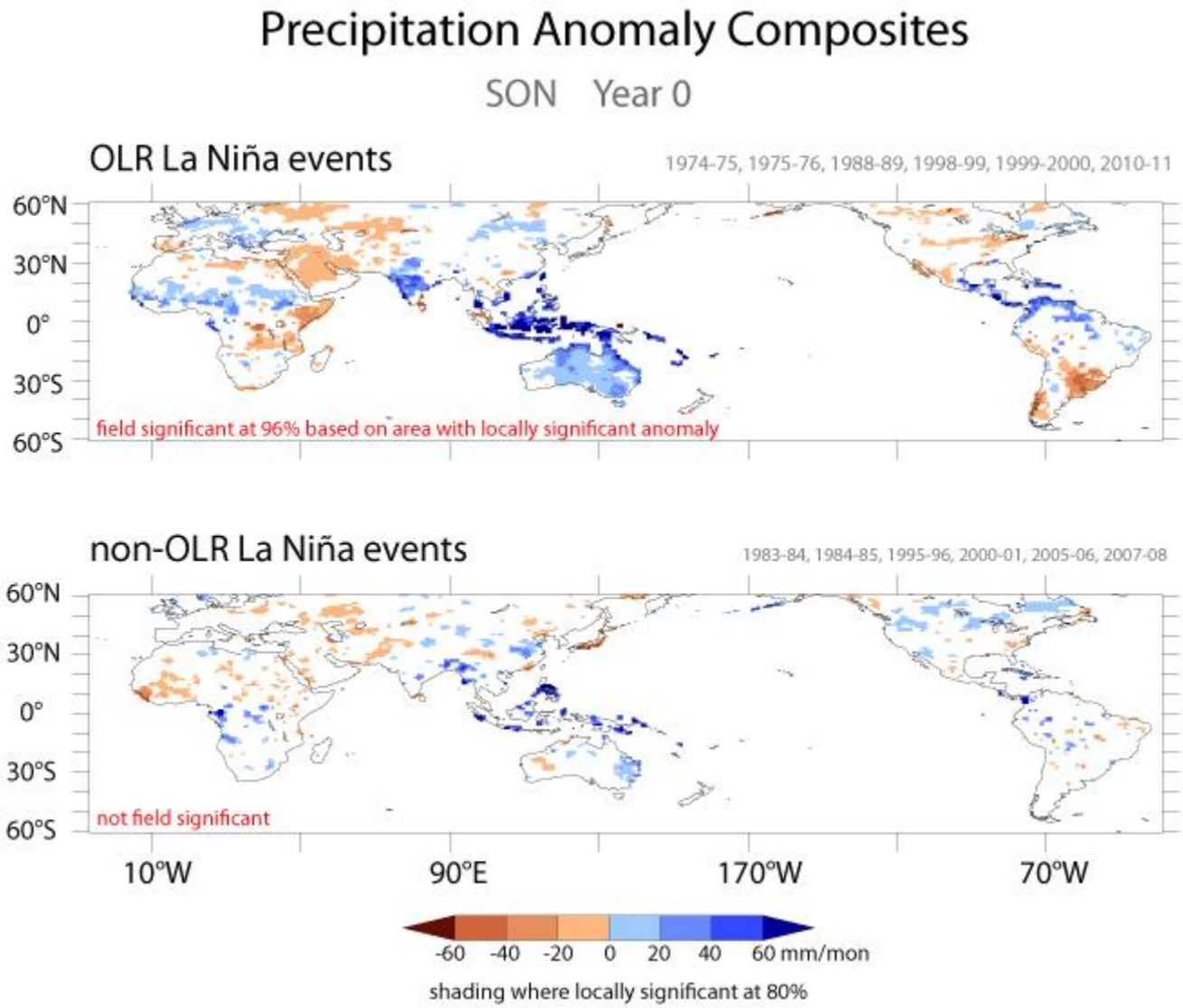
Much more statistically significant z500 anomaly is seen in the OLR La Niña than non-OLR La Niña case



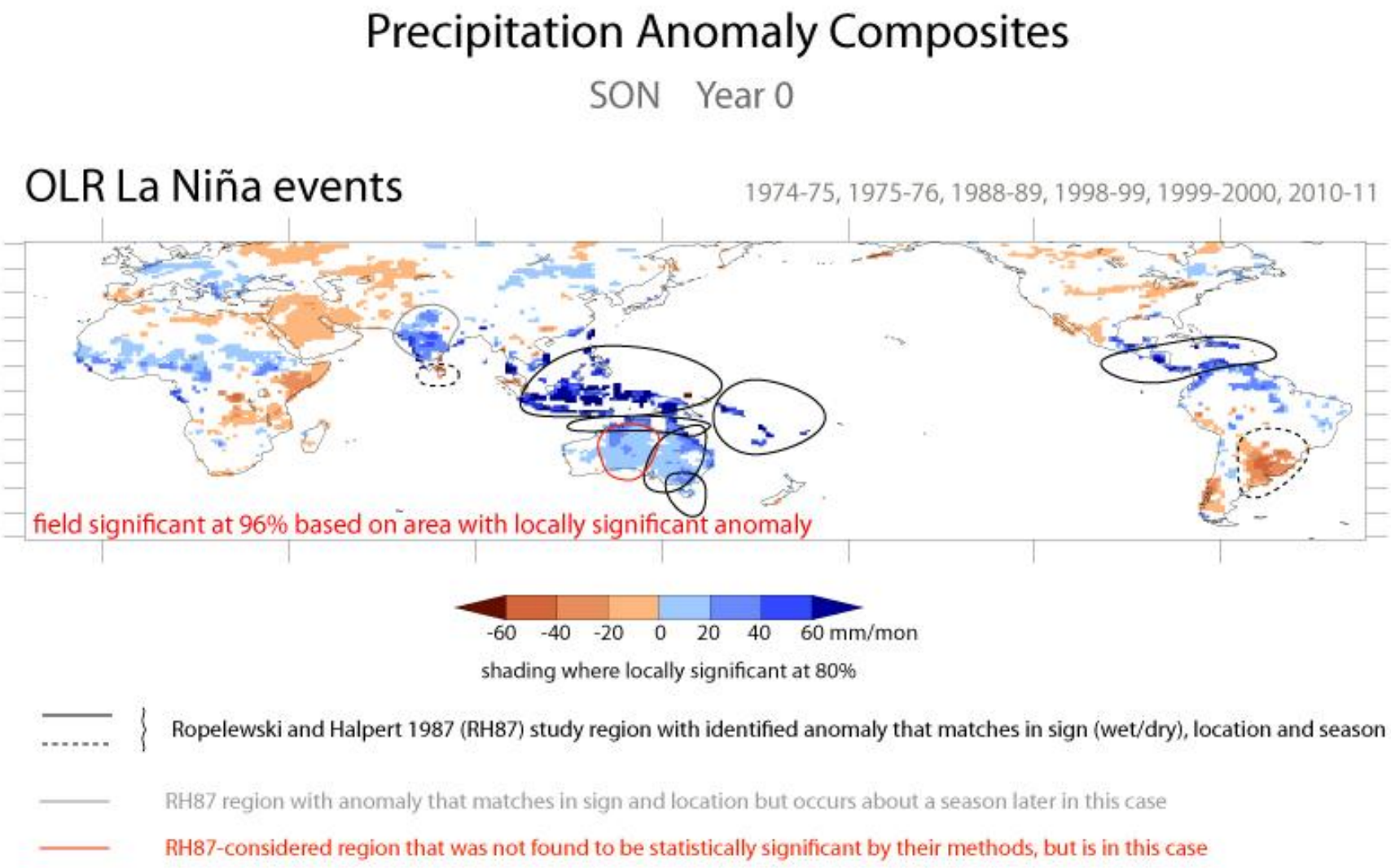
The OLR La Niña events yield globally significant (based on Monte Carlo statistical methods) seasonal precipitation composites, especially in SON and DJF. The other years do not.



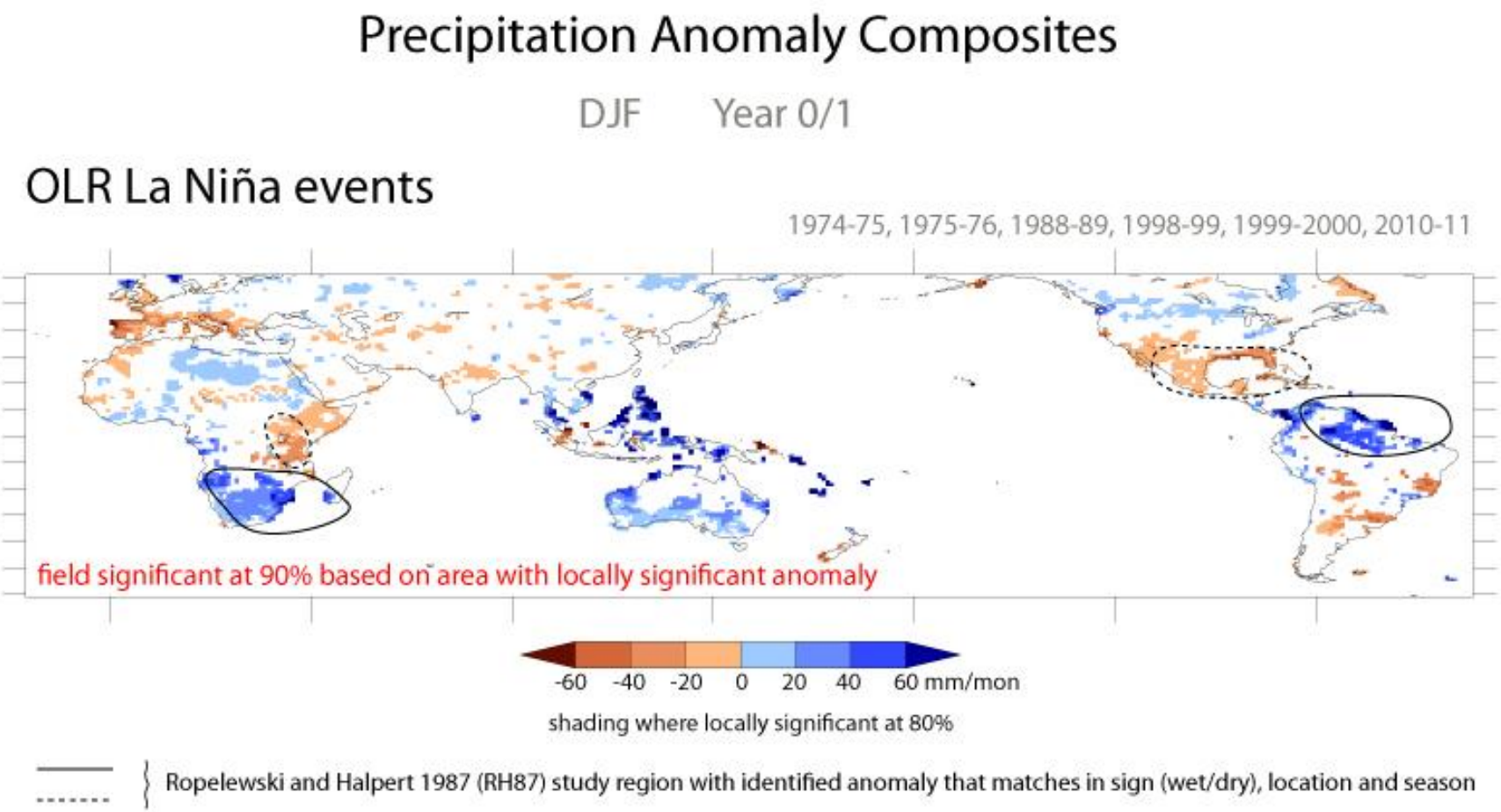
We suggest that like in the El Nino case, most of the useful impacts (consistent and statistically significant) are due to the OLR-identified La Niña events.



Many of the affected regions were similarly identified in seminal work that considered previous period events: the impacts appear to be consistent over time



What is perhaps most notable here, is that the other events with La Nina status based on the current NOAA definition do not have these impacts.



OLR information offers an operational indicator for the years in which tropical Pacific anomaly conditions are most likely to influence global weather patterns

Conclusions

- We have proposed an OLR-based index for the La Niña events that are most likely to have impacts on global seasonal precipitation anomaly
- Other years are being identified by current definitions that do not yield nearly the same amount of statistically significant anomaly
- Distinguishing events based on OLR will be directly useful to seasonal forecasting: the 30-day threshold is crossed by November in 6 out of 6 cases
- The prospects for accurate long-lead OLR forecast are unknown, but if obtained would directly benefit seasonal forecasting in the affected regions.

Precipitation Anomaly Composites

DJF Year 0/1