Two-year predictions of ENSO event duration

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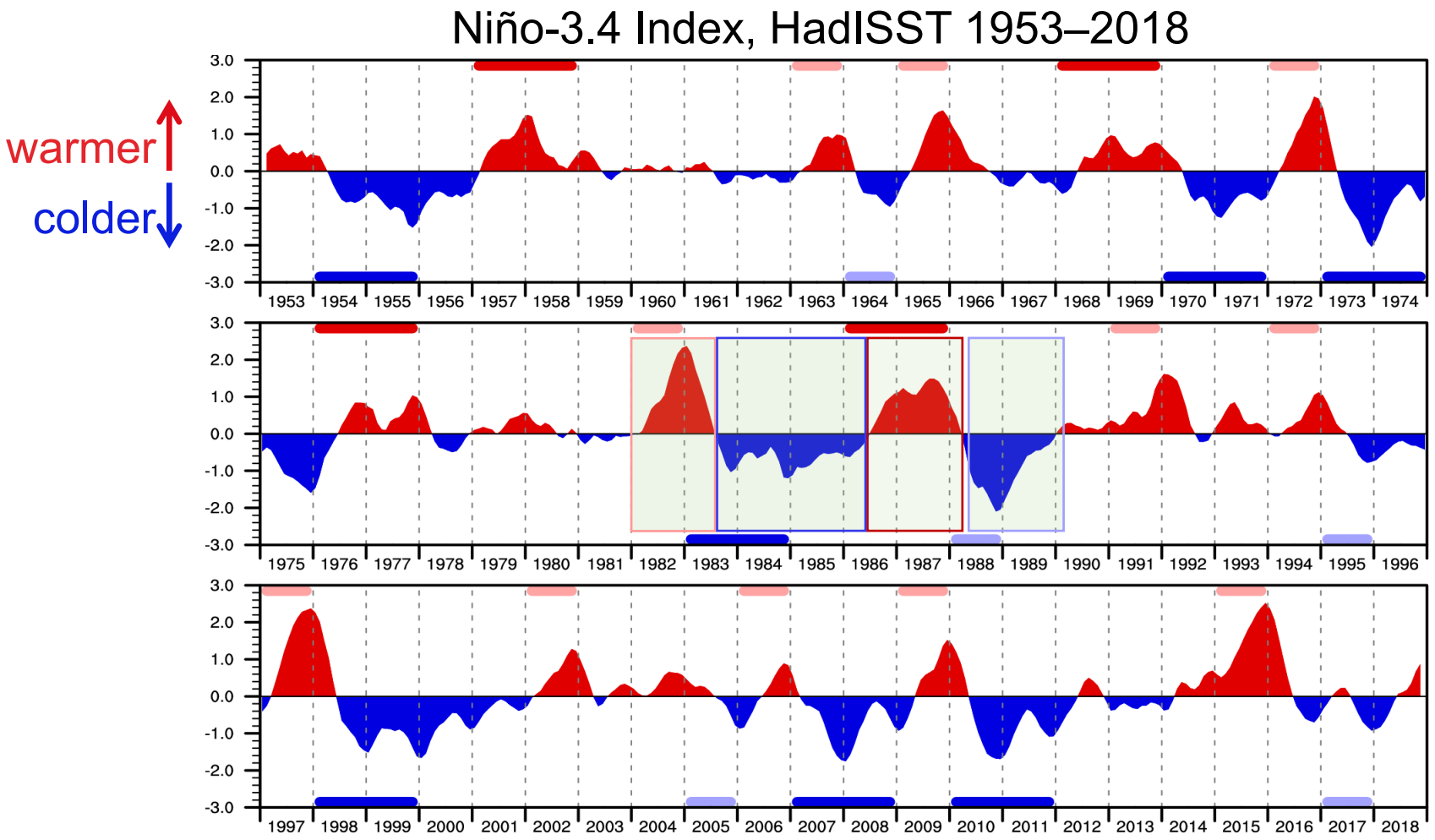
Diverse duration of El Niño and La Niña events



Horizontal bars indicate
1-year El Niño, 2-year El Niño, 1-year La Niña, 2-year La Niña

Duration of ENSO events

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Duration of climate impact

Mechanisms

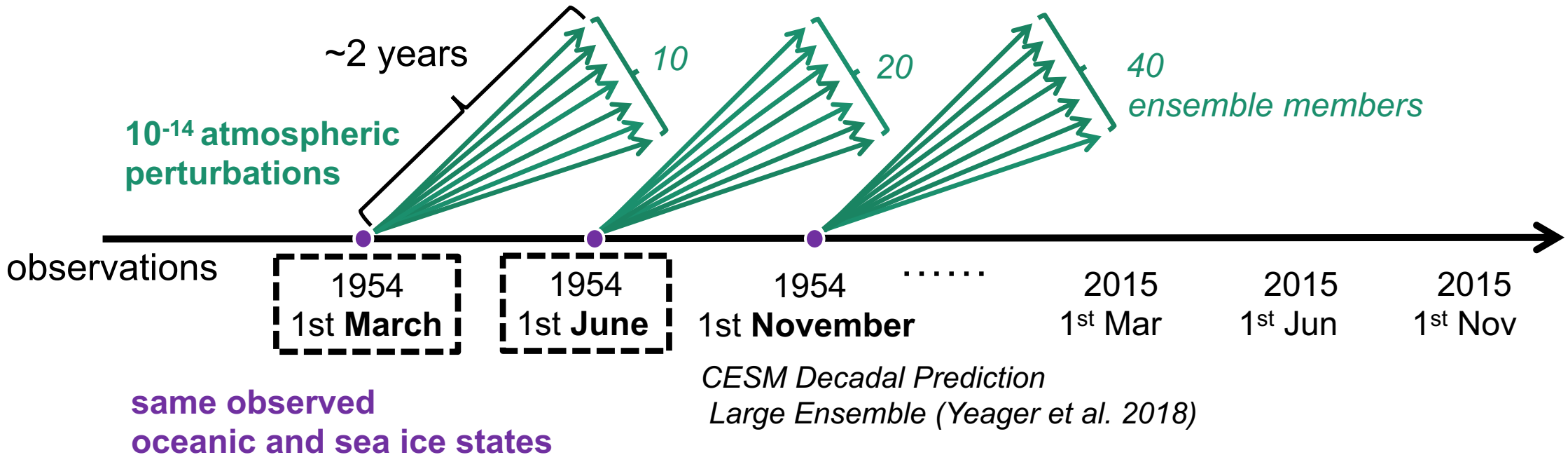
(Wu et al. 2019)

2-year potential predictability

(DiNezio et al. 2017;
Wu et al. 2020, in revision)

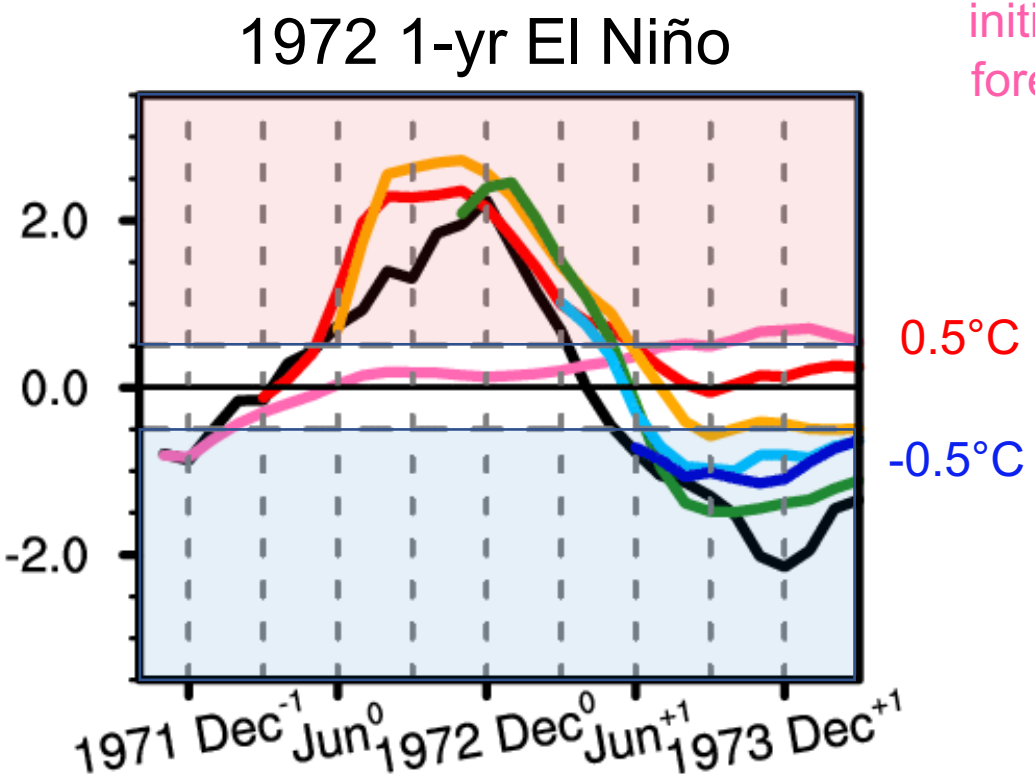
Real-world predictability?

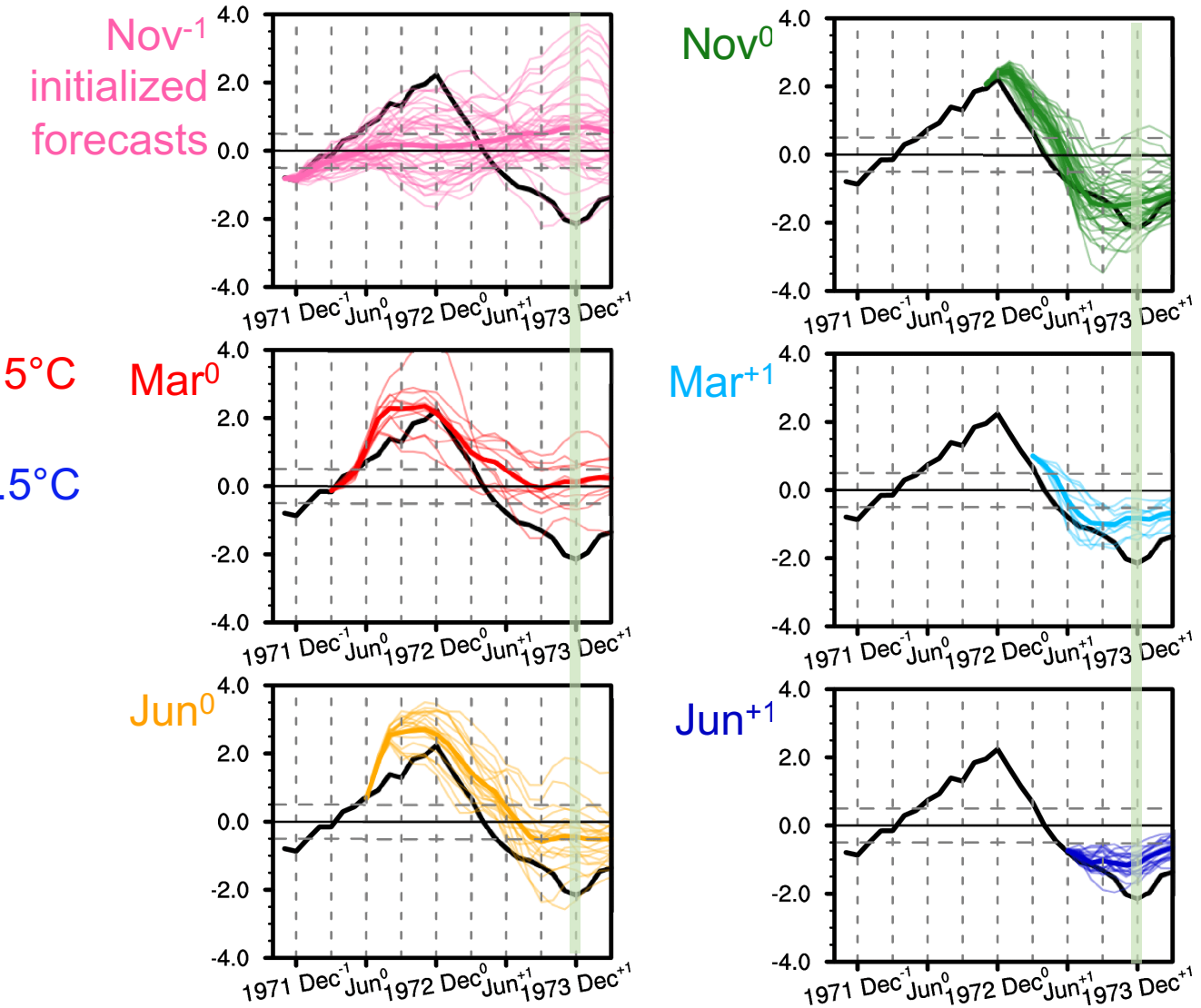
2-year CESM1 forecasts during 1954–2015



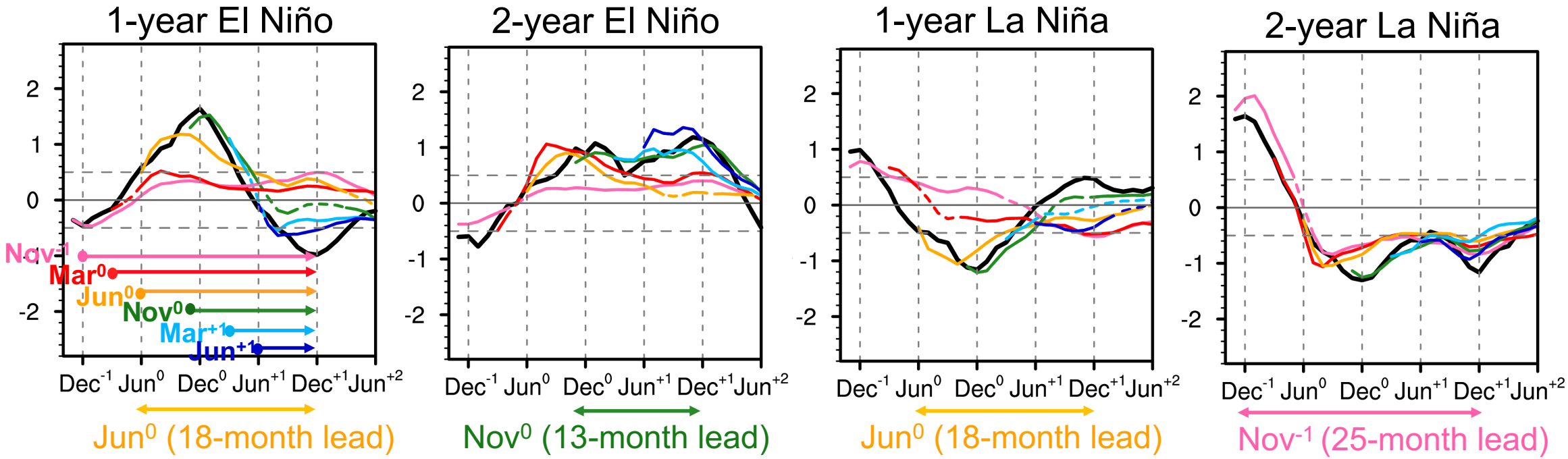
CMIP5 external forcing (‘Historical’ 1954–2005, RCP 8.5 2006–2015)

2-year forecast example





Composite forecasts of 1-year vs. 2-year ENSO events



1963, 1965, 1972, 1982, 1991, 1994, 1997, 2002, 2006, 2009

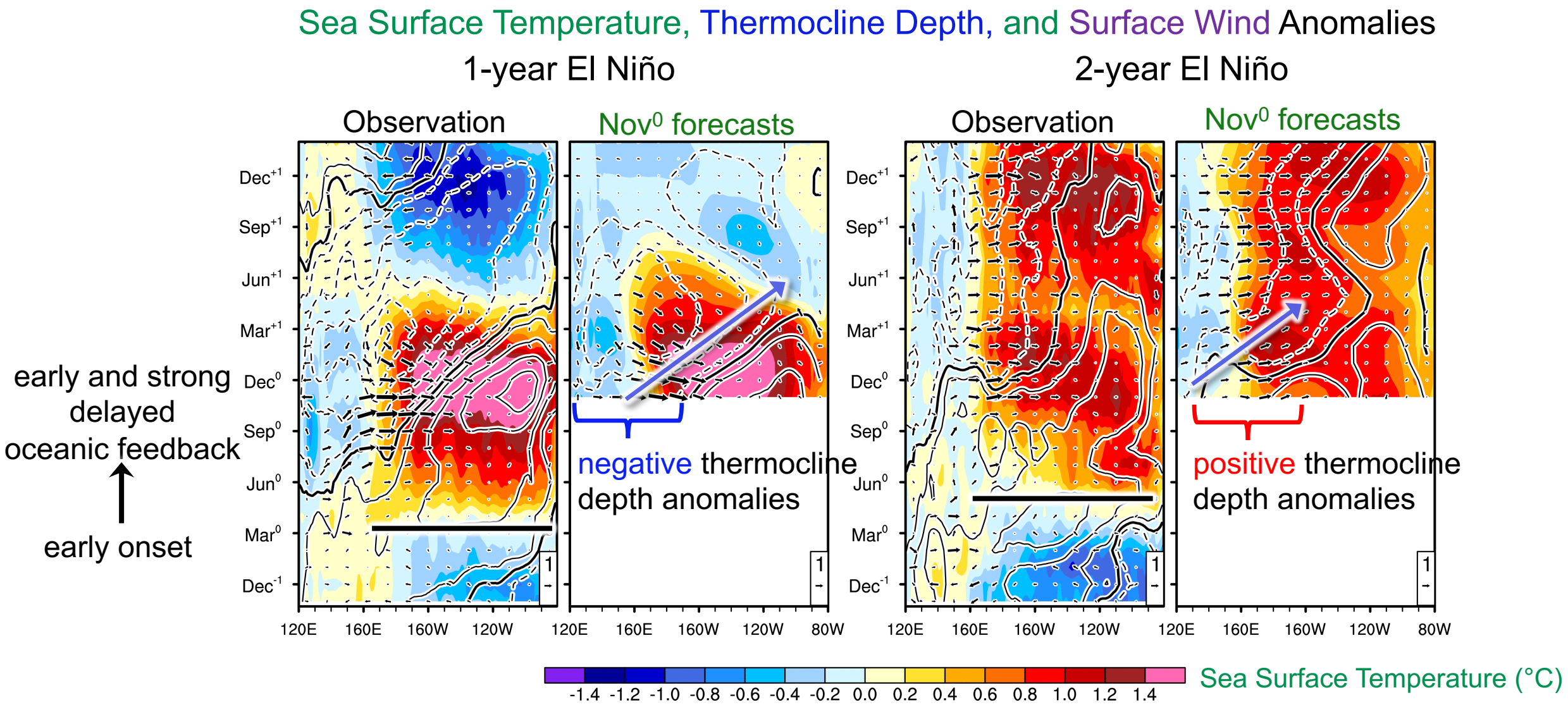
1957-58, 1968-69,1976-77, 1986-87, 2014-15

1964, 1988, 1995, 2005

1954-55, 1970-71, 1973-74, 1983-84, 1998-99, 2007-08, 2010-11, 2017-18

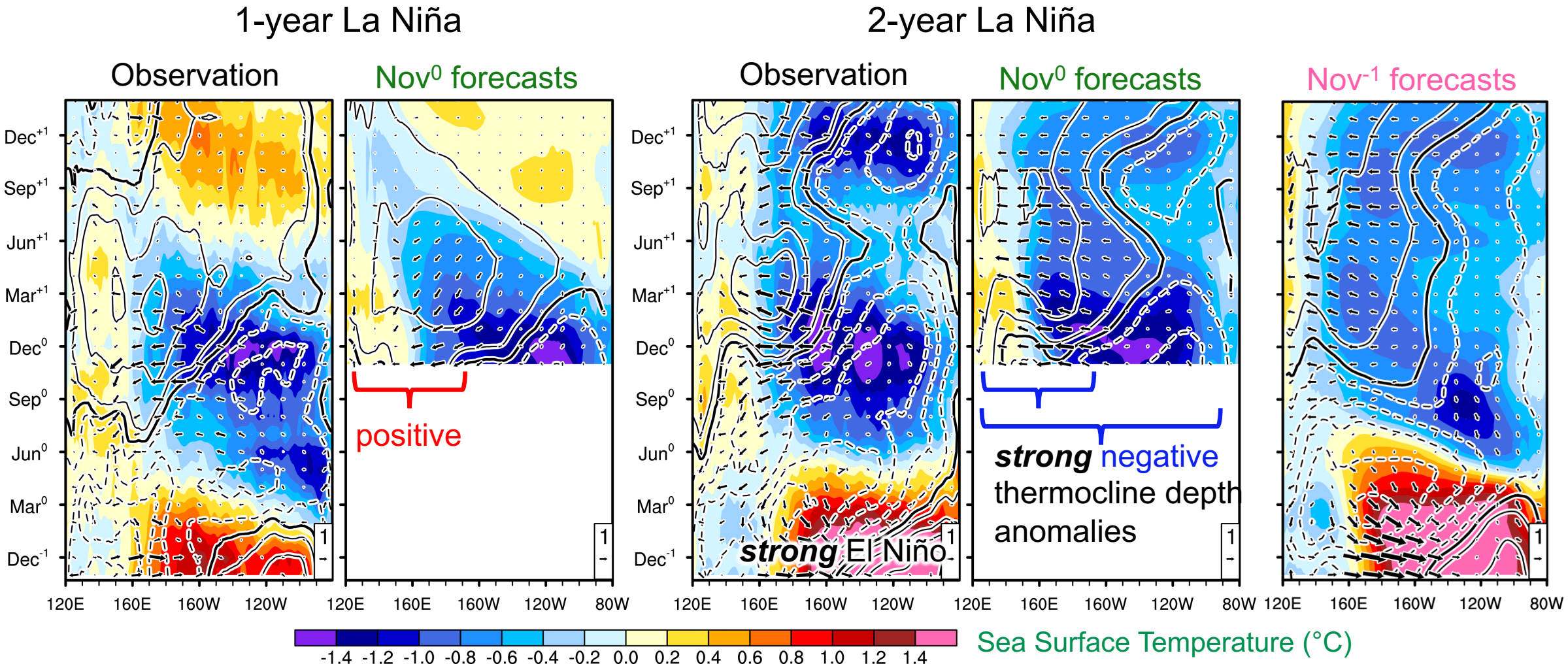
All ENSO events Nov^{0} (13-month lead; Correlation skill > 0.6)
& Multi-year La Niña Nov^{-1} (25-month lead)

Nov^0 forecasts: oceanic precursors ***in*** the equatorial Pacific

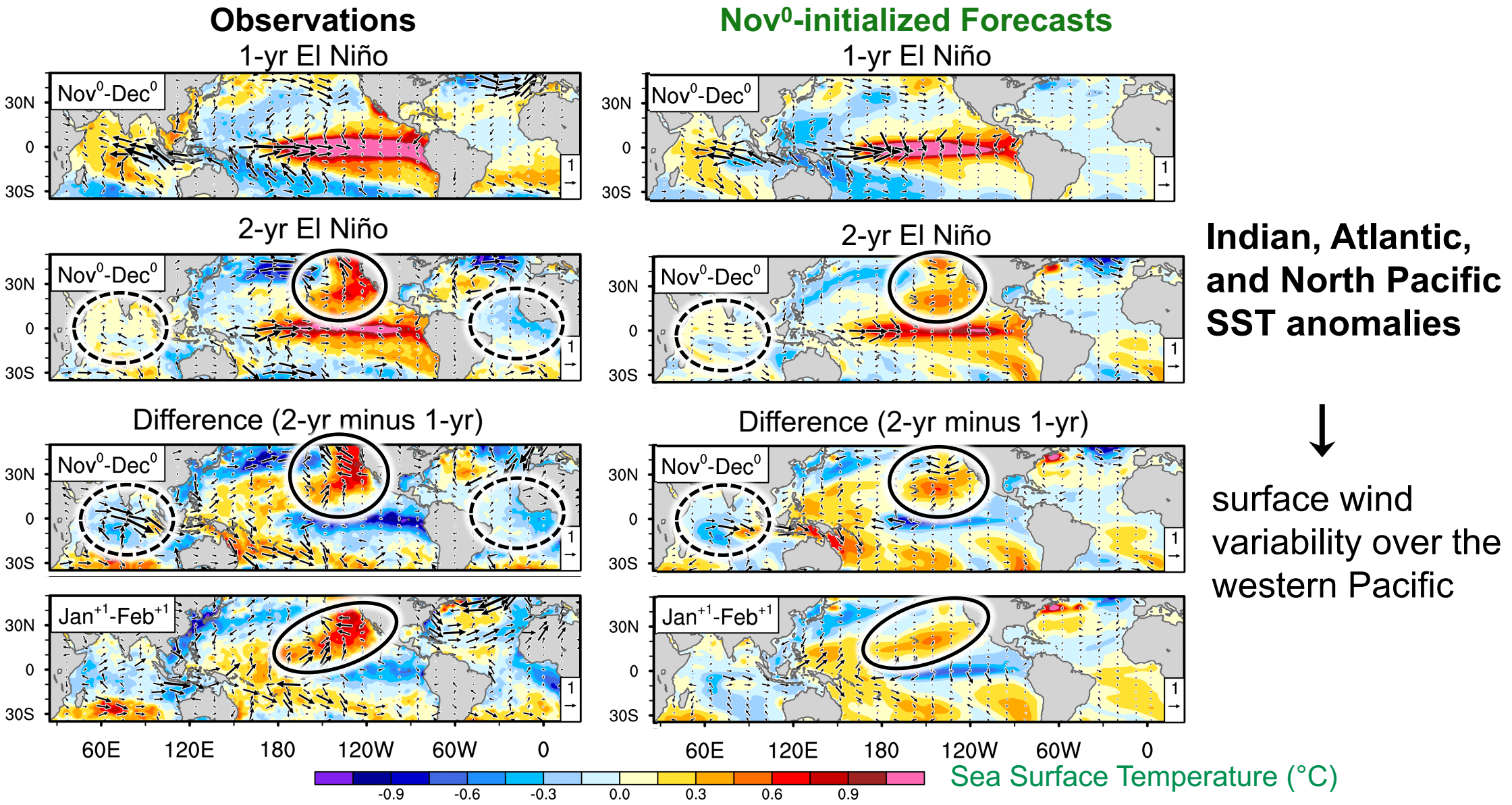


Nov^{0} forecasts: oceanic precursors ***in*** the equatorial Pacific

Sea Surface Temperature, Thermocline Depth, and Surface Wind Anomalies



Nov^0 forecasts: oceanic precursors ***outside*** the equatorial Pacific



Indian, Atlantic, and North Pacific SST anomalies

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surface wind variability over the western Pacific

Summary

- The CESM1 shows high skills in predicting the duration of El Niño and La Niña events with lead times ranging from 6 to 25 months.
- Predictability: initial thermocline depth anomalies in the equatorial Pacific, as well as sea surface temperature anomalies within and outside the tropical Pacific.
- Error growth: variability over the North and South Pacific Oceans as well as the Indian Ocean.

Wu, X., Y. M. Okumura, C. Deser, and P. N. DiNezio, 2020:
Two-year Predictions of ENSO Event Duration during 1954-2015. *in prep.*