Predicting multi-year La Niña events

Pedro DiNezio

Clara Deser, Yuko Okumura, Alicia Karspeck, Steve Yeager, Gokhan Danabasoglu, Nan Rosenbloom, Julie Caron, Jerry Meehl

Predicting multi-year La Niña events

Half of all La Nina events last at least 2 years, with outsized impacts on US drought *(Okumura et al., GRL 2017).*

Predicting multi-year La Niña events

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Most climate models cannot simulate them; CESM1 is an exception.

Predicting multi-year La Niña events

1. **Dynamics**

DiNezio, P. N., & Deser, C. (2014). Nonlinear controls on the persistence of La Niña. *Journal of Climate*.

Predicting multi-year La Niña events

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DiNezio, P. N., & Deser, C. (2014). Nonlinear controls on the persistence of La Niña. *Journal of Climate.*

2. Perfect model predictions (CESM1)

DiNezio, P. N., Deser, C., Okumura, Y., & Karspeck, A. (2017). Predictability of 2-year La Niña events in a coupled general circulation model. *Climate Dynamics.*

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## 3. Initialized forecasts (CESM1-DP-LE)

DiNezio,P.N. et al. (2017). A 2 Year Forecast for a 60–80% Chance of La Niña in 2017–2018. *Geophys. Res. Lett.*

Initialized forecasts with the CESM1 Decadal Prediction Large Ensemble
(Yeager et al., 2018 BAMS)

- 40-member ensembles
- Initialized in November of each year since 1954
- Initial conditions from CORE-forced POP run
- Historical / RCP8.5 external forcings
- Each member run for 10 years
- Drift correction (following CLIVAR 2011)
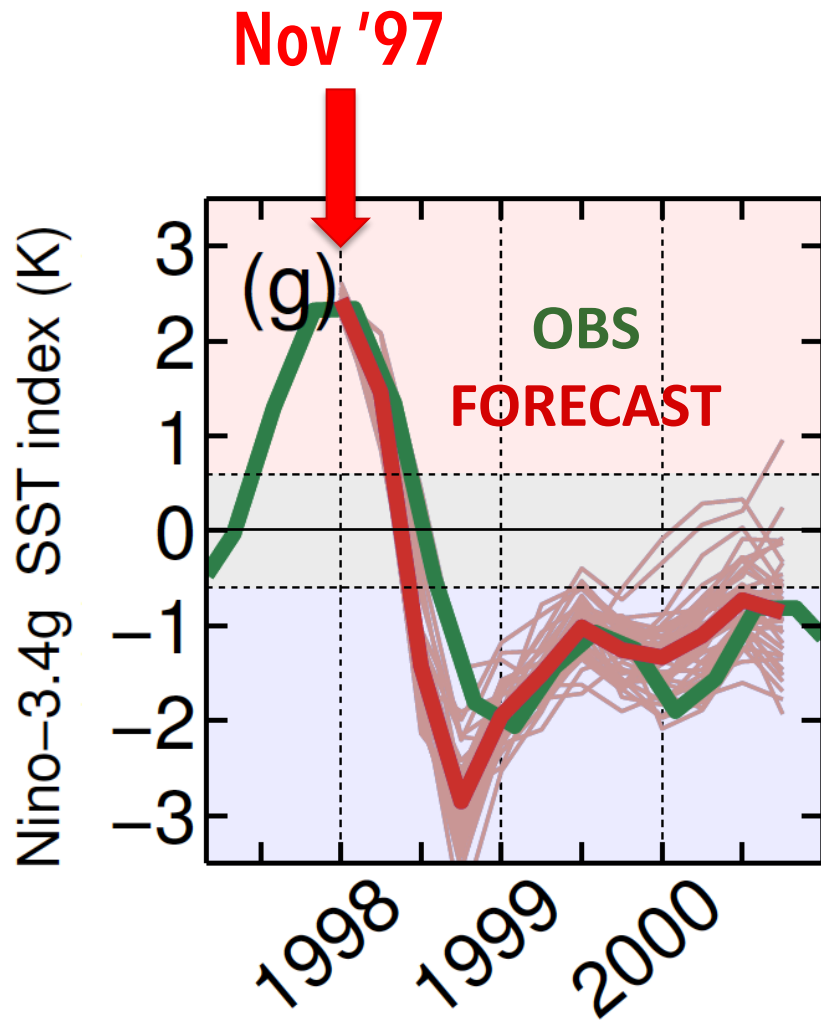- Verified against forced persistence forecasts (see DiNezio et al. 2017b).

Initialized forecasts (CESM1-DP-LE)
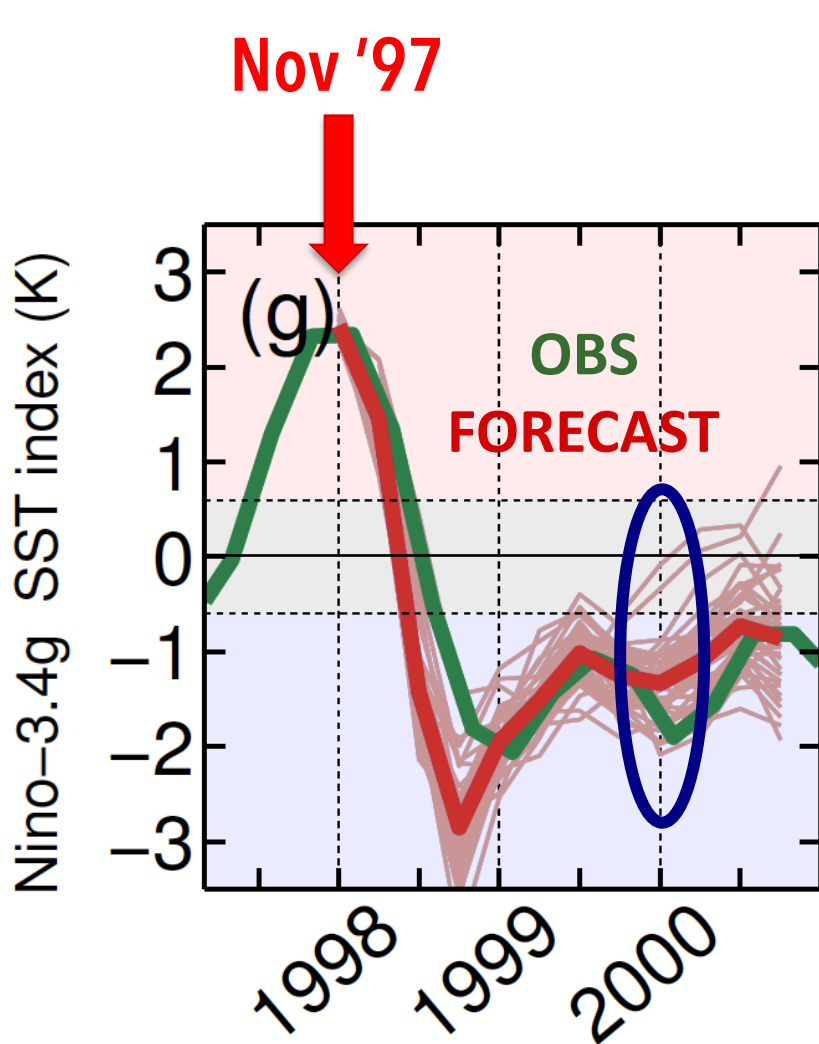## Composite of 9 El Niño events
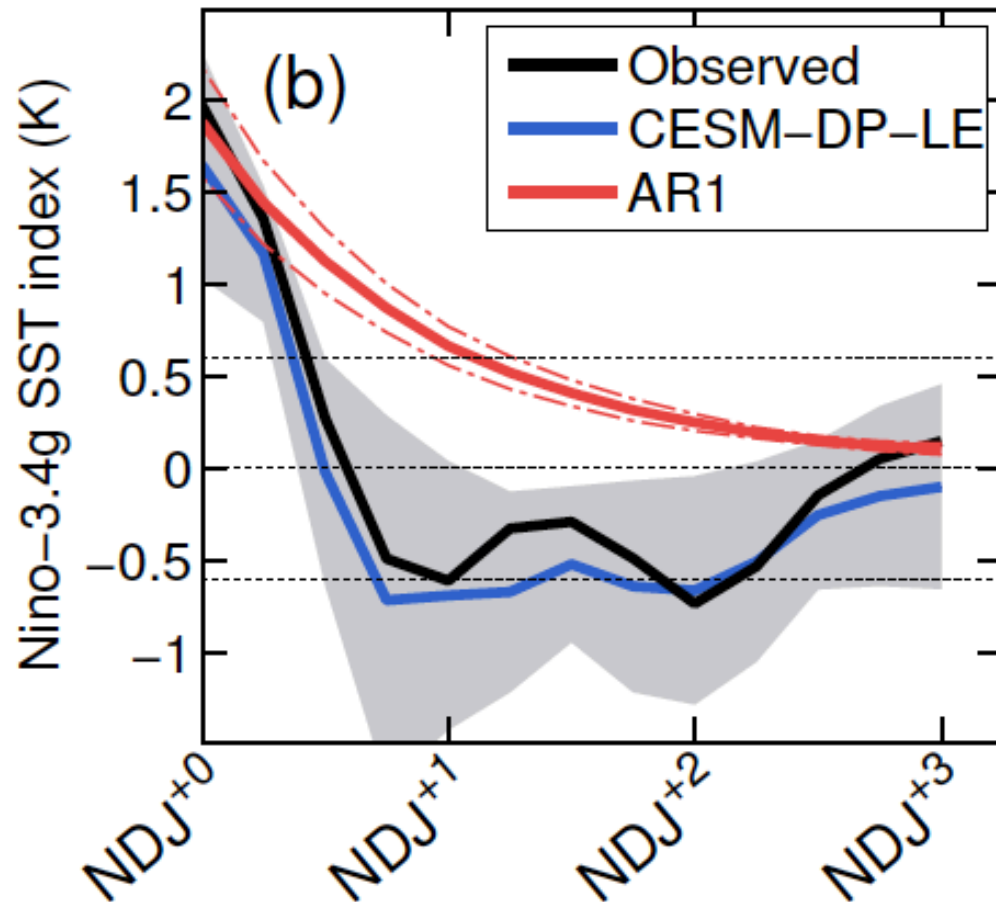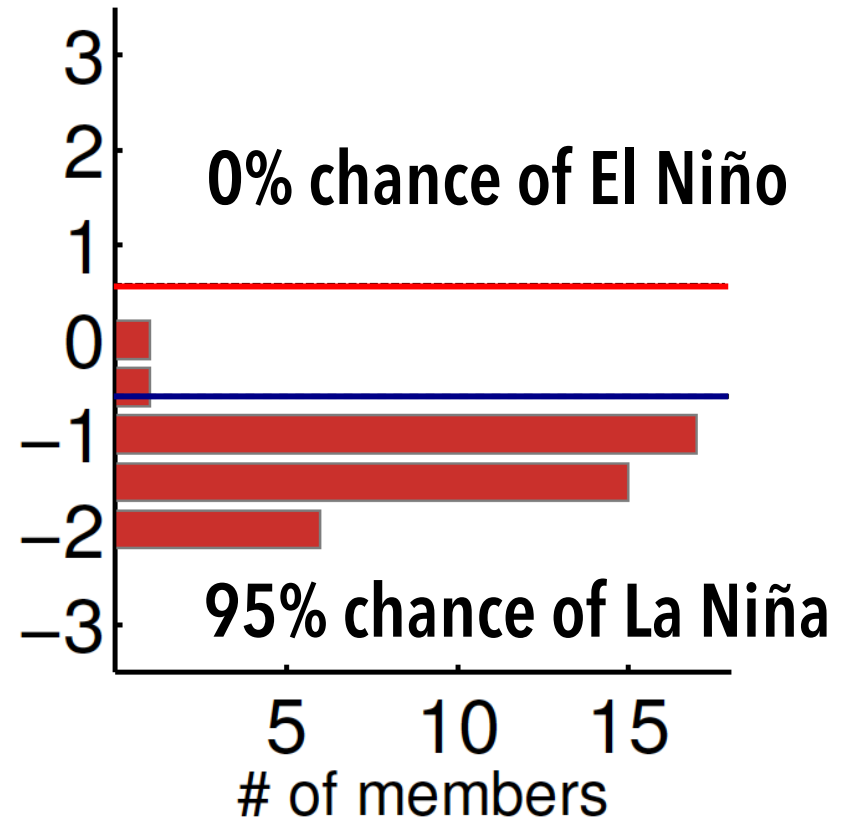

Skillful out to at least 24 months

DiNezio *et al.* 2017b

Forecasts initialized in Nov 1997

DiNezio *et al.* 2017b

Forecasts initialized in Nov 1997

DiNezio *et al.* 2017b

Forecasts initialized in Nov 2015

DiNezio *et al.* 2017b

Forecasts initialized in Nov 2015

Nov '15

Year 2
(24-mo forecast)

OBS
FORECAST

Nino-3.4g SST index (K)

5% chance of
El Niño

60% chance of
La Niña

# of members

DiNezio *et al.* 2017b
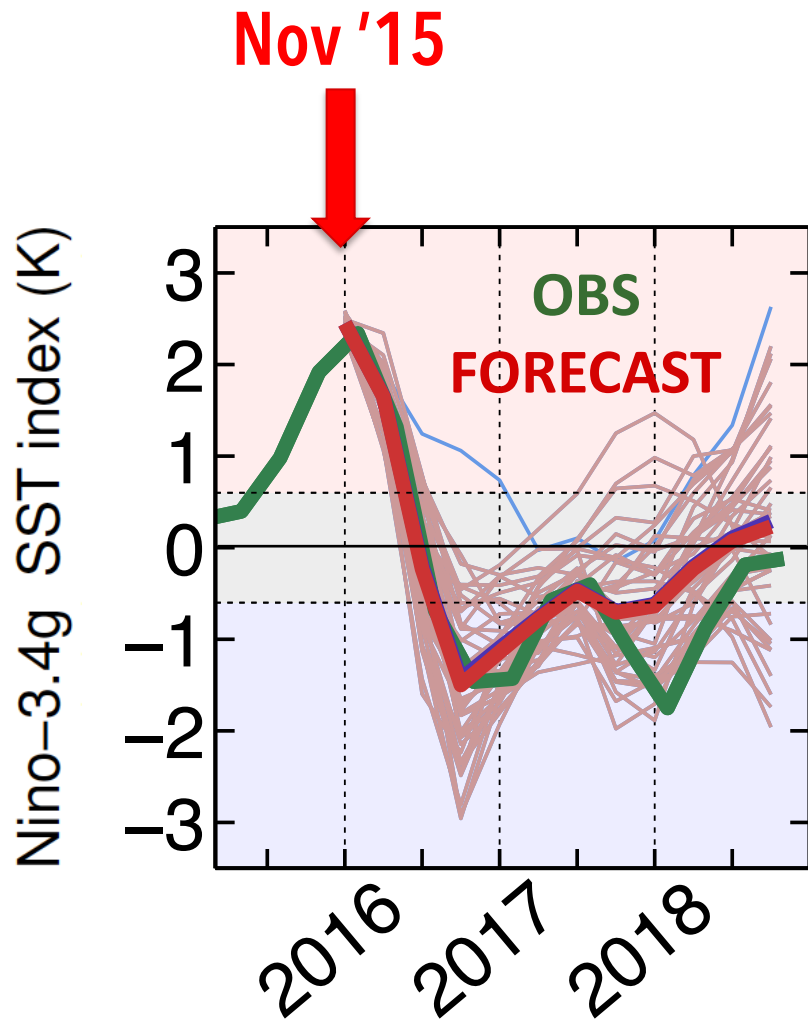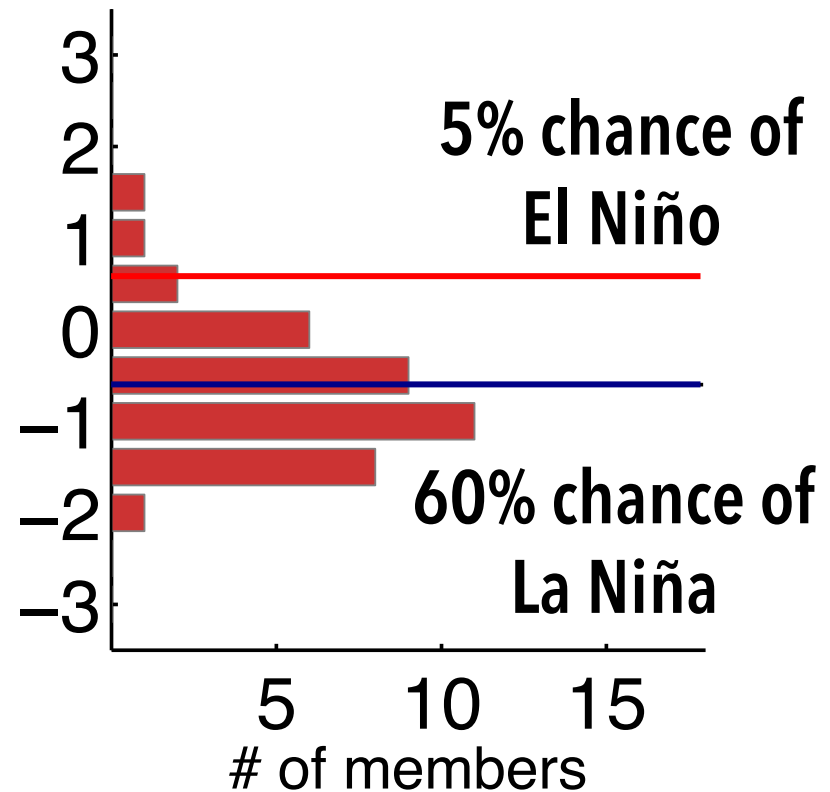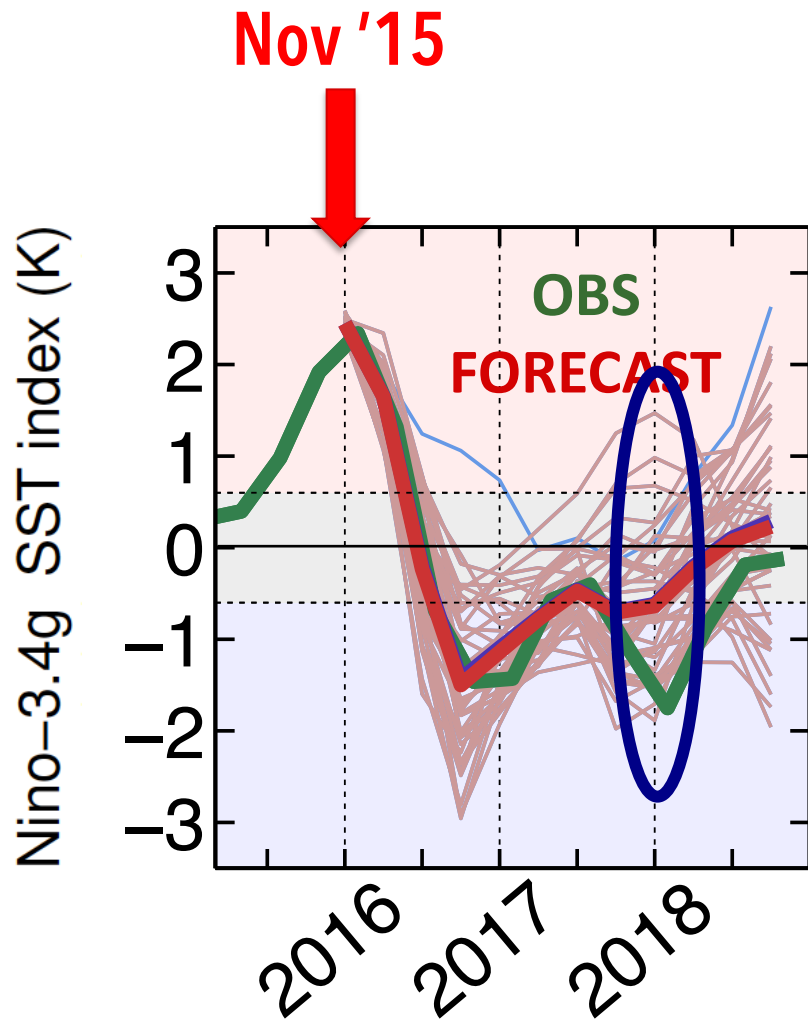
Forecasts initialized in Nov 2015

Rainfall 2017-18 (DJF)

Observed **24-mo forecast**

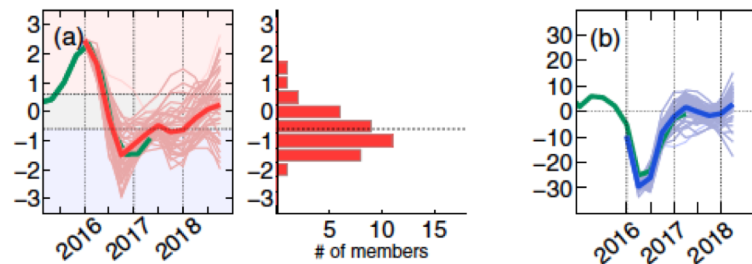rainfall anomaly (mm/mon)

DiNezio *et al.* 2017b
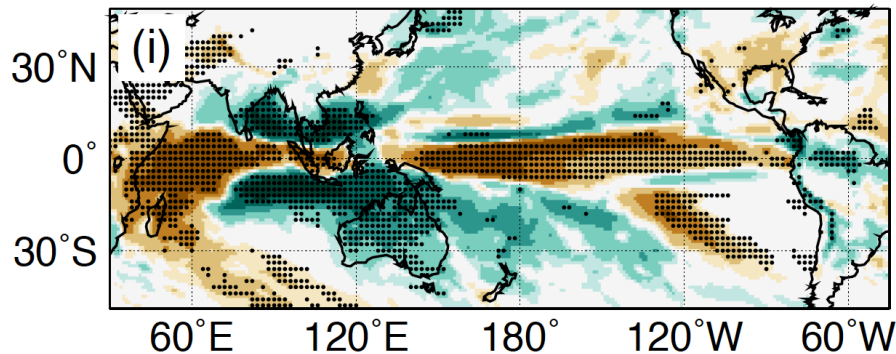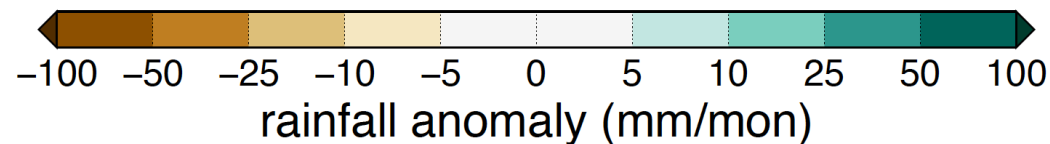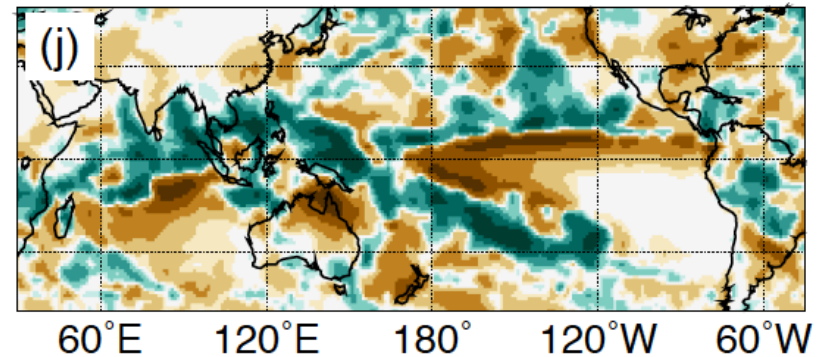
Summary

Multi-year La Nina events can be skillfully predicted up to 24 months in advance by when initialized at the peak of the preceding El Nino event.
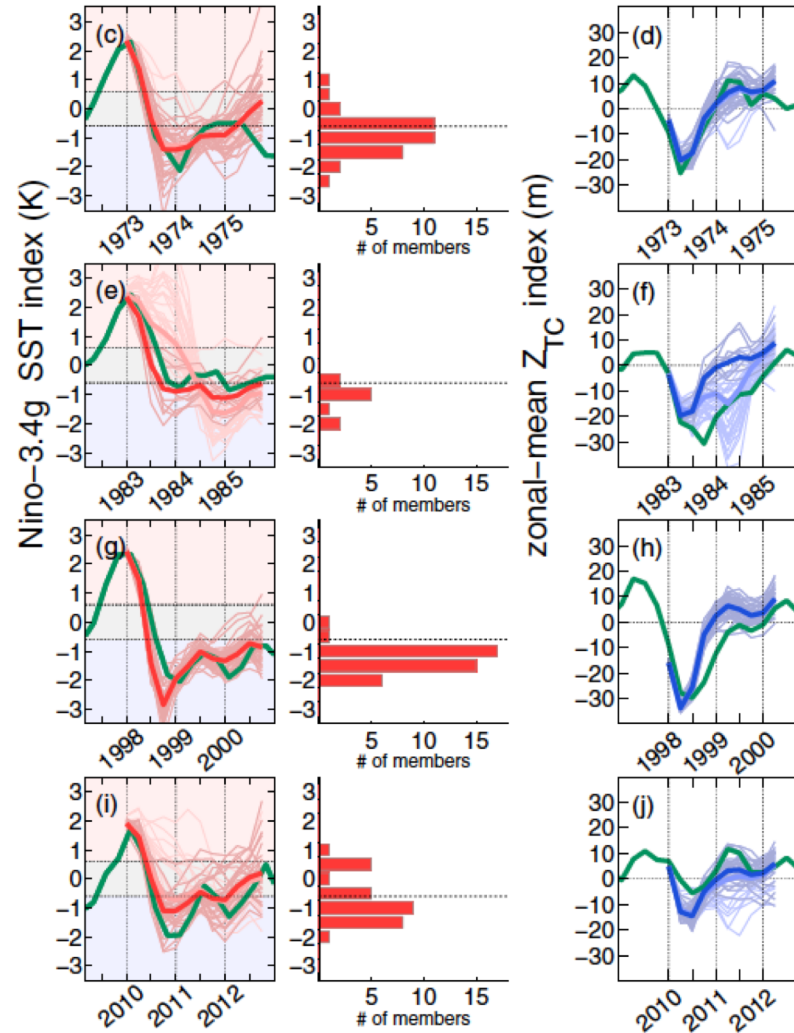
Requires a model with realistic La Nina dynamics and duration frequency.
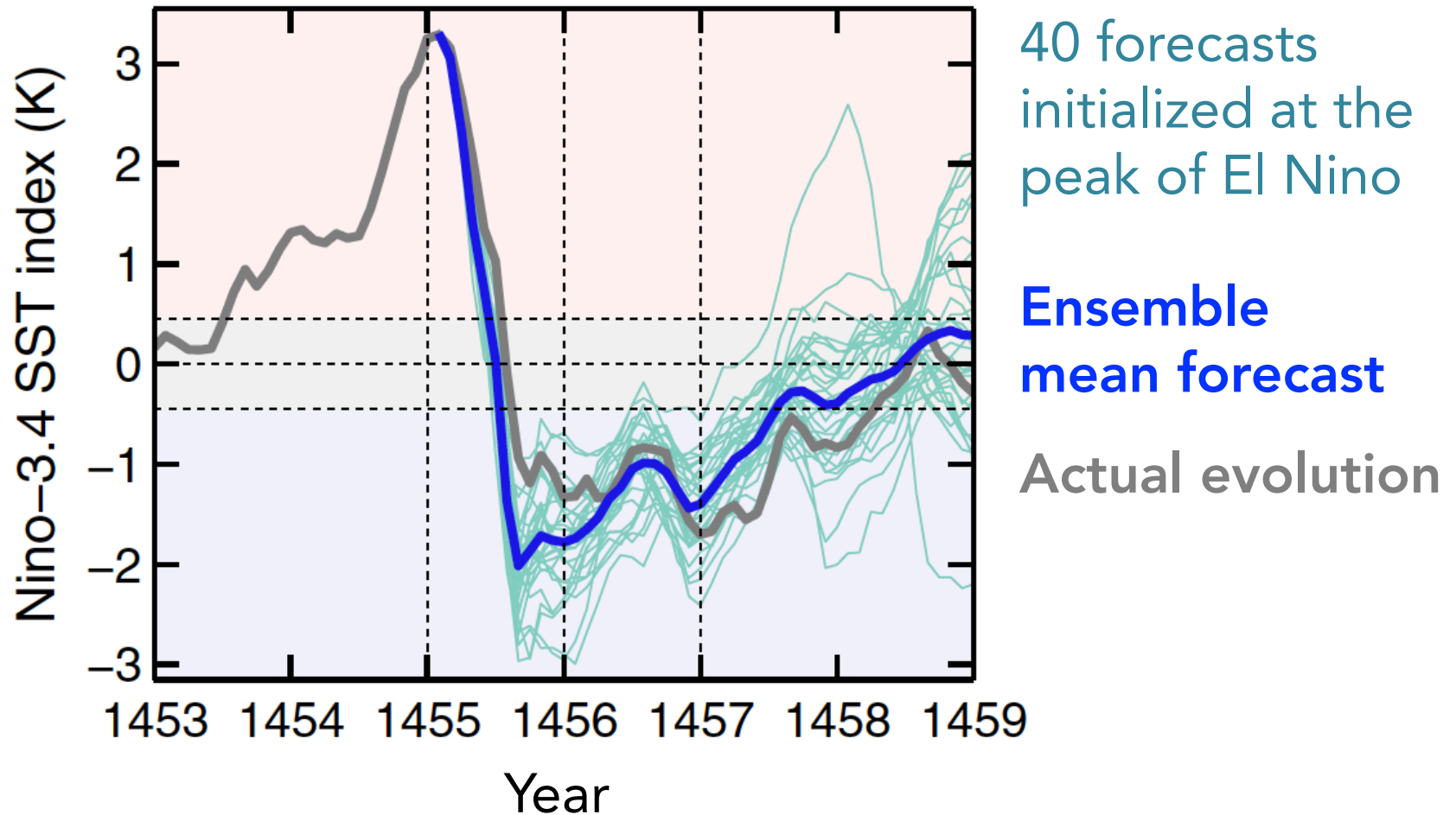
Extra

Current predictions of 2-year La Nina

Retrospective predictions of 2-year La Nina

Perfect model forecasts
(CESM1 control simulation)

40 forecasts initialized at the peak of El Nino

Ensemble mean forecast

Actual evolution

DiNezio *et al.* 2017a

Perfect model forecasts
(CESM1 control simulation)

40 forecasts initialized at the peak of El Nino

Ensemble mean forecast

Actual evolution

All members predict a 2-yr La Niña two years in advance

DiNezio *et al.* 2017a