What Controls the Duration of El Niño and La Niña Events?

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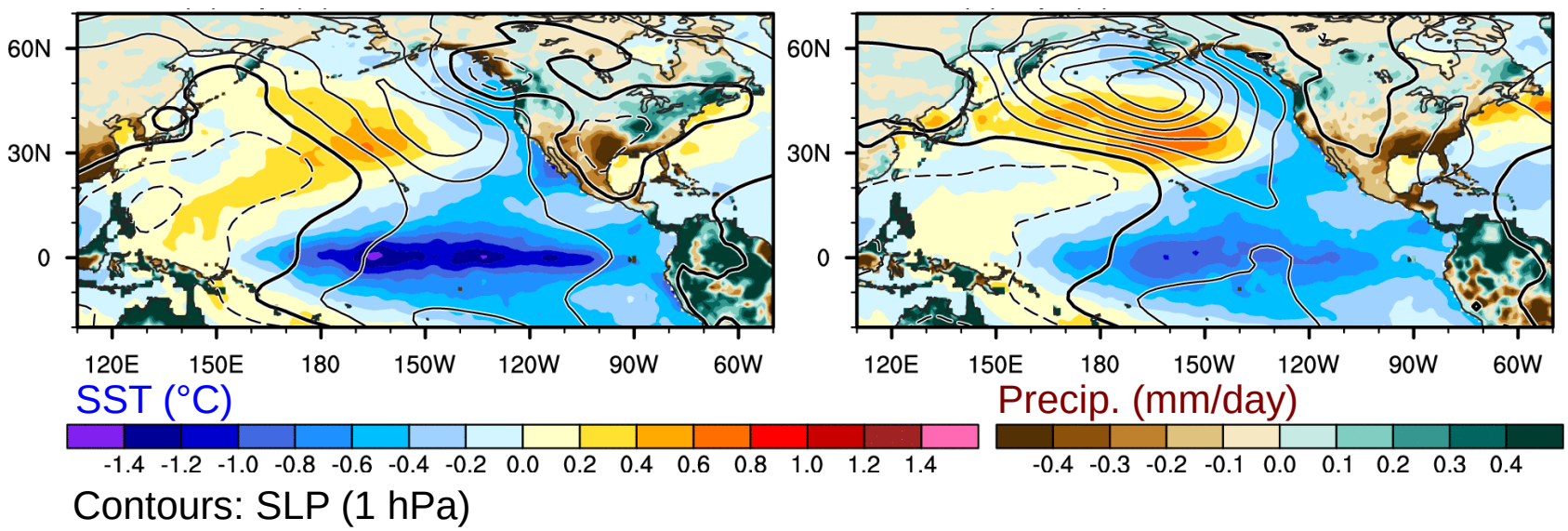
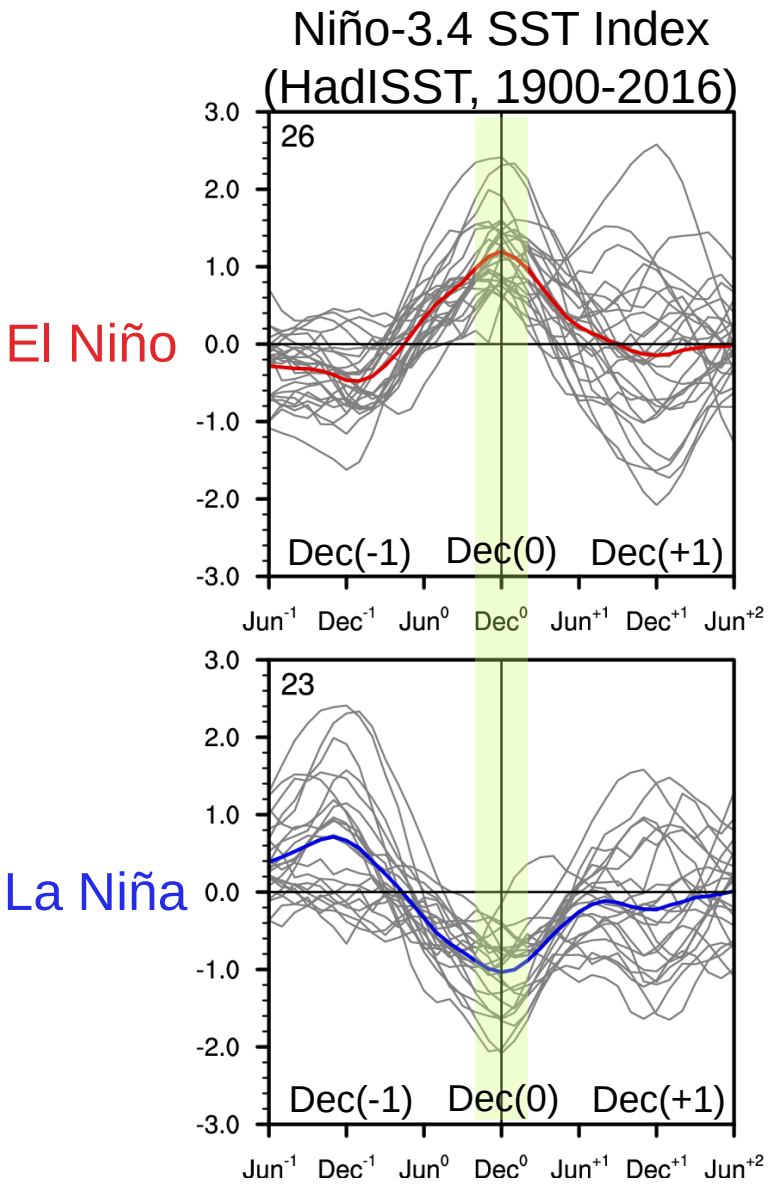
Impact of Multi-year La Nina Events

Composite Anomalies (HadISST/GPCC/20CR, 1901-2012)



Okumura, DiNezio and Deser (2017, GRL)

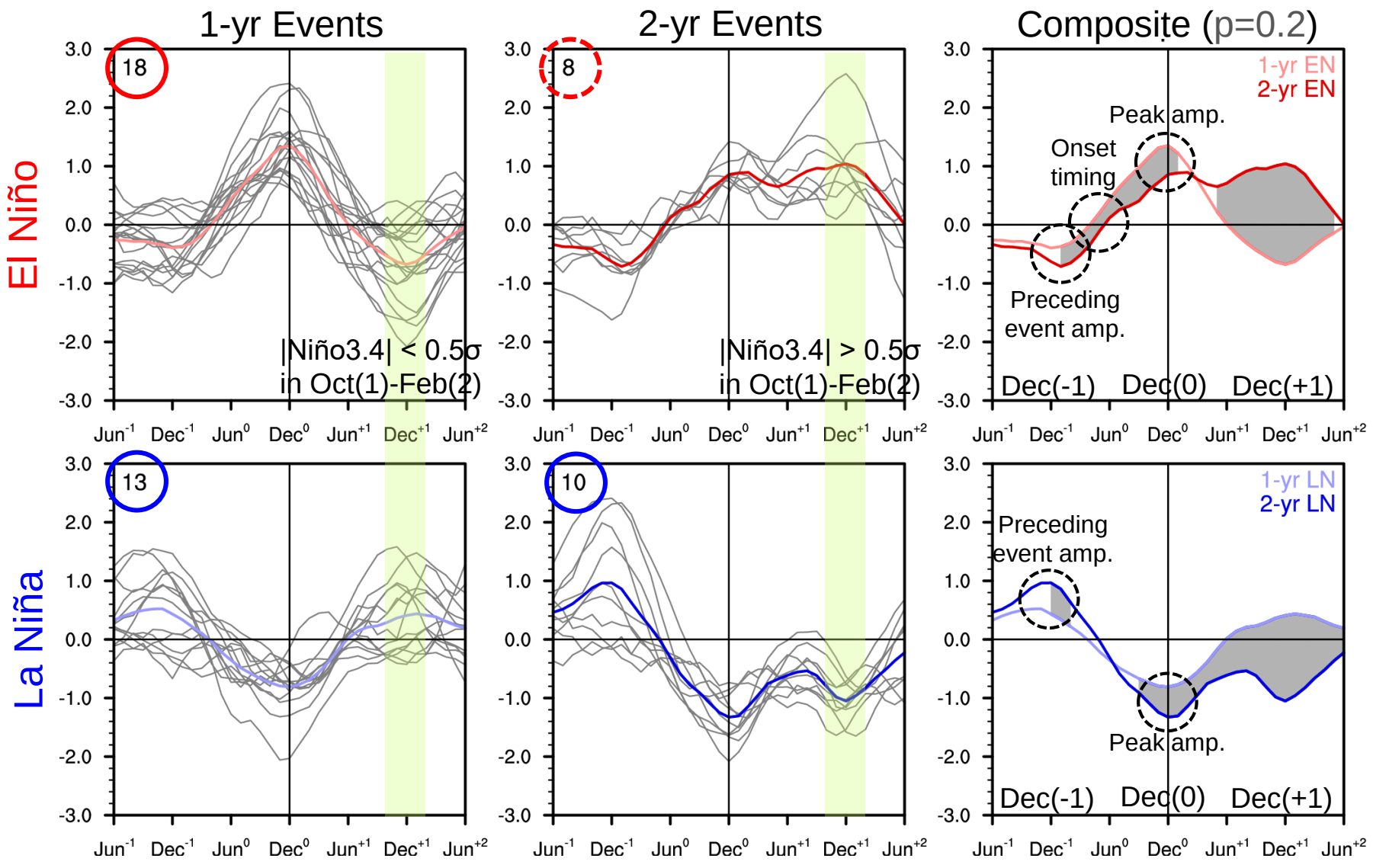
Diverse Evolution of ENSO Events



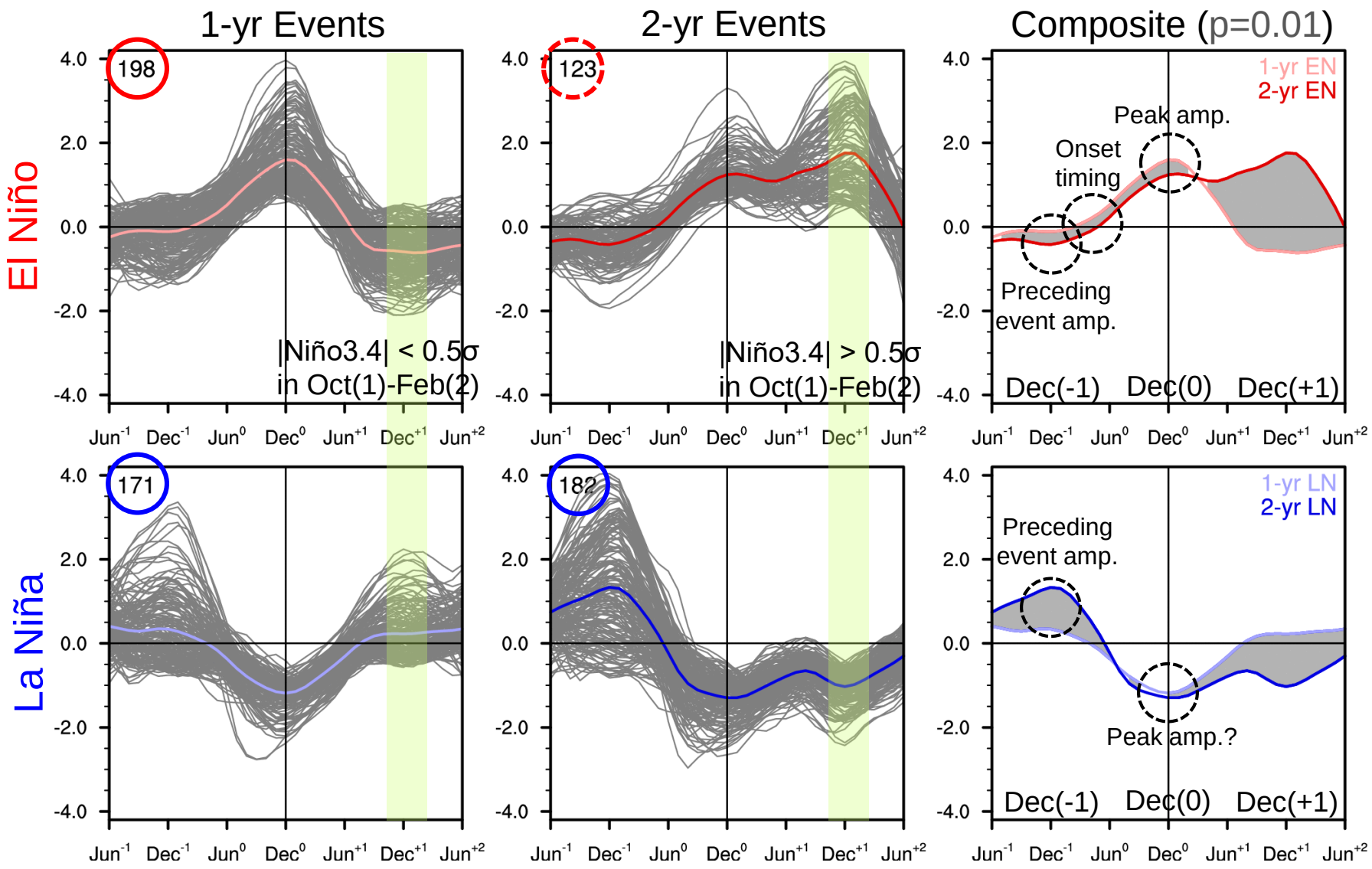
| Niño-3.4 | > 0.75σ
in Oct(0)-Feb(1)

What controls the duration of El Niño and La Niña?

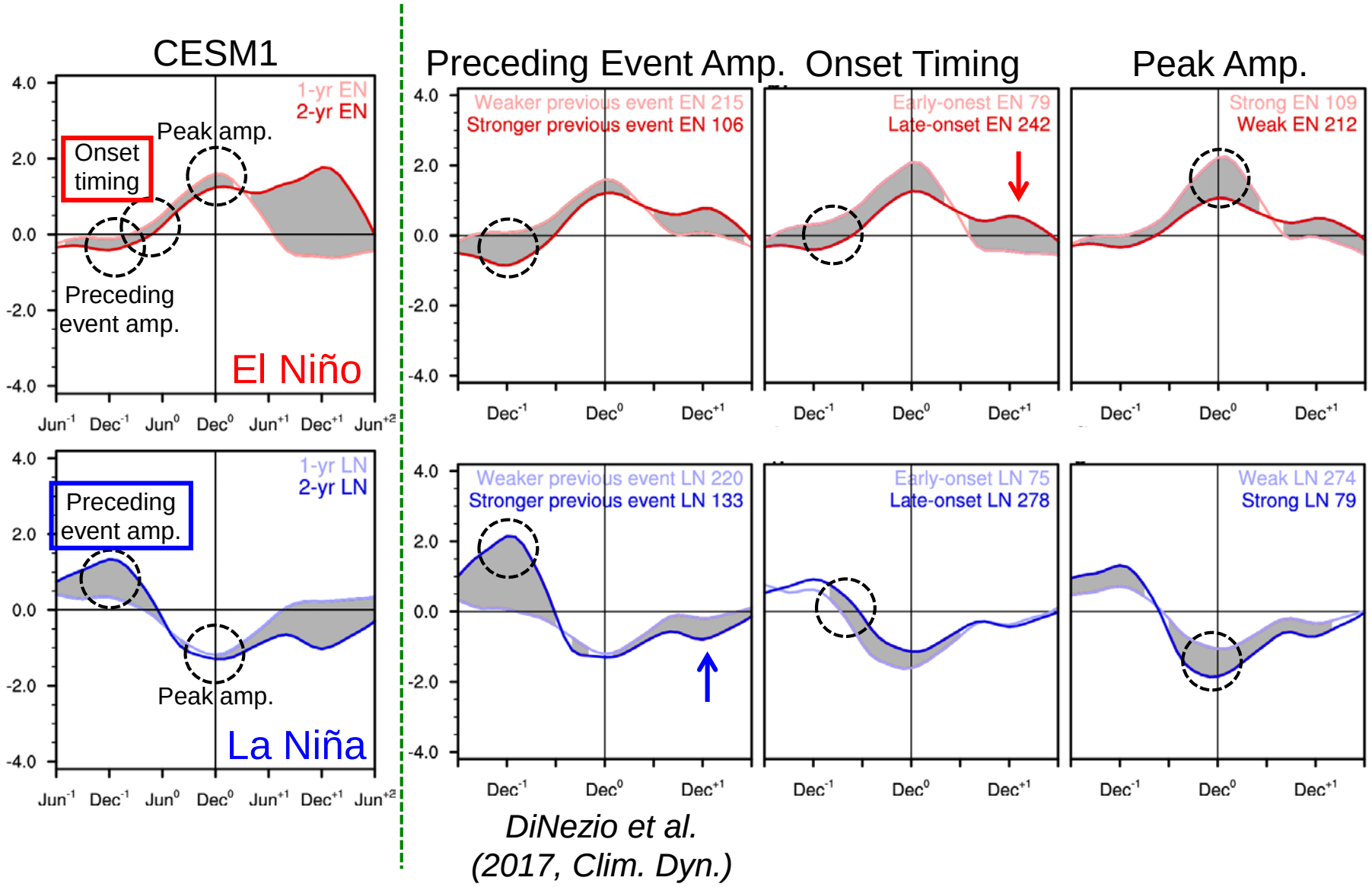
1-yr vs. 2-yr Events: Observations (1900-2016)



1-yr vs. 2-yr Events: CESM1 PI Control Run (1800 yrs)

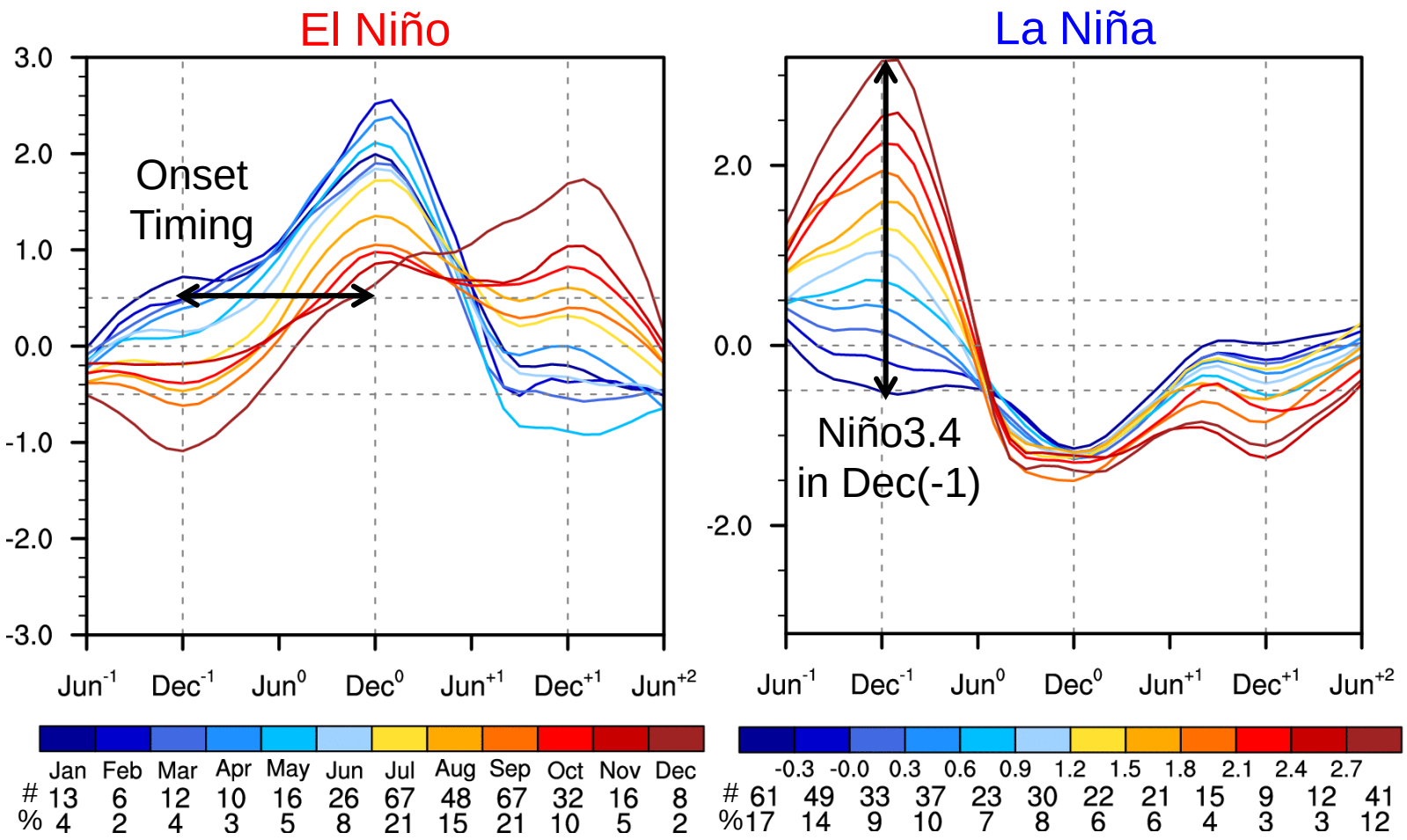


Relative Importance of These Factors (CESM1)



DiNezio et al.
(2017, Clim. Dyn.)

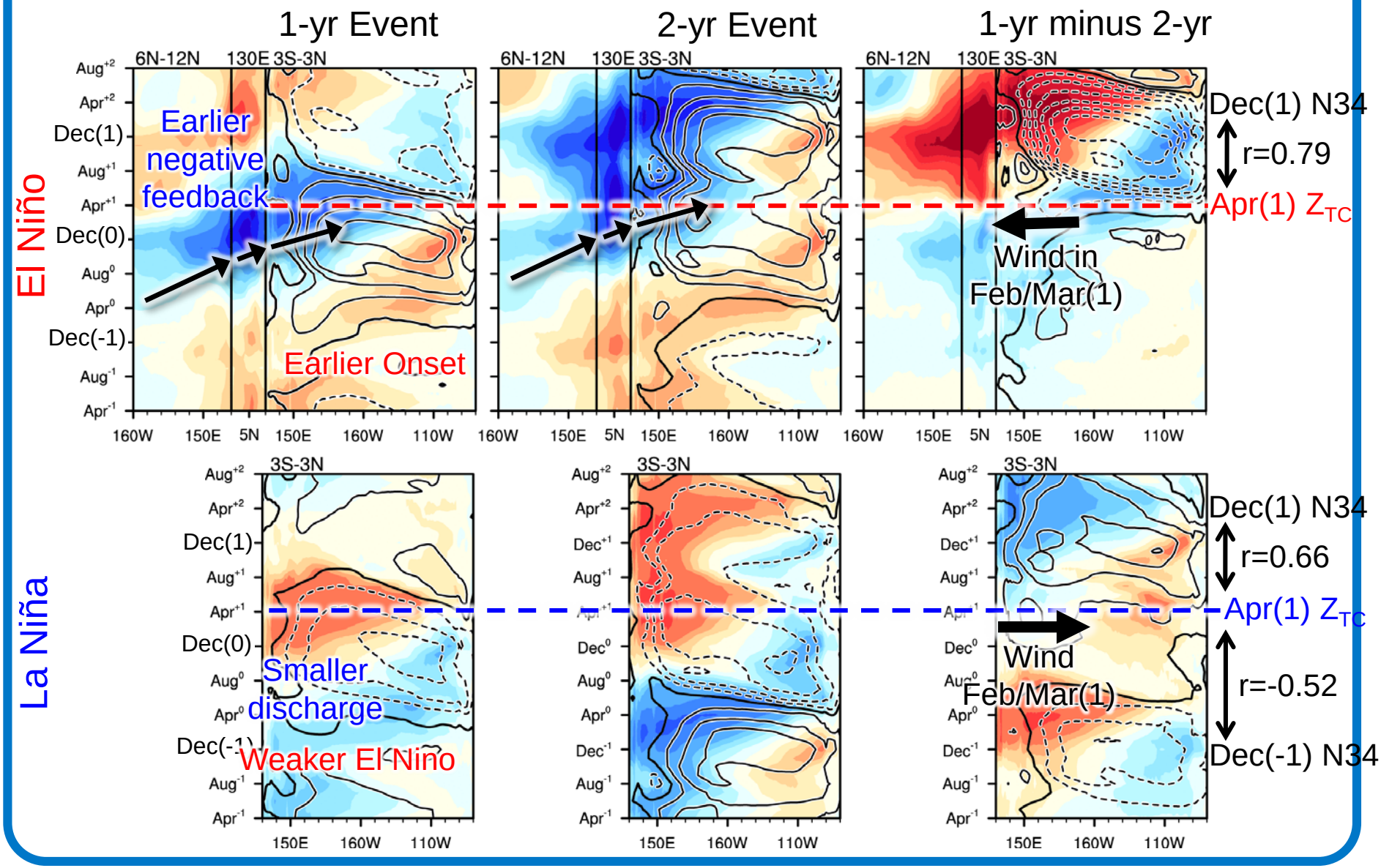
Leading Factors for El Niño and La Niña Duration (CESM1)



How do these factors affect the duration of
El Niño and La Niña in CESM1?

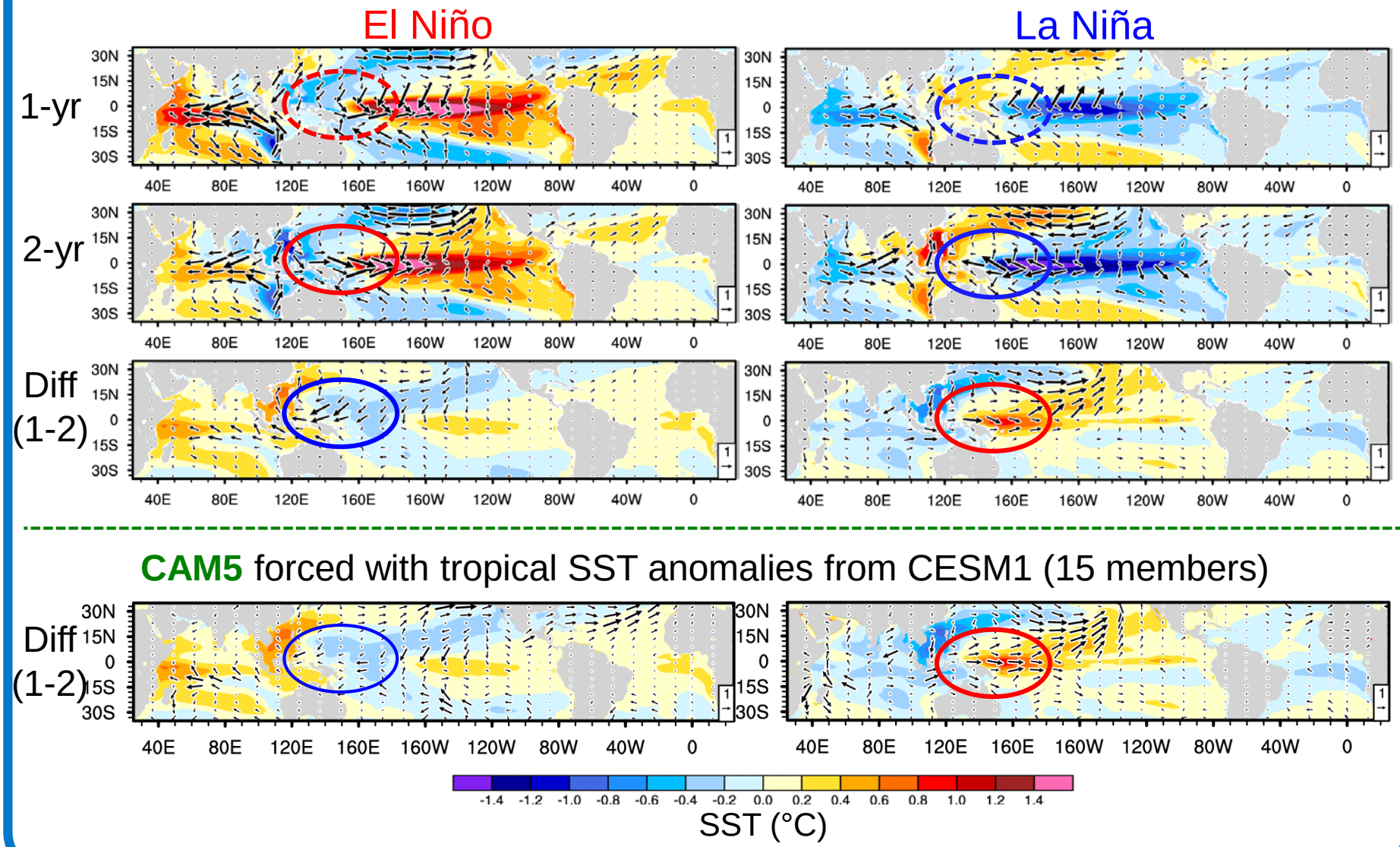
Role of Oceanic Adjustments (CESM1)

Thermocline Depth (Z_{TC}) and SST Composite Anomalies (3S-3N)



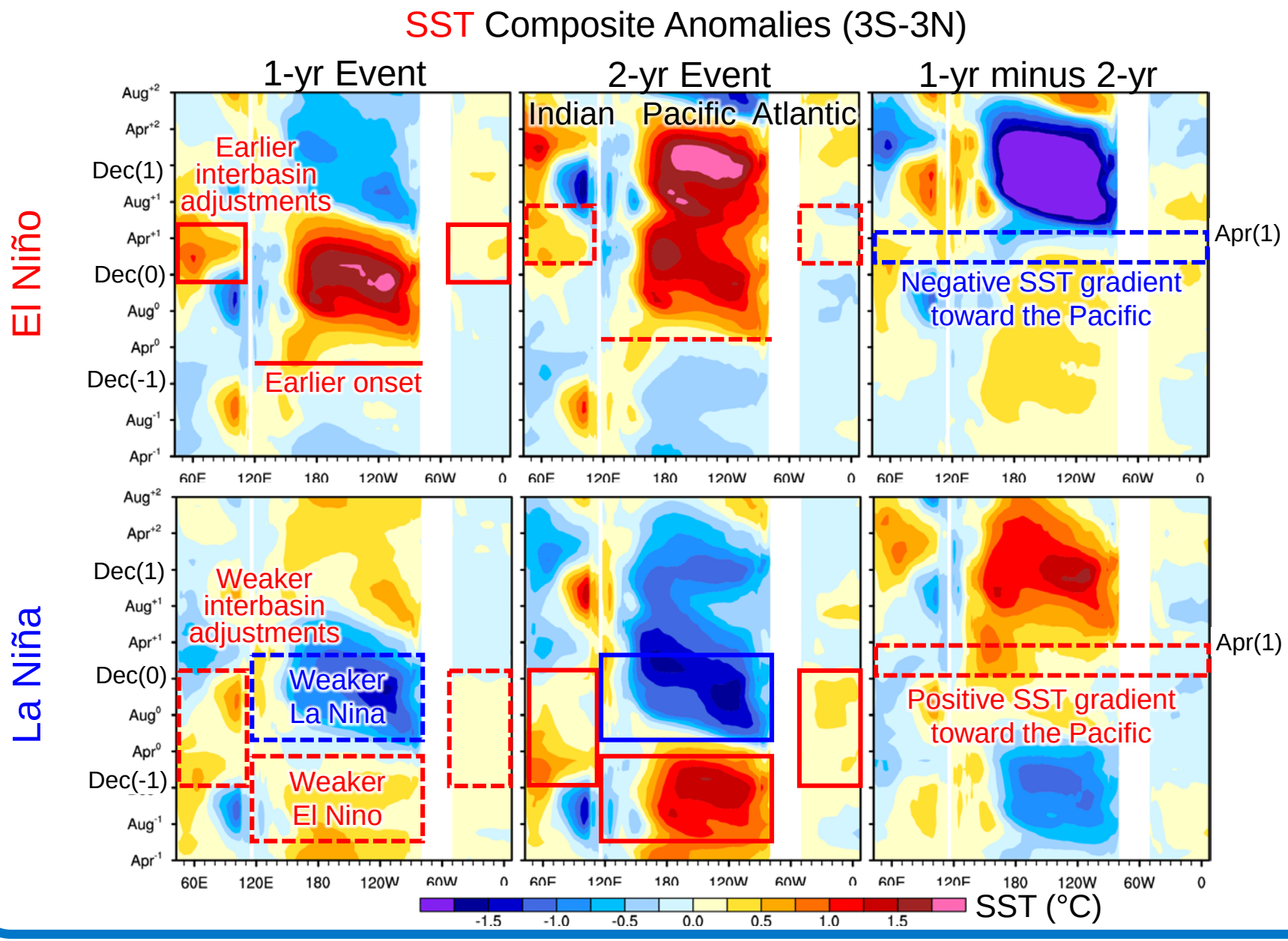
Role of Atmospheric Adjustments (CESM1)

SST and Surface Wind Composite Anomalies in **Feb/Mar(1)**

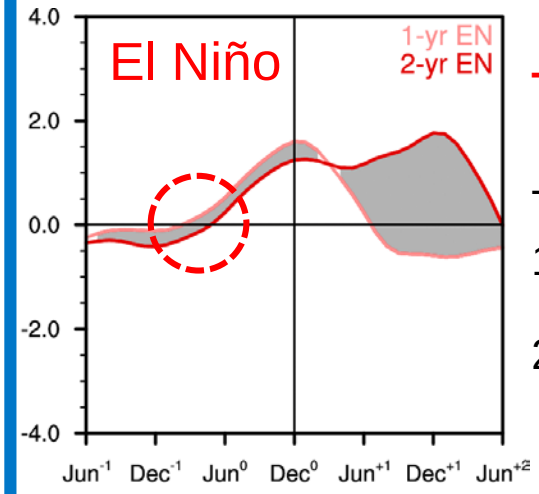


CAM5 forced with tropical SST anomalies from CESM1 (15 members)

Interbasin SST Adjustments



Summary of Diagnostic Analysis



Timing of Onset

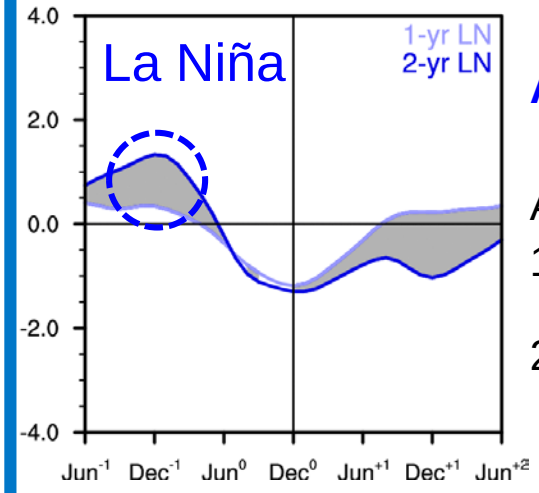
↓

Timing of

1) Thermocline adjustments ➔ E Pacific thermocline ➔ **Duration**

↑

2) Indian/Atlantic SST adjustments ➔ W Pacific winds



Amplitude of Preceding El Nino

↓

Amplitude of

1) Eq. heat content discharge ➔ E Pacific thermocline ➔ **Duration**

↑

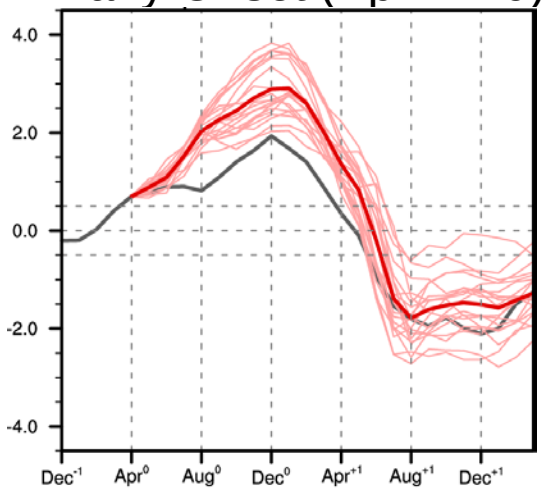
2) Indian/Atlantic SST adjustments & La Nina ➔ W Pacific winds

Can we predict the duration of El Niño and La Niña events based on these factors?

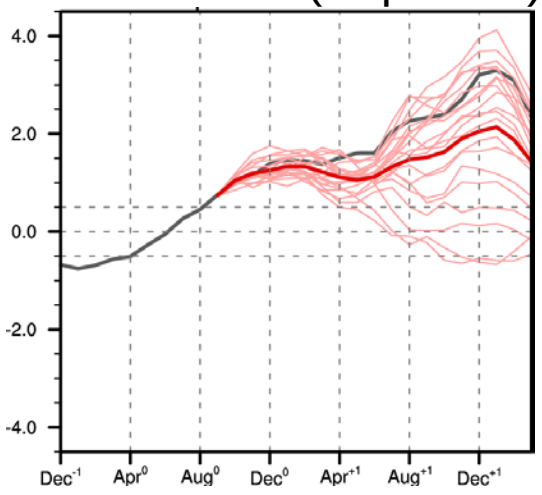
CESM1 Perfect Model Forecast Experiments

El Niño

Early Onset (Apr 1729)



Late Onset (Sep 1236)



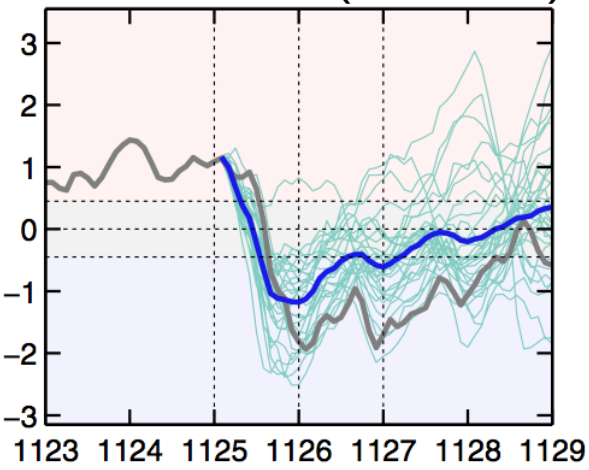
20-member ensemble forecasts

What is the predictability in the real world?

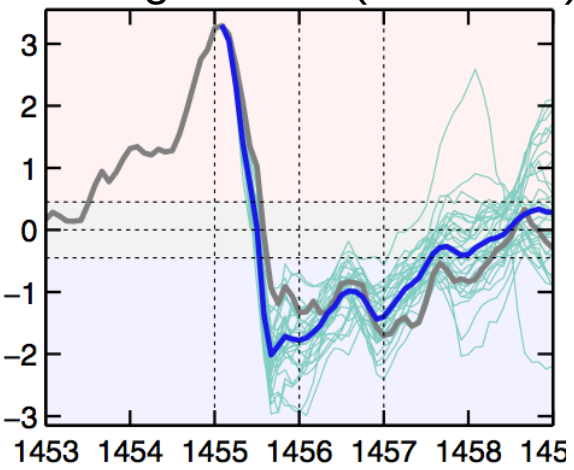
Analysis of the CESM1 decadal prediction large ensemble *(DiNezio et al. 2017, GRL)*

La Niña

Weak El Nino (Jan 1225)



Strong El Nino (Jan 1455)



30-member ensemble forecasts initialized with oceanic conditions from the CESM1 PI control run

DiNezio et al. (2017, Clim. Dyn.)