

**On the fragile relationship between El Niño and California rainfall**

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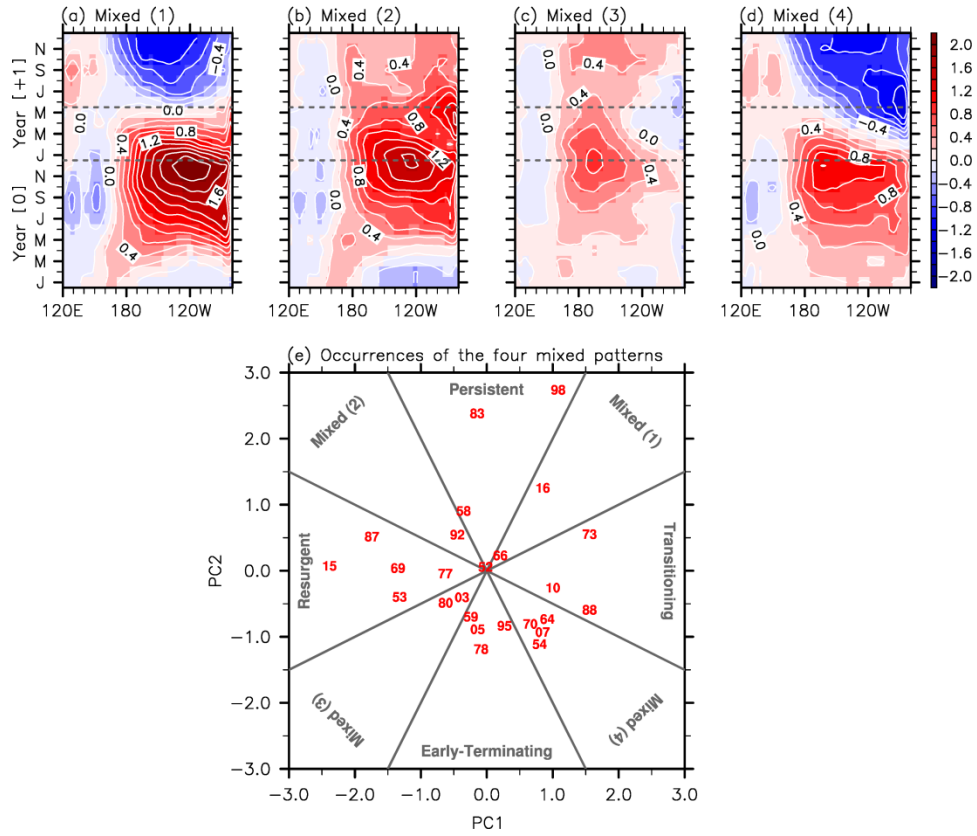
**Contents of this file**

Figures S1 to S5

**Introduction**

The supporting information provides five supplementary figures. Figure S1 shows the time-longitude plots of the tropical Pacific SSTAs, averaged between 5°S and 5°N for the four mixed El Niño flavors during 1948–2016. Figures S2 is identical to Figure 3, but for JFM(+1)-averaged anomalies. Figure S3 is identical to Figure 3, but for MAM(+1)-averaged anomalies. Figure S4 is identical to Figure 3, but for the four mixed El Niño flavors. Figure S5 shows signal to noise ratios of rainfall in JFMAM(+1) during the 25 El Niño events.

Four mixed El Nino patterns & their occurrences



**Figure S1.** (a-d) Time-longitude plots of the tropical Pacific SSTAs, averaged between 5°S and 5°N, illustrate the four mixed El Niño flavors during 1948–2016. (e) Normalized PC1 versus PC2 values for all 25 El Niño events. The two digit numbers indicate the El Niño decay years. The dashed gray lines in (a-c) indicate January 1(+1) and May 31(+1). The thick gray lines in (e) are the boundaries (i.e.,  $PC1 = \pm 2 \times PC2$  and  $PC2 = \pm 2 \times PC1$ ) that separate the four principal El Niño flavors from the mixed flavors. The units for SSTAs in (a-d) are in °C.

SST, PREC & GPOT (500hPa) anomalies during four El Nino patterns in JFM (+1)

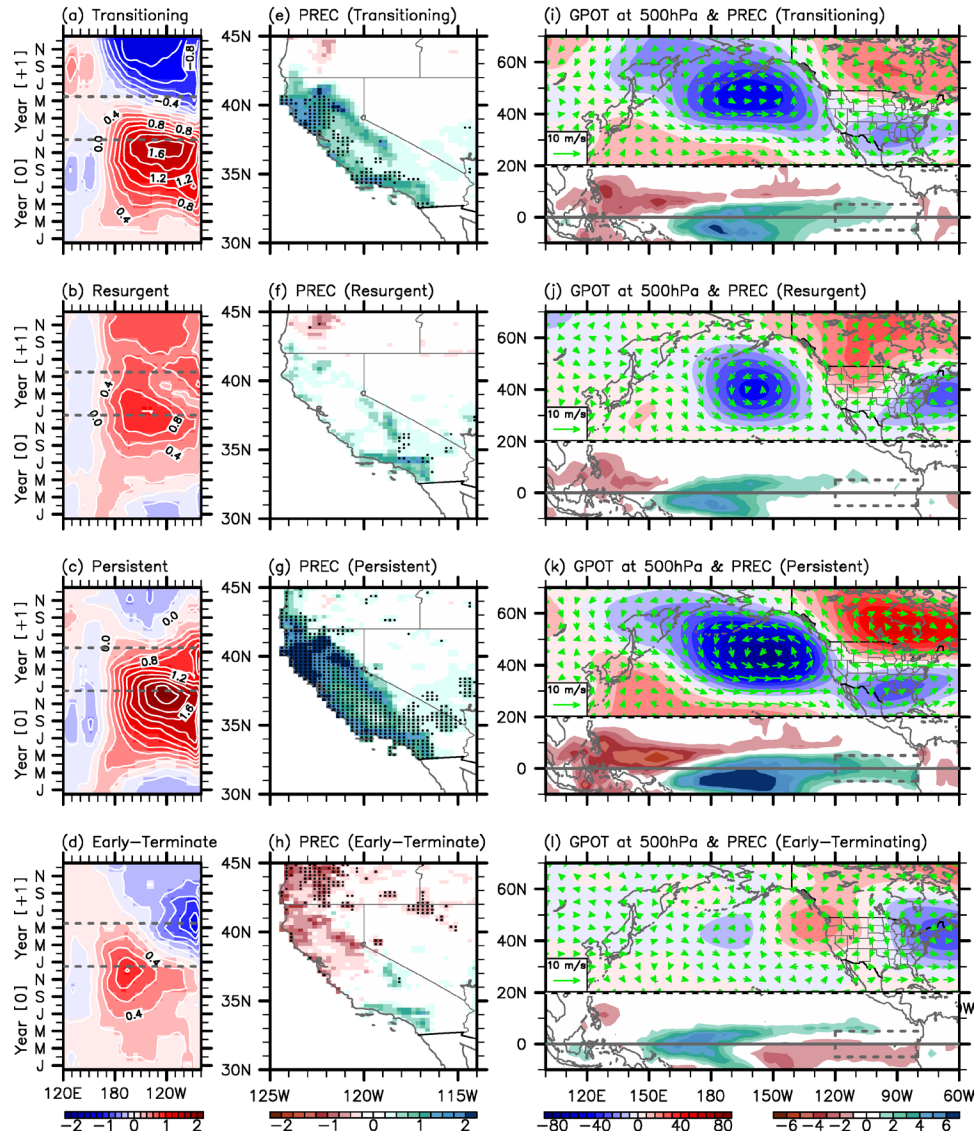


Figure S2. Same as Figure 3, but for JFM(+1).

SST, PREC & GPOT (500hPa) anomalies during four El Nino patterns in MAM (+1)

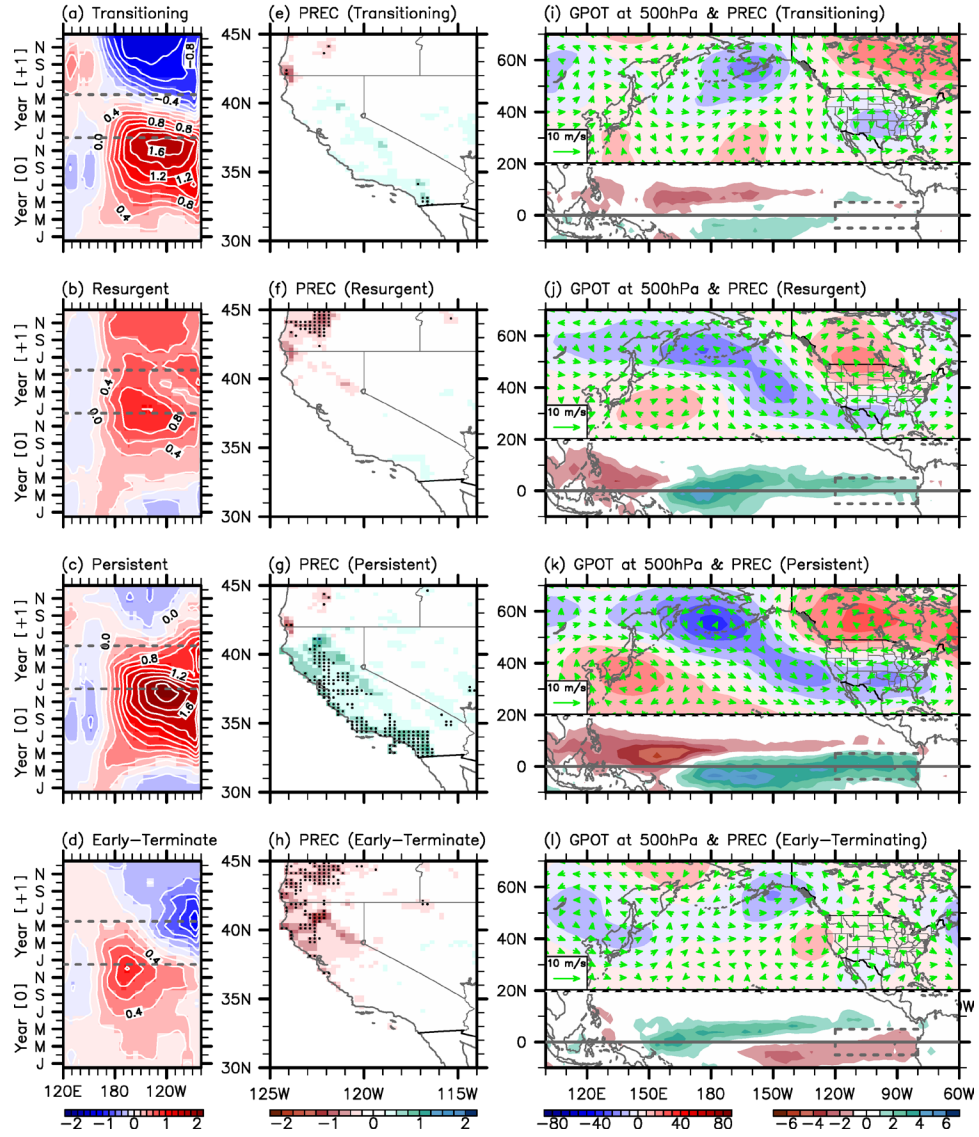
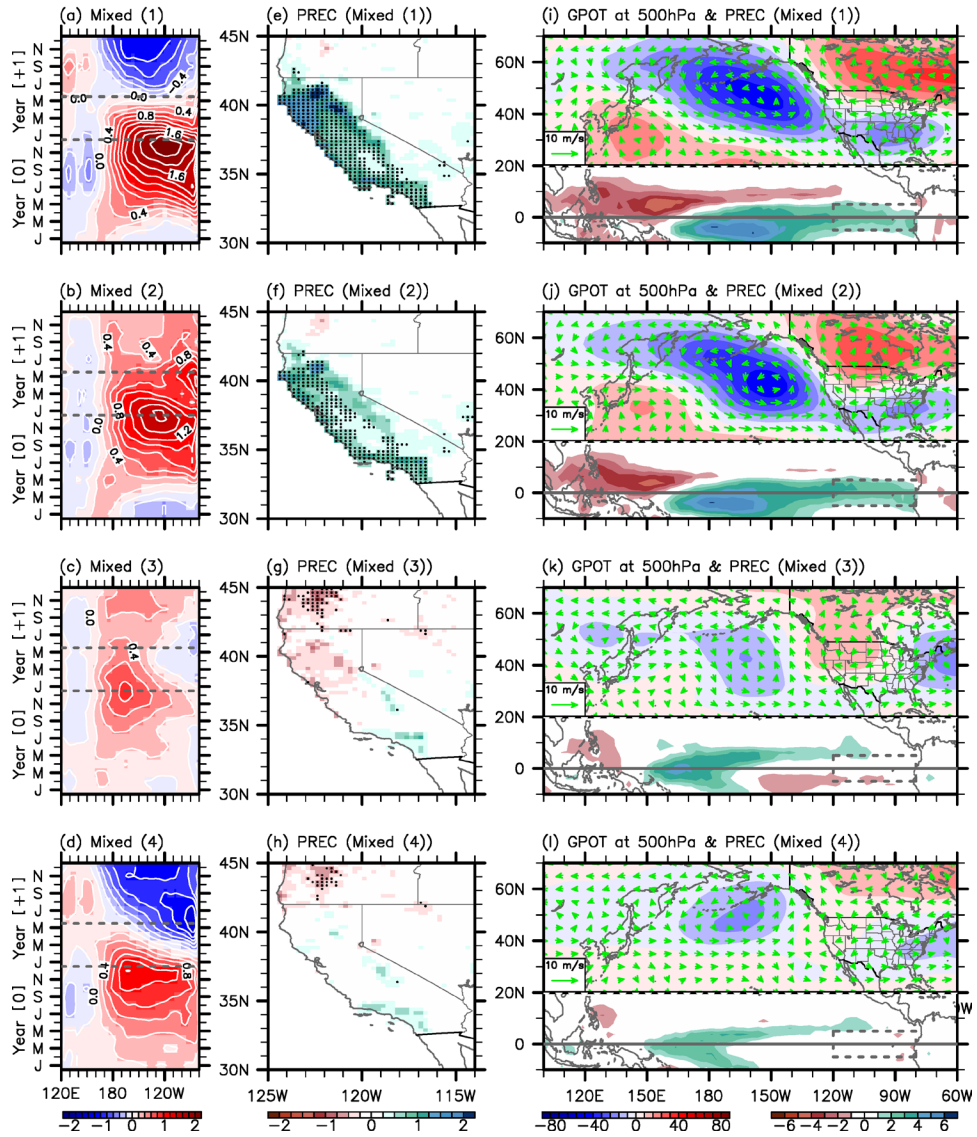


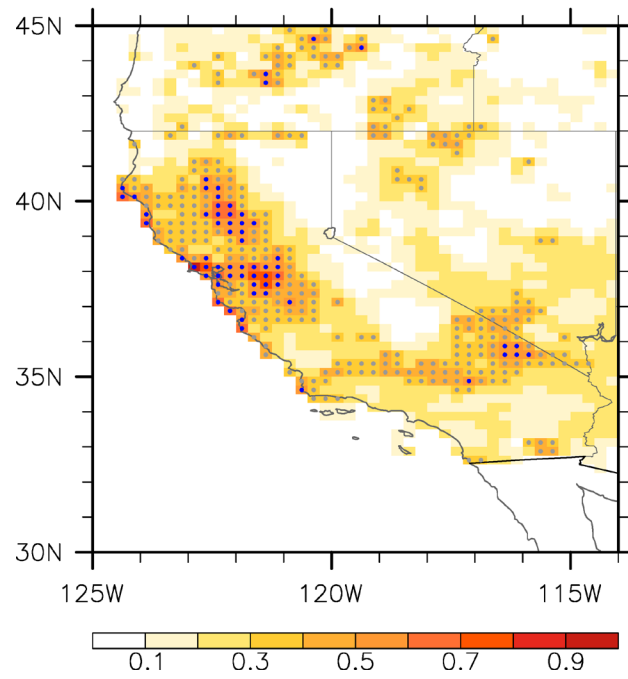
Figure S3. Same as Figure 3, but for MAM(+1).

SST, PREC & GPOT (500hPa) anomalies during four mixed patterns in JFMAM (+1)



**Figure S4.** Same as Figure , but for the four mixed El Niño flavors.

Signal to noise ratio of PREC anomalies in JFMAM (+1)



**Figure S5.** Signal to noise ratios of rainfall in JFMAM(+1) during the 25 El Niño events, which are computed by the variance explained by the El Niño flavors (i.e., two leading EOF modes) divided by the variance caused by internal variability. The gray dots indicate that the signal to noise ratio is above 0.3, whereas the blue dots indicate that the signal to noise ratio is above 0.5.