Supplementary Information for
El Niño/Southern Oscillation response to low-latitude volcanic eruptions depends on ocean pre-conditions and eruption timing

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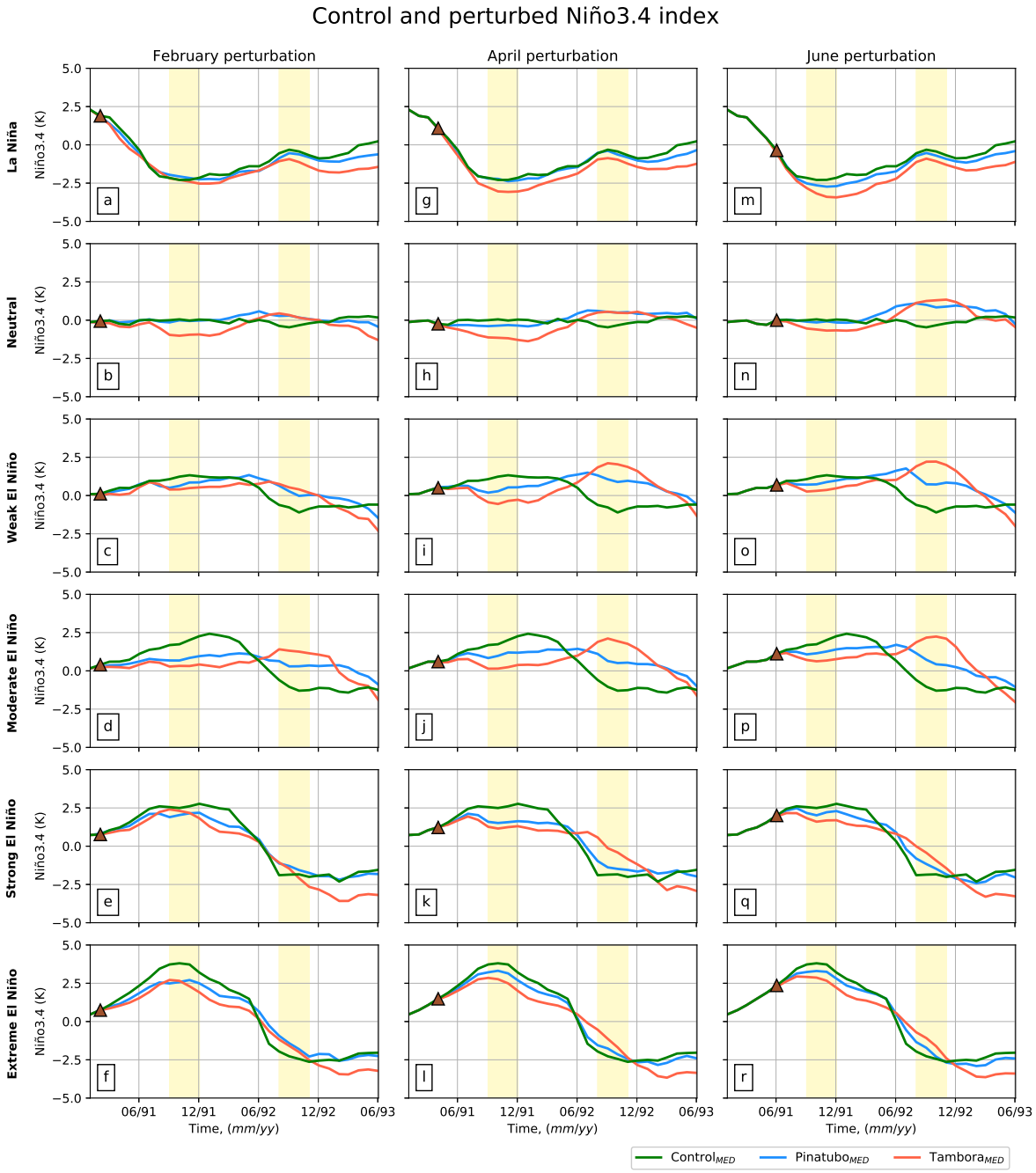
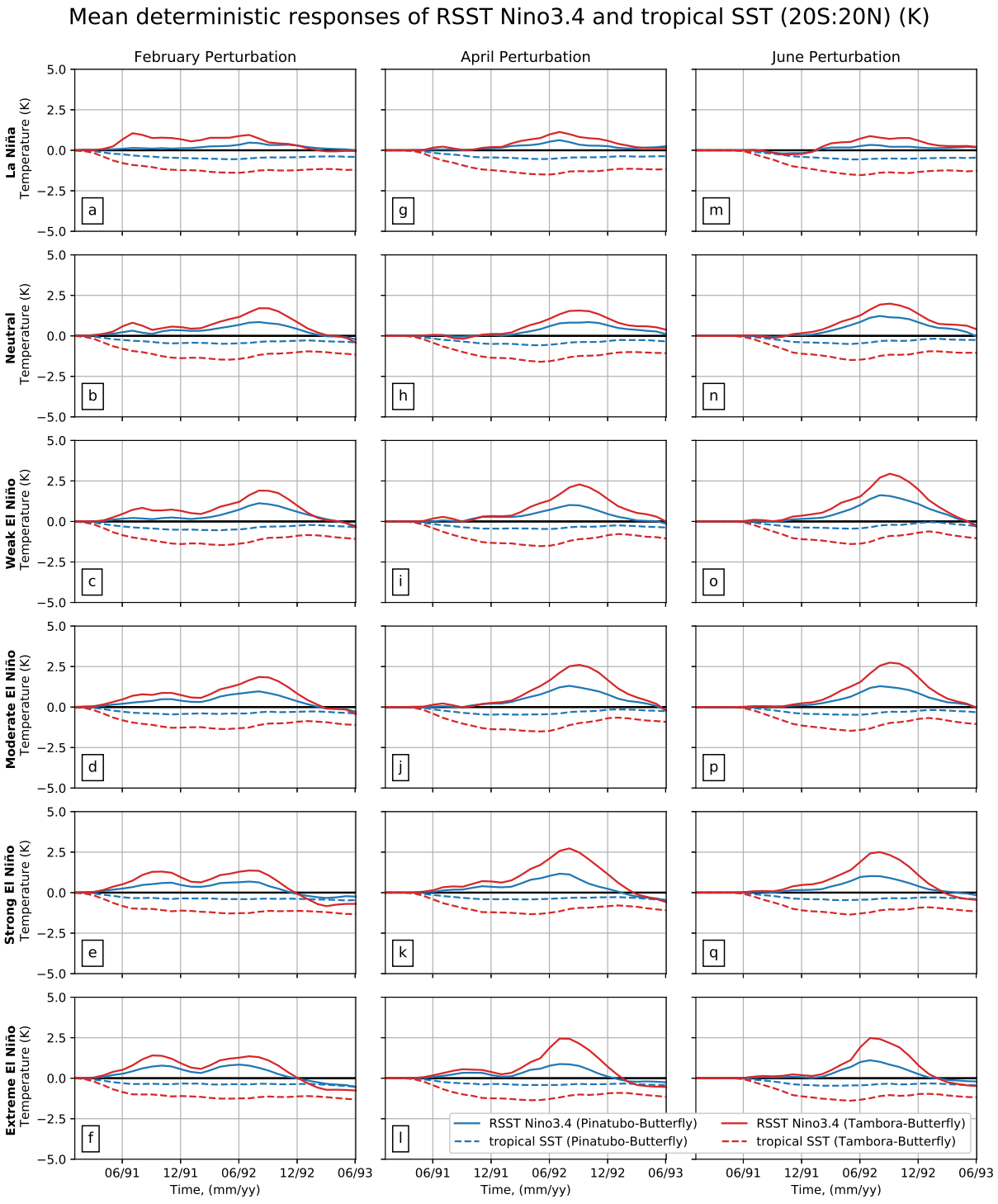
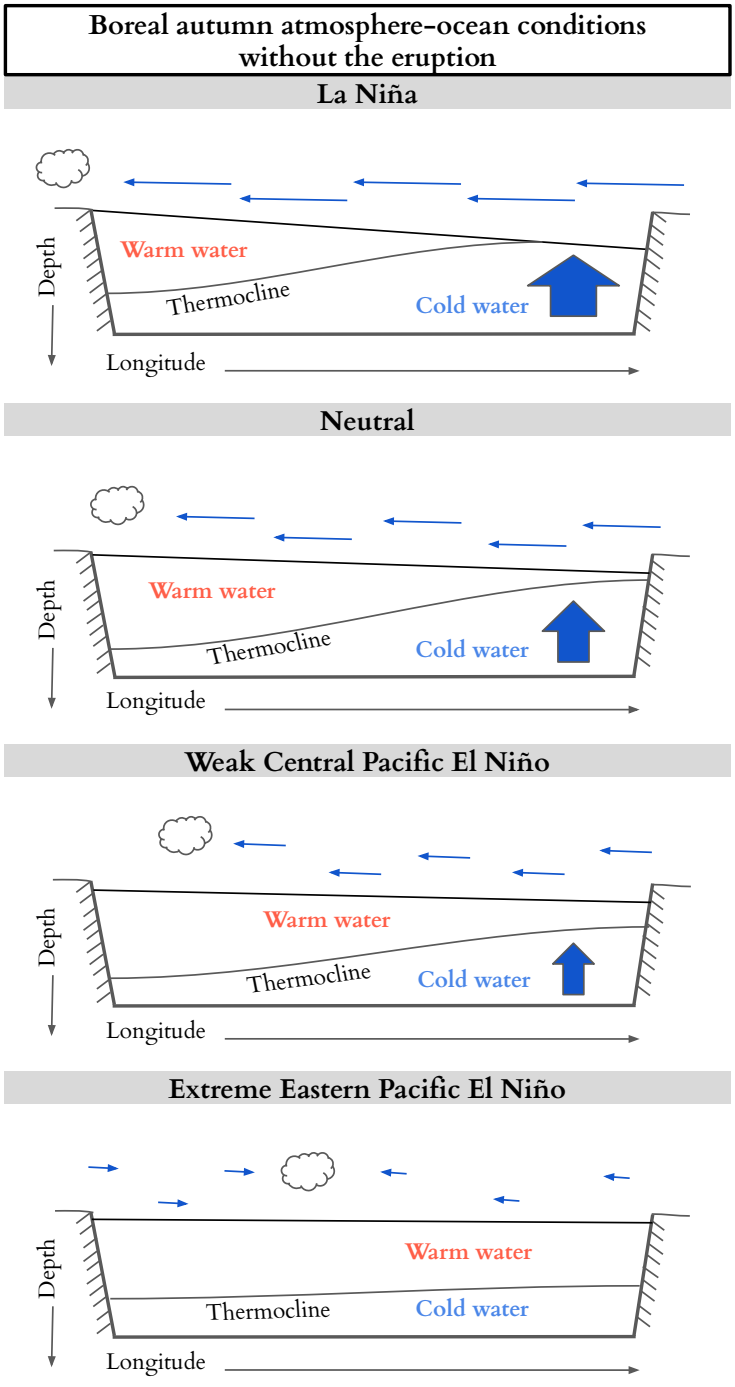
Supplementary Figures



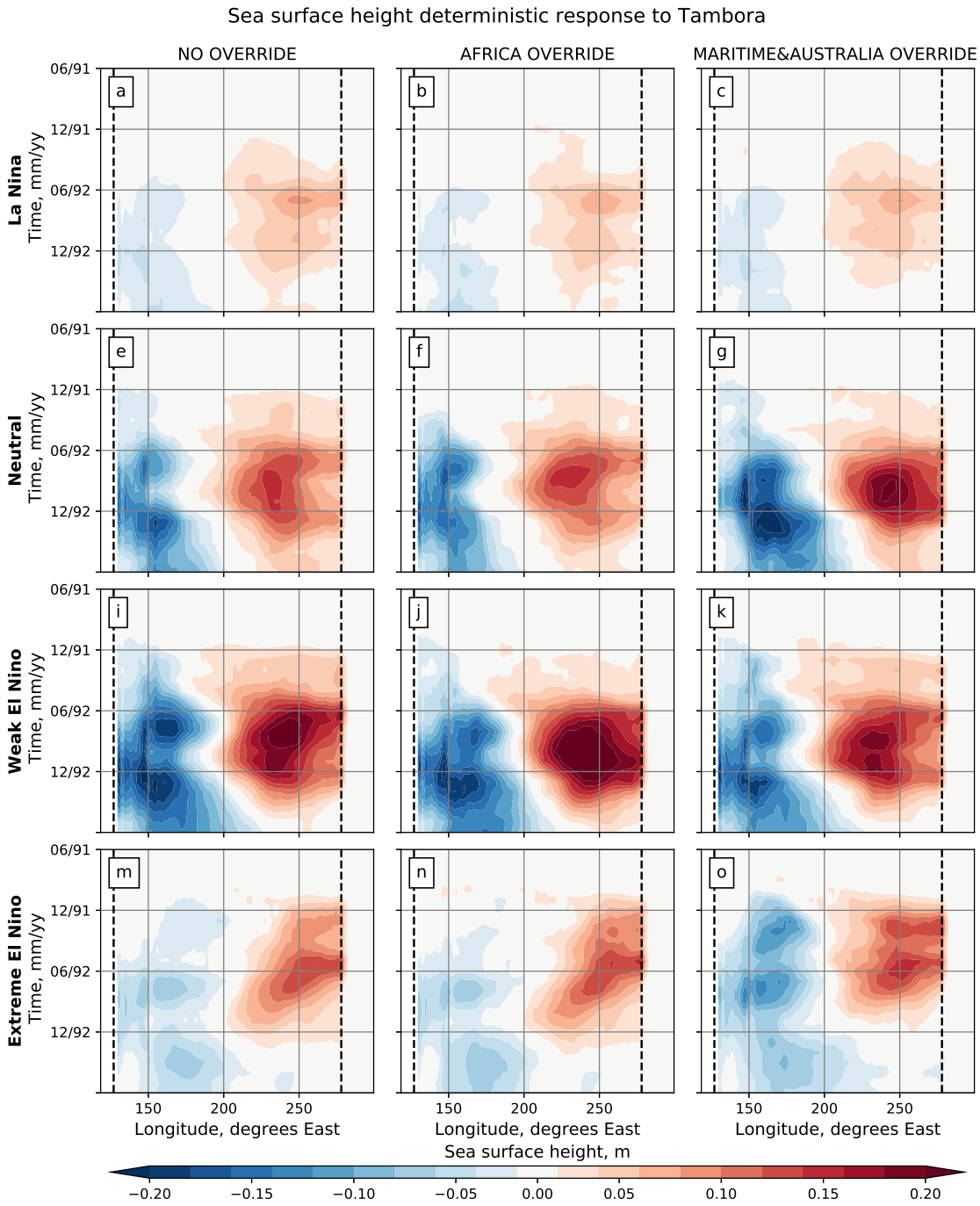
Supplementary Figure 1: Control and perturbed Nino3.4 SST anomaly. Each row represents an individual control ENSO onset group as the median of control ensemble (Control$_{MED}$, green): La Niña (panels a,g,m), Neutral (panels b,h,n), weak El Niño (panels c,i,o), moderate El Niño (panels d,j,p), strong El Niño (panels e,k,q), and extreme El Niño (panels f,l,r). Please see Experimental setup for control ENSO event definitions. The perturbed ENSO states after February (panels a-f), April (panels g-l), and June (panels m-r) Pinatubo-size and Tambora-size eruptions are shown as medians of volcanic grand-ensembles (Pinatubo$_{MED}$, blue) and Tambora grand-ensemble (Tambora$_{MED}$, red). Niño3.4 (K). Eruption times are marked by brown triangles. Yellow-shaded vertical bands indicate the seasons OND 1991 and SON 1992 used to summarize ENSO responses in Fig. 2 of the manuscript.



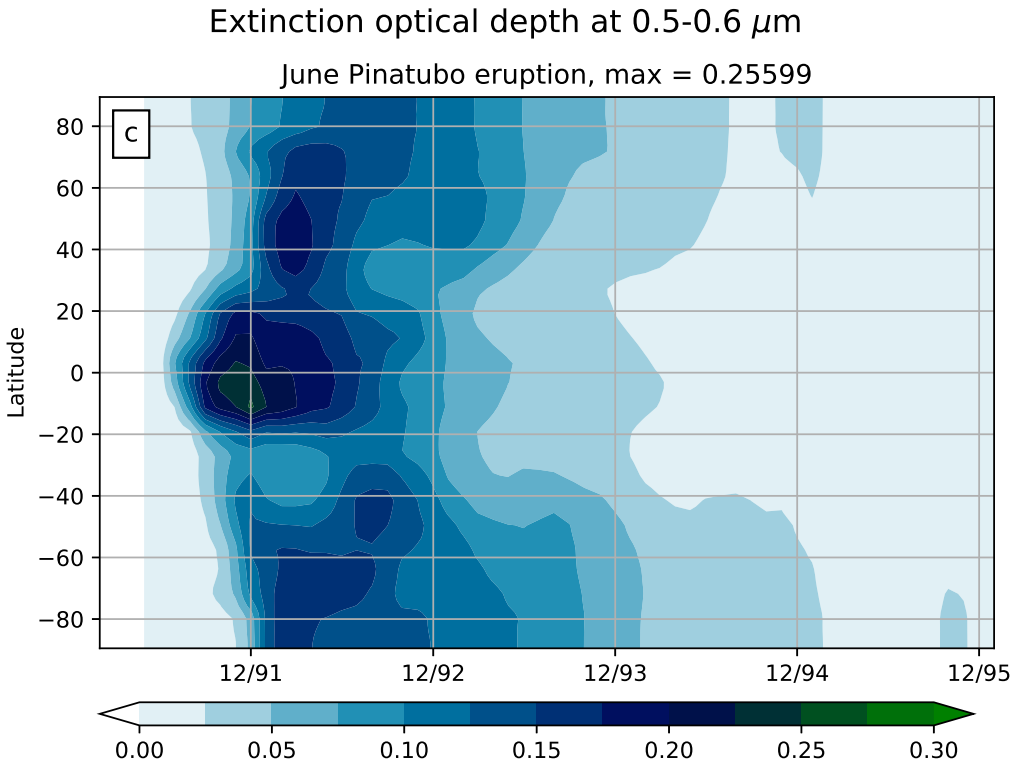
Supplementary Figure 2: Deterministic responses of the RSST index (K) to February (panels a-f), April (panels g-l), or June (panels m-r) Pinatubo-size (blue) and Tambora-size (red) perturbations. Each row represents responses of an individual control ENSO onset group: La Niña (panels a,g,m), Neutral (panels b,h,n), weak El Niño (panels c,i,o), moderate El Niño (panels d,j,p), strong El Niño (panels e,k,q), and extreme El Niño (panels f,l,r) (see Experimental setup for control ENSO event definitions). The deterministic response to volcanic forcings is calculated as the mean difference between the volcanic and Butterfly grand-ensembles. The dashed curves represent the tropical cooling used for calculations of the RSST Nino3.4 index.



Supplementary Figure 3: **Schematic of the boreal autumn atmosphere-ocean conditions without the eruption.**



Supplementary Figure 4: Hovmöller (longitude vs. time) diagrams of the deterministic response of the sea surface height (SSH, m) to June 1991 Tambora-size eruptions averaged over 5S-5N during June 1991 – June 1993. The response is calculated as the Tambora grand-ensemble median minus the Butterfly grand-ensemble median, for experiments without continental temperature override (panels a,e,i,m) and with temperature override over Africa (panels b,f,j,n) and the Maritime Continent and Australia (panels c,g,k,o). Rows indicate responses of La Niña (panels a-c), Neutral (panels e-g), weak El Niño (i-k), and extreme El Niño (m-o) onsets (see Experimental setup for event definitions). Medians are calculated from 100-member grand-ensembles for the experiments without override, and 50-member grand-ensembles for the experiments with override. Dashed black lines bound the Pacific ocean.



Supplementary Figure 5: Hovmöller (latitude vs. time) diagram of zonally averaged column integrated aerosol extinction optical depth at 0.5-0.6 μm after the June 1991 Pinatubo eruption.