



ENSO: Atmospheric/Ocean Variable Associations: Inter-event Similarities and Differences



<https://psl.noaa.gov/enso/difference/>

Goal: Provide an easy to use webpage with maps and plots of many ocean and atmospheric variables for El Niños and La Niñas during the course of individual events. Also provide summary plots which show the composite (average) event with an measure of how consistent variables are among events. The ultimate goal is to illustrate how individual ENSO events are alike and different from each other and to illustrate what the areas of similarities and differences are.

Background and Method

ENSO Event Definition: Ranked Ocean Niño Index (ONI) values for DJF. For 20CR, Niño3.4 from the HadISST1.1 SST dataset.

Variables: Variables are largely obtained from ocean/atmosphere reanalyses. These include ERA5, 20CRv3 (atmosphere) surface (ERA5, ORAS5, 20VRv3) and ocean depth (ORAS5). Some other datasets are available including Nclimgrid US surface T/P, tidal data, and more.

Regions: Users can select from the Globe, the CONUS, the Tropical Pacific ocean, and the Arctic. More can be added.

Plot type 1: For each of El Niño or La Niña, there are anomaly maps for each event, the composite(average), and the inter-event standard deviation.

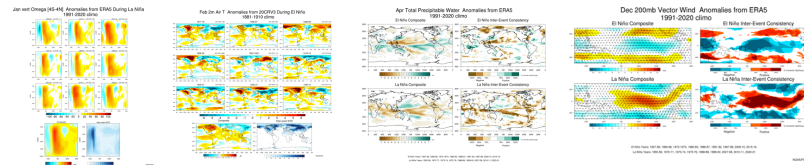
Plot type 2: A summary plot of El Niño and La Niña composites is shown. To have a measure of the consistency of the variables association, we plot the percent of events that have the same signed anomaly, where that is larger than would be expected randomly.

Issues: Some variables are reanalysis and not directly measured. There is not a single accepted definition of ENSO events. There is a large temperature trend, particularly since 1980. So anomalies may reflect the trend and not the impact of ENSO.

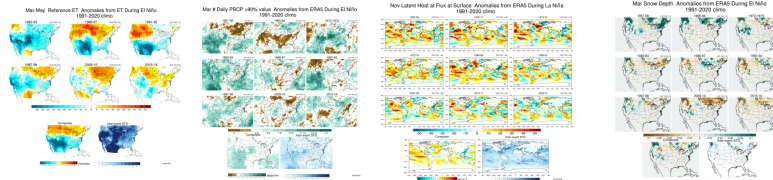
"Extreme" statistics: For some variables, we plotted the number of days they exceeded or were less than 90%/10% compare to what is expectedly randomly.

Sample Plots

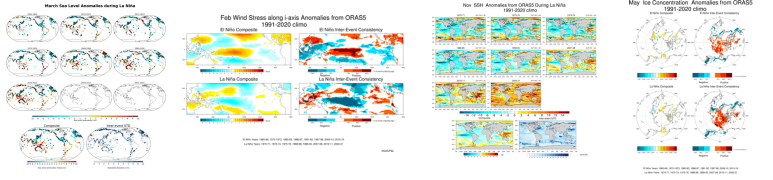
Atmosphere Variables



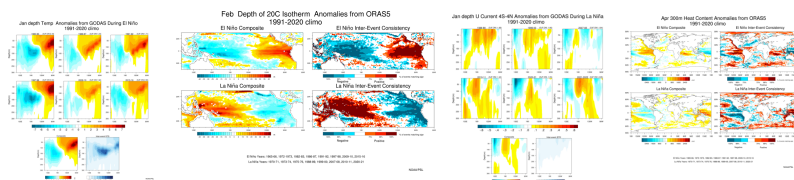
Meteorological Surface



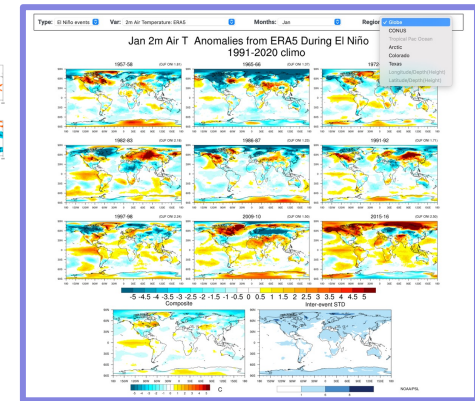
Ocean Surface



Ocean Depth



Web Interface



Plotting and Web Code: The plots were all generated using NCL code that was set to use flexible inputs and plotting options. The Webpage uses JavaScript with a table of available menu options for each variable. ENSO events were defined depending on the length of a dataset and could be changed. Color tables reflect the type of variable (warm vs cold or wet vs dry)

Future Plans: Add More variables and variable types. Examine linear relationship (correlations), look at Holmollers and do more with shorter time scales.

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