

## **Indices of El Niño - Southern Oscillation from historical data sets based on sea surface temperature measurements: Estimates and their uncertainties**

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Since El Niño - Southern Oscillation (ENSO) events vary in their spatial patterns, a variety of sea surface temperature (SST) based indices that characterize these events have been getting attention, in addition to well-researched NINO3 and NINO3.4 indices. Naturally, for each index its actual "observed" values depend on a data set from which they were computed. The fact that there are noticeable changes between versions of an index computed from different widely used observational data sets is a concern for researchers, *e.g.*, trying to classify different types of ENSO events. Here I attempt to ease their predicament by

- (1) presenting verifiable error bars for monthly index time series computed from a reduced space objective analysis of SST observations;
- (2) emphasizing consistency between such estimates and those obtained from unanalyzed data sets;
- (3) interpreting and explaining, to a reasonable extent, differences between indices computed from analyzed data set produced using different methods.

Intended conclusion is that there is a decent, usable consistency in interannual variability of ENSO indices computed from different observational data sets (differences in multidecadal and secular trends, as opposed to those in the interannual variability, might require a separate investigation). The period of consistency extends back from the present to some point in the past when the tropical SST data essentially become too poor to discriminate between ENSO states as described by a given index. Preliminary estimate for this early boundary of consistency is around 1870 for the eastern Pacific SST indices and somewhat later for the western Pacific. (Requiring the uncertainty in indices that is smaller than what is necessary for the rough identification of ENSO state types would shorten periods of acceptable consistency).