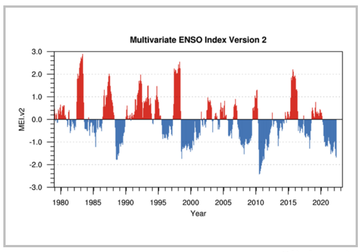
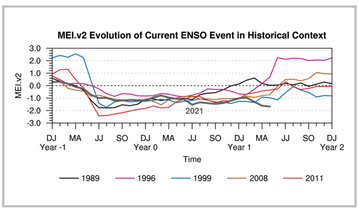
Multivariate ENSO Index Version 2 (MEI.v2)





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Overview

The El Niño/Southern Oscillation (ENSO) - a naturally occurring anomalous state of tropical Pacific coupled ocean-atmosphere conditions - is the primary predictor for global climate disruptions. These can persist over several seasons and thereby produce severe regional effects. An appraisal of the real-time status of ENSO is thus important for a host of climate services that inform societal responses and trigger policy actions for water supply, food security, health, and public safety. The MEI, which combines both oceanic and atmospheric variables, facilitates in a single index an assessment of ENSO. It especially gives real-time indications of ENSO intensity, and through historical analysis - provides a context for meaningful comparative study of evolving conditions.

The bi-monthly Multivariate El Niño/Southern Oscillation (ENSO) index (MEI.v2) is the time series of the leading combined Empirical Orthogonal Function (EOF) of five different variables (sea level pressure (SLP), sea surface temperature (SST), zonal and meridional components of the surface wind, and outgoing longwave radiation (OLR)) over the tropical Pacific basin (30°S-30°N and 100°E-70°W). The EOFs are calculated for 12 overlapping bi-monthly "seasons" (Dec-Jan, Jan-Feb, Feb-Mar,..., Nov-Dec) in order to take into account ENSO's seasonality, and reduce effects of higher frequency intraseasonal variability. During the typical height of ENSO during late Fall/early Winter, the canonical features of atmosphere and ocean anomalies are shown schematically below based on a composite of 11 historical El Niño and La Niña events. Key features of composite positive MEI events (warm, El Niño) include (1) anomalously warm SSTs across the east-central equatorial Pacific, (2) anomalously high SLP over Indonesia and the western tropical Pacific and low SLP over the eastern tropical Pacific, (3) reduction or reversal of tropical Pacific easterly winds (trade winds), (4) suppressed tropical convection (positive OLR) over Indonesia and Western Pacific and enhanced convection (negative OLR) over the central Pacific (Fig. 1a). Key features of composite negative MEI events (cold, La Niña, Fig. 1b) are of mostly opposite phase. For any single El Niño or La Niña situation, the atmospheric articulations may depart from this canonical view.

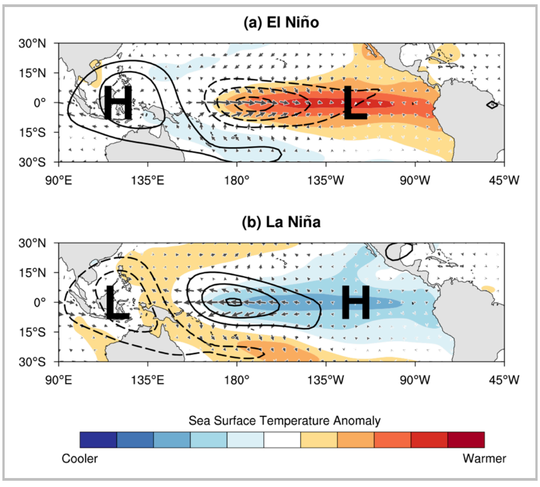

Fig. 1: Schematic diagram showing the physical mechanisms by which the SST (shaded), OLR (contours), surface zonal and meridional winds (vectors), and sea level pressure (represented by "H" and "L" which indicate the high and low pressure center, respectively) determine the wintertime Multivariate ENSO Index (MEI) during (a) El Niño and (b) La Niña events. The schematic is based on the composite anomalies for November-December (ND) drawn from 11 warm events and 11 cold events during 1980-2016.

This is a Research and Development Application

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