

TOWARD AN ENSO INDEX FOR A CHANGING CLIMATE

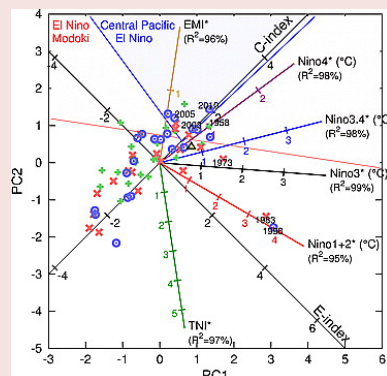
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Problems

1. No standard ENSO Index (or is this a feature?)
2. ENSO is fundamentally nonlinear
3. Index values affected by trends (L'Heureux et al., 2013)

Some existing indices (Barnston, 2015; L'Heureux et al., 2015)

Air pressure
Southern Oscillation Index
Equatorial Southern Oscillation Index
Sea surface temperature
Niño 1+2
Niño 3
Niño 3.4
Niño 4
Niño infinity
Oceanic Niño Index
Trans-Niño Index
El Niño Modoki Index
EP-ENSO, EP-PC1
CP-ENSO, CP-PC1
Satellite
OLR-El Niño index
Combined
Multivariate ENSO Index
Bivariate ENSO Index

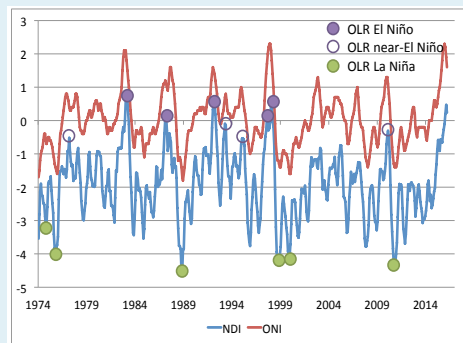


Linear regression of ENSO indices on leading tropical Pacific EOFs (Takahashi et al. 2011)

Current Strategy

Chiodi and Harrison (2013): ENSO index defined by OLR better distinguished strong from weak teleconnections.

Hypothesis: ENSO index based on variations in the tropical Pacific SST gradient will measure key causal link: SST → Change in location of tropical convection → Change in large-scale circulation → Change in impacts



Niño Difference Index (NDI): Difference between NINO 3.4 SSTs and SSTs over the Maritime Continent

Desirable characteristics:

1. Not too unfamiliar (partly based on NINO 3.4)
2. Well correlated with remote ENSO responses
3. Unaffected by uniform SST increases
4. Captures nonlinearity through sign change
5. Less affected by changes in observing methods
6. Long-term historical record
7. Directly applicable to climate model simulations

Shortcomings:

1. New
2. One index is not enough

Request for Input

(write your responses below)

What are the desirable characteristics of an ENSO index?

What should an ENSO index be optimized to do?

References

Barnston, A., 2015: Why are there so many ENSO indices, instead of just one? Climate.gov, NOAA, accessed Oct. 20, 2017

Chiodi, A. M., and D. E. Harrison, 2013: El Niño Impacts on Seasonal U.S. Atmospheric Circulation, Temperature, and Precipitation Anomalies: The OLR-Event Perspective. *J. Climate*, doi:10.1175/JCLI-D-12-00097.1.

L'Heureux, M. L., D. C. Collins, and Z.-Z. Hu, 2013: Linear trends in sea surface temperature of the tropical Pacific Ocean and implications for the El Niño-Southern Oscillation. *Climate Dynamics*, doi:10.1007/s00382-012-1331-2.

L'Heureux, M. L., M. K. Tippett, and A. G. Barnston, 2015: Characterizing ENSO Coupled Variability and its Impact on North American Seasonal Precipitation and Temperature. *J. Climate*, doi: 10.1175/JCLI-D-14-00508.1

Takahashi, K., A. Montecinos, K. Goubanova, and B. Dewitte, 2011: ENSO regimes: Reinterpreting the conaonical and Modoki El Niño. *GRL*, doi: 10.1029/2011GL047364.