U.S. Department of Commerce | National Oceanic & Atmospheric Administration | NOAA Research

Physical Sciences Division

Climate Indices: Monthly Atmospheric and Ocean Time Series

Please reference time series use in publications! Time series that are **regularly** updated have a * after their name.

PNA	***Pacific North American Index*:** From NOAA Climate Prediction Center (CPC)
EP/NP	***Eastern Pacific Oscillation:*** From NOAA Climate Prediction Center (CPC). This index replaces the old EP index which is no longer maintained by CPC.
WP	***Western Pacific Index** From NOAA Climate Prediction Center (CPC)
NAO	***North Atlantic Oscillation** From NOAA Climate Prediction Center (CPC)
NAO (Jones)	***North Atlantic Oscillation*** From CRU Hurrell, J.W., 1995: Decadal trends in the North Atlantic Oscillation and relationships to regional temperature and precipitation. Science 269, 676-679. Jones, P.D., Jónsson, T. and Wheeler, D., 1997: Extension to the North Atlantic Oscillation using early instrumental pressure observations from Gibraltar and South-West Iceland. Int. J. Climatol. 17, 1433-1450.
SOI*	***Southern Oscillation Index*** From NOAA Climate Prediction Center (CPC)
Nino 3*	***Eastern Tropical Pacific SST*** (5N-5S,150W-90W) From NOAA Climate Prediction Center (CPC)
BEST* longer version	***Bivariate ENSO Timeseries*** Calculated from combining a standardized SOI and a standardized Nino3.4 SST timeseries. **Note that different SST dataset (Hadley SST) is now used to calculate Nino 3.4 timeseries. This replaces the GISST dataset. Most recent data is based on the NOAA OI V2 SST dataset.** PSD
TNA	***Tropical Northern Atlantic Index** Anomaly of the average of the monthly SST from 5.5N to 23.5N and 15W to 57.5W. GISST and NOAA OI 1x1 datasets are used to create index. Climatology is 1951-2000. Enfield, D.B., A.M. Mestas, D.A. Mayer, and L. Cid-Serrano, 1999: How ubiquitous is the dipole relationship in tropical Atlantic sea surface temperatures? JGR-O, 104, 7841-7848. AOML and PSD
TSA	***Tropical Southern Atlantic Index** Anomaly of the average of the monthly SST from Eq-20S and 10E-30W. GISST and NOAA OI 1x1 datasets are used to create index. Climatology is 1951-2000. Enfield, D.B., A.M. Mestas, D.A. Mayer, and L. Cid-Serrano, 1999: How ubiquitous is the dipole relationship in tropical Atlantic sea surface temperatures? JGR-O, 104, 7841-7848. AOMLand PSD
WHWP	***Western Hemisphere warm pool** Monthly anomaly of the ocean surface area warmer than 28.5°C in the Atlantic and eastern North Pacific. Climatology is 1951-2000. Wang, C., and D.B. Enfield, 2001: The tropical Western Hemisphere warm pool, Geophys. Res. Lett., 28, 1635-1638. AOML and PSD
ONI	***Oceanic Nino Index*** From NOAA Climate Prediction Center (CPC). Three month running mean of NOAA ERSST.v2 SST anomalies in the Nino 3.4 region (5N-5S, 120-170W), based on the 1971-2000 base period. Time Series is a newer version from source!
MEI	***Multivariate ENSO Index (MEI)** From PSD. Time series is bimonthly so the Jan value represents the Dec-Jan value and is centered between the months. Details and current values are at Dr Wolter's website. Reference: Wolter, K., and M.S. Timlin, 1998: Measuring the strength of ENSO - how does 1997/98 rank? Weather, 53, 315-324.
Nino 1+2	***Extreme Eastern Tropical Pacific SST** *(0-10S, 90W-80W) From CPC
Nino 4	***Central Tropical Pacific SST** *(5N-5S) (160E-150W) From CPC
Nino 3.4	***East Central Tropical Pacific SST** (5N-5S)(170-120W) From CPC
PDO	***Pacific Decadal Oscillation*** is the leading PC of monthly SST anomalies in the North Pacific Ocean. **UPDATED: Using data from 1948 to 2002.** Details and more information are available.
NOI	***Northern Oscillation Index*** is an index of climate variability based on the difference in SLP anomalies at the North Pacific High and near Darwin Australia. Schwing, F.B., T. Murphree, and P.M. Green. 2002. The Northern Oscillation Index (NOI): a new climate index for the northeast Pacific. Progress in Oceanography 53: 115-139. The time series and more information are available.
NP	***North Pacific pattern*** is the area-weighted sea level pressure over the region 30N-65N, 160E-140W. Time series source Trenberth and Hurrell (1994): Climate Dynamics 9:303-319.
TNI (Trans-Niño Index)	Indices of El Niño evolution: Kevin E. Trenberth and David P. Stepaniak: ***J. Climate***, **14**, 1697-1701. calculated at PSD. for longer tiumeseries, go to http://www.esrl.noaa.gov/psd/Pressure/Timeseries/TNI/

Trend	A linear time series (1,2,3,...). **NOT** the linear trend of the variable
Hurricane activity	**(Updated to 2003) Monthly totals Atlantic hurricanes and named tropical storms** Each month has the total number of hurricanes or named tropical storms in that month in the Atlantic region. These values are from Unisys at http://weather.unisys.com/hurricane/atlantic/ who obtained them from Colorado State/Tropical Prediction Center. **I** computed the number of hurricanes that begin in each month. Note that the hurricane might extend to the next month but won't be listed there. Their webpage should be read for a more complete description and attribution.
AO	**Note, values are now from CPC as they update their data through the present** From CPC: The loading pattern of AO (AAO) is defined as the first leading mode from the EOF analysis of monthly mean height anomalies at 1000-hPa (NH) or 700-hPa (SH). Note that year-round monthly mean anomaly data has been used to obtain the loading patterns. Since the AO and AAO have the largest variability during the cold sesaon (variance of AO/AAO), the loading patterns primarily capture characteristics of the cold season patterns. Daily and monthly AO (AAO) indices are constructed by projecting the daily and monthly mean 1000-hPa (700-hPa) height anomalies onto the leading EOF mode. Both time series are normalized by the standard deviation of the monthly index (1979-2000 base period). Since the loading pattern of AO (AAO) is obtained using the monthly mean height anomaly dataset, the index corresponding to each loading pattern becomes one when it is normalized by the standard deviation of the monthly index.Values and description
AAO	***Antarctic Oscillation.*** Values and references Data from CPC
Pacific Warmpool	***1st EOF of SST* (60e-170E, 15S-15N) SST EOF, all months** GISST 1948-1949 Reconstructed Reynolds 1950-1981 OI 1982-present Reference: Matin P. Hoerling (personal communication)
Tropical Pacific SST EOF	***1st EOF of SST*** 20N-20S, 120E-60W GISST 1948-1949 Reconstructed Reynolds 1950-1981 OI 1982-present Reference: Martin P. Hoerling, Arun Kumar, and Taiyi Xu, 2001: Robustness of the nonlinear climate response to ENSO's extreme phases. Journal of Climate, Vol.14, No.6, 1277-1293
Atlantic Tripole SST EOF	***1st EOF of SST*** 10N-70N, 0-80W GISST 1948-1949 Reconstructed Reynolds 1950-1981 OI 1982-present Deser, Clara, Michael S. Timlin, 1997: Atmosphere-Ocean Interaction on Weekly Timescales in the North Atlantic and Pacific. Journal of Climate: Vol. 10, No. 3, pp.393-408.
Atlantic multidecadal Oscillation Long Version	***AMO, unsmoothed*** Note: this index is newly computed from a new dataset. Please use it and note that it supersedes the old indices. The data is calculated from the Kalplan SST. See the AMO webpage for more details. Enfield, D.B., A. M. Mestas-Nunez and P.J. Trimble, 2001: The Atlantic multidecadal oscillation and it's relation to rainfall and river flows in the continental U.S.. Geophysical Research Letters, Vol. 28, 2077-2080.
Atlantic Meridional Mode	***AMM*** Note: this index is newly availablecomputed from a new dataset. See the AMM webpage for more details. 2004 Chiang, J. C. H., and D. J. Vimont: Analagous meridional modes of atmosphere-ocean variability in the tropical Pacific and tropical Atlantic. J. Climate,17(21), 4143-4158.
North Tropical Atlantic Index (NTA)	***NTA:North Tropical Atlantic SST Index*** (Definition slightly changed: old version available).The timeseries of SST anomalies averaged over 60W to 20W, 6N to 18N and 20W to 10W, 6N to 10N map. Data is obtained from the COADS dataset for 1951-1991 and NCEP afterwards. Anomalies were calculated relative to the 1951-2000 climatology, smoothed by three months running mean procedure and projected onto 20 leading EOFs. Month of data is the center of the 3 months that are smoothed. More information and the indexes forecasted values are available. Penland, C., and L. Matrosova, 1998: "Prediction of tropical Atlantic sea aurface temperatures using Linear

	Inverse Modeling," J. Climate, March, 483-496 pp.
Caribbean Index (CAR)	***CAR:Caribbean SST Index*** (Definition slightly changed: old version available). The timeseries of SST anomalies averaged over the the Caribbean. Data is obtained from the COADS dataset for 1951-1991 and NCEP after. Anomalies were calculated relative to the 1951-2000 climatology, smoothed by three months running mean procedure and projected onto 20 leading EOFs. More information and the indexes forecasted values are available. Penland, C., and L. Matrosova, 1998: "Prediction of tropical Atlantic sea surface temperatures using Linear Inverse Modeling," J. Climate, March, 483-496 pp.
Atlantic multidecadal Oscillation Long Version	***AMO, smoothed*** Note: this index is newly computed from a new dataset. Please use it and note that it supersedes the old indices. The data is calculated from the Kalplan SST. See the AMO webpage for more details. Enfield, D.B., A. M. Mestas-Nunez and P.J. Trimble, 2001: The Atlantic multidecadal oscillation and it's relation to rainfall and river flows in the continental U.S.. Geophysical Research Letters, Vol. 28, 2077-2080.
QBO	***Quasi-Biennial Oscillation****. Calculated at PSD (from the zonal average of the 30mb zonal wind at the equator as computed from the NCEP/NCAR Reanalysis).
Globally Integrated Angular Momentum	***Globally Integrated Angular Momentum**** Note that time series is scaled by 1e25. Values are 3-month running means except for the last month which is a 2-month average. Weickmann, K.M., W.A. Robinson and M.C. Penland, 2000: Stochastic and oscillatory forcing of global atmospheric angular momentum. ***J. Geophys. Res.***, **105**, D12, 15543-15557.
ENSO precipitation index	***ENSO precipitation index*** http://precip.gsfc.nasa.gov/ESPItable.html Please cite "ENSO Indices Based on Patterns of Satellite-Derived Precipitation" Curtis and Adler in ***J. of Climate***, 13,2786 (2000). Time series that uses rainfall data in the Tropical Pacific to describe ENSO events.
Central Indian Precipitation (core monsoon region)	***Central Indian Precipitation*** http://www.tropmet.res.in/ Please cite the Indian Institute of Tropical Meteorology. CORE-MONSOON INDIA RAINFALL (1871-1999) 7 SUB 776,942 SQ.KM.
Sahel rainfall	***Sahel Standardized Rainfall (20-8N, 20W-10E)*** http://jisao.washington.edu/data_sets/sahel/ From Mitchell: The averaging region is based on the rotated principal component analysis of average June through September African rainfall presented in Janowiak (1988, J. Climate, 1, 240-255). Stations within 20-8N, 20W-10E are obtained from the National Center for Atmospheric Research World Monthly Surface Station Climatology (WMSSC), and 14 retained which had complete or almost complete records for 1950-93. See link for stations.
SW Monsoon Region rainfall	***SahelArea averaged precipitation for Arizona and New Mexico*** Calculated using NCDC's climate division dataset. Monthly precipitation values for each of the climate divisions in Arizona and New Mexico are are averaged to produce a single monthly value. Reference: personal communication, Catherine Smith. Also, NCDC, 1994, Time Bias Corrected Divisional Temperature-Precipitation-Drought Index. Documentation for dataset TD-9640. Available from DBMB, NCDC, NOAA, Federal Building, 37 Battery Park Ave. Asheville, NC 28801-2733. 12pp.
Northeast Brazil Rainfall Anomaly	***Northeast Brazil Rainfall Anomaly*** http://jisao.washington.edu/data_sets/brazil/ From Mitchell: The northeast Brazil rainfall index is calculated from data for Fortaleza (3.7S, 38.5W) and Quixeramobim (5.3S, 39.3W) Brazil obtained from the NCAR World Monthly Surface Station Climatology. Climatological mean is for 1950-79.
Solar Flux (10.7cm)	***Solar Flux (10.7cm)**** http://www.ngdc.noaa.gov/stp/SOLAR/getdata.html For NGDC. Go to bottom of page. t To cite, "The 10.7cm Solar Flux Data are provided as a service by the National Research Council of Canada". They would appreciate a preprint or at least a reference if you use the data (URL is http://www.drao.nrc.ca/index_eng.shtml.. Time series is ftp://ftp.ngdc.noaa.gov/STP/SOLAR_DATA/SOLAR_RADIO/FLUX/MONTHLY.OBS.

Global Mean Lan/Ocean Temperature Index	***Global Mean Lan/Ocean Temperature*** Values change over time! Data values are in the file http://data.giss.nasa.gov/gistemp/tabledata/GLB.Ts+dSST.txt from NASA/GISS. Please read and refer to this web page plus the main web page describing various temperature indices at http://data.giss.nasa.gov/gistemp/. Note, the index is an **anomaly** index. They have comments in the datafile and the writeup on obtaining an absolute global mean temperatures. Please reference the papers: Christy, J.R., R.W. Spencer, and W.D. Braswell 2000. J. Atmos. Oceanic Tech. 17, 1153. Hansen, J., R. Ruedy, M. Sato and R. Reynolds 1996. Global surface air temperature in 1995: Return to pre-Pinatubo level. Geophys. Res. Lett. 23, 1665-1668. Hansen, J., M. Sato, J. Glascoe and R. Ruedy 1998. A common-sense climate index: Is climate changing noticeably? Proc. Natl. Acad. Sci. 95, 4113-4120. Hansen, J., R. Ruedy, J. Glascoe, and M. Sato 1999. GISS analysis of surface temperature change. J. Geophys. Res. 104, 30997-31022. Hansen, J., R. Ruedy, M. Sato, M. Imhoff, W. Lawrence, D. Easterling, T. Peterson, and T. Karl 2001. A closer look at United States and global surface temperature change. J. Geophys. Res. 106, 23947-23963 Intergovernmental Panel on Climate Change 2001. Climate Change 2001 (J.T. Houghton et al., Eds.), Cambridge Univ. Press, New York. National Research Council 2000. Reconciling Observations of Global Temperature Change. National Academy Press, Washington, DC, 85 pp. Peterson, T.C., and R.S. Vose 1997. An overview of the Global Historical Climatology Network temperature database. Bull. Amer. Meteorol. Soc. 78, 2837-2849. Rayner, N. 2000. HadISST1 Seaice and sea surface temperature files. Hadley Center, Bracknell, U.K. Reynolds, R.W., N.A. Rayner, T.M. Smith, D.C. Stokes, and W. Wang 2002. An improved in situ and satellite SST analysis for climate. J. Climate 15, 1609-1625, doi:10.1175/1520-0442(2002)015<1609:AIISAS>2.0.CO;2. Reynolds, R.W., and T.M. Smith 1994. Improved global sea surface temperature analyses. J. Climate 7, 929-948, doi:10.1175/1520-0442(1994)007<0929:IGSSTA>2.0.CO;2 Smith, T.M., R.W. Reynolds, R.E. Livesay, and D.C. Stokes 1996. Reconstruction of historical sea surface temperature using empirical orthogonal functions. J. Climate 9, 1403-1420.

Time Series Format

The format for all time series is:

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 year1 yearN
year1 janval febval marval aprval mayval junval julval augval sepval octval decval
year2 janval febval marval aprval mayval junval julval augval sepval octval decval
...
yearN janval febval marval aprval mayval junval julval augval sepval octval decval
  missing_value
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