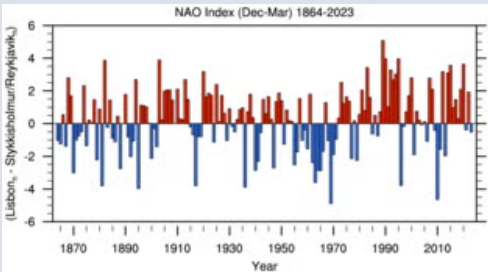


Hurrell North Atlantic Oscillation (NAO) Index (station-based)



The winter (December thru March) station-based index of the NAO is based on the difference of normalized sea level pressure (SLP) between Lisbon, Portugal and

Stykkisholmur/Reykjavik, Iceland since 1864. Positive values of the NAO index are typically associated with stronger-than-average westerlies over the middle latitudes, more intense weather systems over the North Atlantic and wetter/milder weather over western Europe. Monthly, seasonal and annual indices using slightly different data sources for the southern station are also available.

Key Strengths

- Station-based indices extend back to the mid-19th century or earlier
- Simple to construct and understand

Key Limitations

- The stations are fixed in space and thus may not track the movement of the NAO centers of action through the annual cycle
- Individual station pressure readings can be noisy due to small-scale and transient meteorological phenomena unrelated to the NAO

Data Access

Please cite data sources, following the data providers' instructions

Dataset DOIs

None

Hosted Climate Index Files

1.  [NAO Station-Based Index \(Annual\)](#).

Missing Value

-999

Hurrell North Atlantic Oscillation (NAO) Index (station-based)

Years of record

1865-01 to 2023-06

Main variables

[Atmosphere](#) | [Sea Level Pressure](#)

Dataset collections

[Climate Analysis Section \(CAS\) Data Catalog](#)

Type of data product


[Climate Indices](#) | [Circulation](#) | [NAO](#)


Institution and PIs

NCAR / Jim Hurrell


About the experts




Pages with expert guidance by  [Dr. James Hurrell at Colorado State University](#).

 [Hurrell North Atlantic Oscillation \(NAO\) Index \(PC-based\)](#)


 [NCAR Sea Level Pressure](#)


 [Hurrell North Atlantic Oscillation \(NAO\) Index \(station-based\)](#)


 [North Pacific \(NP\) Index by Trenberth and Hurrell; monthly and winter](#)




Pages with expert guidance by [Adam Phillips at the National Center for Atmospheric Research \(NCAR\)](#)

 [Hurrell North Atlantic Oscillation \(NAO\) Index \(station-based\)](#)

 [Hurrell wintertime SLP-based Northern Annular Mode \(NAM\) Index](#)

 [North Pacific \(NP\) Index by Trenberth and Hurrell; monthly and winter](#)

 [Hurrell North Atlantic Oscillation \(NAO\) Index \(PC-based\)](#)

Units

hPa

Updated Through

2022-12-15

Next Update

2024-05-15

Start Date

1865-01-01

File Notes

A test note

CAS Citation

NAO Index Data provided by the Climate Analysis Section, NCAR, Boulder, USA, Hurrell (2003). Updated regularly. Accessed DD Month YYYY [list date you accessed the data].

2.  [NAO Station-Based Index \(DJFM\)](#).

Missing Value

-999

Units

hPa

Updated Through

2023-03-15

Next Update

2024-05-15

Start Date

1864-01-01

File Notes

DJFM NAO Index: The station index value for year N refers to an average of December year N-1 and January, February, and March year N. (Example: The 1999 value contains the average of December 1998 and January, February, and March 1999. DJFM versus Monthly timeseries: The values of the DJFM index are not exactly the same as the average of the individual months of Dec, Jan, Feb and Mar in the monthly index. This is because of the normalization that is done for each index. For the DJFM index, each station's seasonal anomalies are normalized before one station is subtracted from the other. For the monthly index, each station's monthly anomalies are normalized before the stations are subtracted from each other. Thus, one cannot take the monthly DJFM values and average

them to get the corresponding DJFM seasonal average value for that year.

CAS Citation

NAO Index Data provided by the Climate Analysis Section, NCAR, Boulder, USA, Hurrell (2003). Updated regularly. Accessed DD Month YYYY [list date you accessed the data]

3.  [NAO Station-Based Index \(Monthly\).](#)

Missing Value

-999

Units

hPa

Updated Through

2023-06-15

Next Update

2024-05-15

Start Date

1865-01-01

File Notes

DJFM versus Monthly timeseries: The values of the DJFM index are not exactly the same as the average of the individual months of Dec, Jan, Feb and Mar in the monthly index. This is because of the normalization that is done for each index. For the DJFM index, each station's seasonal anomalies are normalized before one station is subtracted from the other. For the monthly index, each station's monthly anomalies are normalized before the stations are subtracted from each other. Thus, one cannot take the monthly DJFM values and average them to get the corresponding DJFM seasonal average value for that year.

CAS Citation

NAO Index Data provided by the Climate Analysis Section, NCAR, Boulder, USA, Hurrell (2003). Updated regularly. Accessed DD Month YYYY [list date you accessed the data].

4.  [NAO Station-Based Index \(seasonal\).](#)

Missing Value

-999

Units

hPa

Updated Through

2023-05-15

Next Update

2024-05-15

Start Date

1865-01-01

File Notes**CAS Citation**

NAO Index Data provided by the Climate Analysis Section, NCAR, Boulder, USA, Hurrell (2003). Updated regularly. Accessed DD Month YYYY [list date you accessed the data].

Data Access

None

Usage Restrictions

None

Expert Developer Guidance

Since there is no unique way to define the spatial structure of the NAO, it follows that there is no universally accepted index to describe the temporal evolution of the phenomenon. Most modern NAO indices are derived either from the simple difference in surface pressure anomalies between various northern and southern locations, or from the PC time series of the leading (usually regional) EOF of sea level pressure (SLP). Many examples of the former exist, usually based on instrumental records from individual stations near the NAO centers of action, but sometimes from gridded SLP analyses. A major advantage of most of these indices is their extension back to the mid-19th century or earlier.

A disadvantage of station-based indices is that they are fixed in space. Given the movement of the NAO centers of action through the annual cycle, such indices can only adequately capture NAO variability for parts of the year. Moreover, individual station pressures are significantly affected by small-scale and transient meteorological phenomena not related to the NAO and, thus, contain noise.

An advantage of the PC time series approach is that such indices are more optimal representations of the full NAO spatial pattern; yet, as they are based on gridded SLP data, they can only be computed for parts of the 20th century, depending on the data source.

For a more detailed discussion of issues related to the NAO indices and related indices such as the Northern Annular Mode (NAM) and Arctic

Oscillation (AO), see Hurrell and Deser (2009) and Hurrell et. al (2003), linked in Key Publications 2 and 3 below.

– **James Hurrell**, NCAR

Cite this page

Acknowledgement of any material taken from or knowledge gained from this page is appreciated:

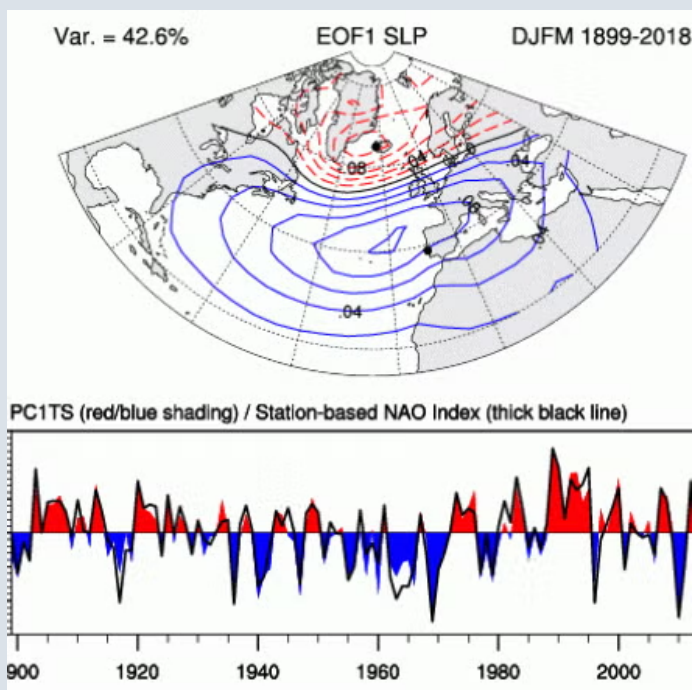
Hurrell, James &, Phillips, Adam & National Center for Atmospheric Research Staff (Eds). Last modified 2023-07-10 "The Climate Data Guide: Hurrell North Atlantic Oscillation (NAO) Index (station-based)." Retrieved from <https://climatedataguide.ucar.edu/climate-data/hurrell-north-atlantic-oscillation-nao-index-station-based> on 2025-03-07.

Citation of datasets is separate and should be done according to the data providers' instructions. If known to us, data citation instructions are given in the Data Access section, above.

Acknowledgement of the Climate Data Guide project is also appreciated:

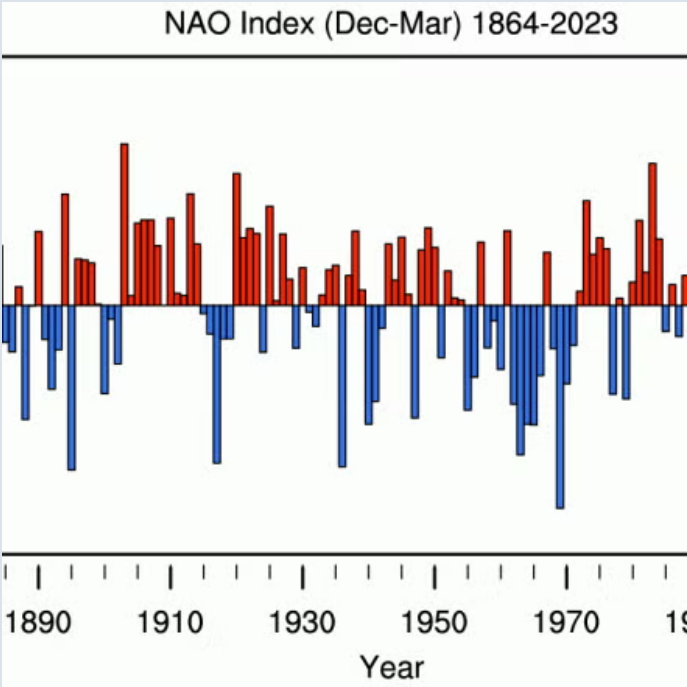
Schneider, D. P., C. Deser, J. Fasullo, and K. E. Trenberth, 2013: Climate Data Guide Spurs Discovery and Understanding. Eos Trans. AGU, 94, 121–122, <https://doi.org/10.1002/2013eo130001>

Key Figures



The station based NAO index may not be an optimal representation of the associated spatial pattern. The principal component (PC) time series of the leading EOF of seasonal (December through March) SLP anomalies over the Atlantic sector (20–80N, 90W–40E) serves as an alternative index (Hurrell 1995). The PC based NAO is in color; the station based index is the black line. The

correlation is 0.93 over 1899–2018. The black dots on the EOF panel show the location of the stations used for the station-based NAO index. (Climate Data Guide; A. Phillips)



Other Information

Main Variables & Data Classification	▼
Metadata	▼
References	▼

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