

Atmospheric River (AR) Detection Algorithm

This file briefly describes the accompanying program

merra_ar_6hly_regional_analysis_web.py

See also **Mundhenk et al., 2016 (*J. Climate*)** for details regarding this detection algorithm and its application.

Atmospheric rivers (ARs) are often characterized as transient, plume-like structures of focused tropospheric water vapor and intense low-level winds that contribute substantially to the atmospheric branch of the hydrologic cycle. Here, we provide an abridged version of an AR detection algorithm in the Python 2.7 programming language.

This algorithm employs a unique approach of detecting AR-like features from within gridded fields of anomalous integrated water vapor transport (IVT). The use of anomalies was found to be efficient and to benefit automated feature detection in large spatial (i.e., North Pacific) and temporal (i.e., sub-daily across all seasons) domains.

The program is hard-coded to work with pre-calculated arrays of IVT based on NASA's Modern-Era Retrospective Analysis for Research and Applications (MERRA) reanalysis dataset at native resolution and on isobaric surfaces. Modifications would be required in order to apply this algorithm to other datasets.

This detection algorithm takes an occurrence-based approach (i.e., one AR "hit" for each time step during which the requisite criteria are met); therefore, each time step is scrutinized independently. Additionally, this algorithm was developed to facilitate climatological and dynamical analyses and compositing, more so than to output a definitive AR event atlas.

As provided, this algorithm executes in < 1 hour in an OS X desktop environment (3.2 GHz Intel Core i5 and 16GB RAM) for 36 years of 6-hourly data truncated to the North Pacific basin. No effort has been made to optimize the performance of the program; however, the approach would support parallel processing.

Our sincere thanks to the ever-growing community behind the Python programming language and to the developers of the modules used in this code for furthering open source programming and computing.