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Statistical relationships between North Atlantic and Pacific circulation patterns and surface wind in North Eastern North America: annual to centennial variability

Etor E. Lucio-Eceiza (1), J. Fidel González-Rouco (1), Jorge Navarro (2), Elena García-Bustamante (3), and Hugo Beltrami (4)

(1) Dpto. Astrofísica y Ciencias de la Atmósfera, Instituto de Geociencias (UCM-CSIC), Universidad Complutense de Madrid. Spain (eelucio@fis.ucm.es), (2) Dpto. Energías Renovables. CIEMAT. Madrid, Spain, (3) Dpto. Física. Universidad de Murcia, (4) Climate & Atmospheric Sciences Institute, St. Francis Xavier University. Antigonish, Nova Scotia. Canada

The region of North Eastern North America poses interesting relationships between various large-scale circulation modes and the seasonal surface wind. Of special relevance are the configurations that allow for the transit of tropical cyclonic events during the summer season and those that favour the even more intense extratropical cyclones during winter.

In this work we present a statistical downscaling method based on Canonical Correlation Analysis (CCA) that exploits the relationships among the main modes of circulation over the North Atlantic and Pacific Sectors and the behaviour of monthly surface wind. The statistical technique has been implemented with predictor variables (mean sea level pressure and geopotential height at different levels) provided by different reanalysis products. The regional scale data consist of a set of 523 sites distributed over North Eastern North America that span over a period of about 60 years (1953-2010). These data have been previously subjected to an exhaustive quality control process. The several decades of observations allow for the study of intra to multidecadal variability.

The statistical relationship obtained by this method also allows for the reconstruction of the regional wind behaviour back to the mid 19th century through various 20th century reanalysis and instrumental sea level pressure datasets.