Geophysical Research Abstracts
Vol. 17, EGU2015-4106, 2015
EGU General Assembly 2015

Wind speed and direction variability evaluation in a multiscale perspective

Cristian Suteanu

Saint Mary's University, Dept. of Geography & Environmental Studies, and Dept. of Environmental Science, Halifax, Canada (cristian.suteanu@smu.ca)

A comprehensive and effective evaluation of wind pattern variability can offer valuable information for important purposes, such as decreasing uncertainties related to wind energy availability, designing systems based on the integration of multiple wind farms to address power intermittency, or assessing implications for yaw error minimization. This paper presents a multiscale approach to wind pattern analysis taking into account wind speed as well as wind direction. First, wind speed time series are analyzed using a multiscale approach (Detrended Fluctuation Analysis). Based on the results of this step, isopersistence diagrams are constructed to reflect the scale-by-scale behaviour of the wind pattern, which offers a nuanced and comprehensive perspective on pattern variability and on the temporal change in the way in which variability depends on the time scale range. Next, wind speed patterns are analyzed by assessing orientation dependent time series obtained by projecting wind speed values for every sample on a plane that is rotated step by step by a small angle. The outcome consists of a set of orientation–time scale–persistence diagrams. The proposed methodological framework is applied to data streams of wind speed and direction. It is illustrated with application examples using data recorded in different areas in Canada and the United States.