

## Investigation of Wind Speed Persistence Over Marmara Region

Evren Özgür and Kasım Koçak

Istanbul Technical University, Department of Meteorology, Istanbul, Turkey (ozgurev@itu.edu.tr)

Persistence is a measure of continuity of a variable over a period of time at any location. This definition implies that wind speed persistence means a positive serial correlation in a time series. In literature, there are numerous methods for measuring wind speed persistence. In this study, wind speed persistence were obtained for 19 stations located in Marmara Region by using two different methods. Daily wind speed data, taken from Turkish State Meteorological Service, were used in the study. The observation period was taken to be 1965-2014 for all stations. The methods used in the study are directional statistical method and wind speed duration curves approach. In directional statistical method, individual dates of winds are defined as directional variables; then, directional mean and variance are calculated. Wind dates are being converted to angular values and these days are being considered as a unit vector which has direction  $\theta$ . In polar coordinate, the measures of directional mean and variance have been expressed as a vector with direction  $\theta_{\text{mean}}$  and magnitude  $r$ . The  $r$  value can be considered as a measure of persistence. The wind speed duration curve is simply the cumulative distribution function of the wind speed in a certain period of time. In other words, it is the graphical representation of wind speed and percentage of exceedence time for a predefined threshold wind speed value in the same graphic. As a threshold wind speed, lower quartile ( $q_{0.25}$ ) value of ranked wind speed data were selected. In application, total time period was divided into five subperiods and changes of persistence in wind speeds as far as subperiods were presented. Persistence can be used in different kinds of study areas such as control of forest fires, dispersion of air pollutants, calculation of wind energy potential, ventilation of a city, etc. The results of this analysis showed that the proposed methods can be used as an alternative approach to determine whether a given time series has changed through time or not.

**Keywords:** Wind, persistence, duration curves, directional statistics, Turkey.