Probabilistic Wind Speed Predictions with an Analog Ensemble

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The Analog Ensemble is a statistical post-processing technique used to generate probabilistic forecasts. The method is based on the searching similar past numerical weather predictions (i.e. analogs) to the current prediction across several variables (i.e. predictors). The measurements corresponding to the closest analogs form the analog ensemble (AnEn), with which the probability distribution of the future state of the atmosphere can be estimated. This study explores the application of AnEn for probabilistic forecasts over the complex terrain of Croatia.

The AnEn is generated with the Aire Limitée Adaptation dynamique Développement InterNational model (ALADIN) run over two nested domains with 8 and 2 km grid spacing, respectively. It is tested at several climatologically different locations across Croatia for point-based wind speed predictions at 10 m and 80 m height. Different predictors such as wind speed, direction, temperature, Richardson number and Scorer parameter are examined. Results are verified and compared to the ALADIN model to address the following question: how does AnEn perform at locations in the complex terrain of Croatia? The analysis focuses on a group of stations with severe weather phenomena such as strong and gusty bora wind.

This study shows that the AnEn adapts well to different heights above various types of terrain. It provides accurate predictions while reliably quantifying their uncertainty and showing a satisfactory spread. The AnEn performance is equal or superior than logistic regression approach, especially for group of stations that are climatologically prone to strong winds.