



Development of a wind atlas for the Trentino region in the Alps

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Numerical simulations with the Weather Research and Forecasting (WRF) model over a climatological period are performed in view of the development of a wind atlas for Trentino, a region in the Italian Alps characterized by a very complex topography. Four nested grids are used, with an innermost domain resolution as high as 1.2 km. Model results are validated against a dataset composed of surface observations from routinely operated weather stations located at different altitudes, to test the ability of WRF to capture the main statistical characteristics of the wind field. Results show that the model is able to reproduce with a reasonable accuracy the main statistics and the distribution of wind velocity both on the valley floor and at higher heights. Moreover the model captures the typical behavior of thermally-driven circulations in valleys during clear sky days in the warm months, characterized by the development of a down-valley wind at night and an up-valley wind during the day. The ability of the model to reproduce the wind roses observed at the surface weather stations is also analyzed, highlighting that errors are larger in low wind speed conditions, when wind direction is more difficult to simulate, but also less significant. Moreover it is shown that large errors in the correct reproduction of the wind roses may be introduced by local-scale topographic features, which considerably affect the local wind field, but which cannot be adequately resolved at the adopted horizontal resolution.