Geophysical Research Abstracts
Vol. 12, EGU2010-3500, 2010
EGU General Assembly 2010

Generation of error-corrected wind climatologies in the Alpine region with 100 m grid spacing

Heimo Truhetz (1,2), Stefan Christof Müller (3), Andreas Gobiet (1,2)

(1) Wegener Center for Climate and Global Change (WegCenter), University of Graz (UniGraz), Graz, Austria (heimo.truhetz@uni-graz.at, ++43 316 380 8442), (2) Institute for Geophysics, Astrophysics, and Meteorology (IGAM), University of Graz (UniGraz), Graz, Austria, (3) Meteotest Genossenschaft, Bern, Switzerland

Due to the strong dependency of near surface wind on surface characteristics accurate high-resolution wind climatologies in complex terrain are difficult to obtain. Earlier studies used either geo-statistical interpolation methods under consideration or dynamical fluid models. The accuracy of geo-statistical methods highly depends on the density and quality of wind observations while dynamical models are extremely time consuming and an appropriate horizontal resolution of 100 m is not achievable in long-term climate simulations.

Within the framework of the project "Austrian Wind Potential Analysis" (AuWiPot, www.windatlas.at), funded by the Austrian Research Promotion Agency (project nr. 818903), a novel hybrid dynamical/geo-statistical modelling approach for near surface wind is developed to serve as an essential prerequisite for estimating Austria's largely unknown wind energy potential. The method enables to derive error-corrected mean wind speeds and frequency distributions on a highly resolved grid (100 m horizontal grid spacing) in complex terrain.

The first step of the method is based on dynamical modelling by using the PSU/NCAR model MM5 as a regional climate model (RCM) and applying it onto the ERA-40 reanalysis dataset. In order to keep the computational demand at a maintainable level, ERA-40 is initially downscaled to 10 km grid spacing. This grid spacing is further reduced to 2 km by operating MM5 in dynamic initialisation (or dynamic adaptation) mode. In the second step, mean wind speeds and frequency distributions from the 2 km MM5 output are geo-statistically downscaled to 100 m grid spacing and implicitly error-corrected. The correction terms are developed by analysing high quality wind observations in combination with a highly resolved digital elevation model (DEM). This leads to correction functions for different types of terrain features, like mountain ridges, narrow and wide valleys, flat areas, etc.

The dynamic wind-downscaling system has already been applied to the Eastern Alps for the year 1999 for testing purposes. First preliminary evaluation results obtained from 65 wind observations show that MM5 generally overestimates wind speeds, but the dynamic initialisation mode significantly adds value: an overall bias of 2.1 m/s is reduced to 1.8 m/s. A further reduction of the model-errors can be expected from the application of the geo-statistical method, which is currently investigated. Final evaluation results of the hybrid dynamical/geo-statistical modelling approach are presented.