Slovenian Wind Atlas

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Slovenia was included in creation of Wind atlas for central European countries, which was issued in 1997. The method used for wind resources calculation followed the one used for previously issued European wind atlas (issued in 1989). Wind characteristics were calculated using WaSP software in both cases. Already during the creation it was assessed that the method was not suitable for regions with complex orography and consequently complex wind regimes. Therefore data from mountain stations and deep valleys in Austria and Slovakia was not used in calculation. Calculations of wind data from slovenian stations with complex wind regime were done at that time, however some of them proved not to be accurate enough to be used for wind resources assessment.

Energy industry demand as well as demand of governmental and non-governmental institutions has fostered creation of new slovenian wind atlas. Some areas with relative high altitude and without on-site wind measurements became interesting for potential investments in wind energy exploitation. Therefore it was logical to choose model approach which is quite frequently used for wind climatologies, especially in data sparse areas.

In most cases a kind of sampling methodology (random samples, weather type based samples) is used in model - based derivation of climatological properties in order to avoid excessive use of computer resources. We have decided to perform a continuous run over multi-year period which would enable us to obtain more accurate wind distributions; especially in case of wind energy exploitation it is essential to have available reliable exponential tails of wind distribution functions since they - despite low frequency - contain important amount of available wind energy.

Model chain is based on nesting of mesoscale model ALADIN into ERA40 fields. Model strategy was thoroughly checked in MAP-SOP period and verified using traditional skill scores as well as using frequency-domain based comparison. Some important lessons about choosing stations for model verification and optimal nesting strategy were learned. Namely, most of the stations located in valleys and basins have large part of spectral wind power in sub-diurnal part of the spectrum which cannot be simulated by mesoscale numerical model. Also, surprisingly, multiple nests with moderate resolution jumps were not outperformed by single model domain with space resolution about 10km nested directly into ERA40.

The final step was downscaling of the results obtained by mesoscale model using a mass-consistent model in high spatial resolution. In that way we were able to introduce high resolution topography into computation process without unreasonable increase of computational costs due to dynamical constraints. In some cases results have improved substantially due to removal of unrealistically smooth orography used in dynamical model. Despite some problems the quality of results is estimated as satisfactory.