Predicting the mean wind speed of a site accurately before installing met towers can save a considerable amount of time and effort. This is especially true in a competitive context like today’s wind power business. Therefore, targeting truly interesting sites is of prime importance. In this paper, we present a method that increases the accuracy of wind speed predictions at the prospecting step.

Mesoscale models typically use a global historical weather database. They can predict wind speed and direction distributions at any location without any on-site measurements. However, mesoscale simulations can’t provide wind distribution at the microscale level.

A widely used method to bridge the gap is to interpolate the wind field within the mesoscale grid. This is generally done using simplified wind flow models. The obvious drawback of such methods is that many physical processes cannot be taken into account at the microscale level like recirculations and flow over steep slopes for example.

Computational Fluid Dynamics (CFD) provides accurate wind speed prediction for flows over complex terrain at the microscale level. The complete set of the non-linear Navier-Stokes equations, including a transport equation for the turbulence intensity is solved. To calibrate the CFD simulations, on-site measurements from one or more met towers are required.

We have computed wind flows over two different sites using the CFD software METEODYN WT and compared them to on-site measurements. The error calculated is very small so we use the CFD solutions as reference to evaluate the accuracy of two different prediction strategies.

### Study area

A mesoscale simulation with a 1km resolution was computed with the software ANEMOSCOPE. It covers an area where five meteorological towers are located on two different sites. We compare two strategies for computing the wind flow at the microscale level. The first one is to use a linearized wind flow model (MS-Micro). The second one is to extract the velocity distribution from the mesoscale simulation and calibrate the CFD computation (METEODYN WT) using virtual met towers created with the mesoscale model.

Compared to the use of a simplified wind flow model, we show that coupling a CFD solver to a mesoscale simulation leads to a reduction of the error of the wind speed prediction.