



## In-situ wind measurements in complex terrain using an UAS

Kjell zum Berge, Martin Schön, Moritz Mauz, Alexander Rautenberg, and Jens Bange

Eberhard Karls Universität Tübingen, Center for Applied Geoscience, Environmental Physics, Tübingen, Germany  
(kjell.zum-berge@uni-tuebingen.de)

The WINSENT project (Wind Science and Engineering in Complex Terrain) aims to create and operate a wind energy test site in south-western Germany. The test site is situated in complex terrain, at the top of a forested escarpment at the rim of the Swabian Alps. Results from this test field will help in assessing new locations for wind turbines in complex terrain and lead to a better understanding of operating wind turbines in complex terrain. As a partner in this joint-venture project, the Environmental Physics working group at the University of Tuebingen uses the MASC3, an UAS (unmanned aircraft system) for in-situ measurements of the atmospheric boundary layer. The MASC3 is a four-meter wingspan, fixed-wing UAS with an electric motor, capable of automatic flight along a pre-defined route with flight times of up to 2 hours. Its sensor payload measures wind speed and temperature at turbulence scales. In the WINSENT project, this platform is used for wind measurements over complex terrain, from low altitudes up to 200m above ground level. The measurement flights over the escarpment were carried out during different meteorological conditions. The resulting wind speed profiles are then compared to CFD simulations, which use weather data as a boundary condition for the model. The MASC3 measurements serve as a comparison for the CFD simulations and complement the mast and LIDAR measurements at the WINSENT test field. We present a comparison between the MASC3 measurement data and the CFD simulation with regard to the influence of the escarpment on the flow in the lowest 200 m above ground.