Geophysical Research Abstracts
Vol. 16, EGU2014-15641, 2014
EGU General Assembly 2014

Spatial interpolation of wind fields in a stably stratified atmospheric boundary layer using OpenFOAM

Tobias Sauter and Friedrich Obleitner
Institute of Meteorology and Geophysics, Innsbruck University, Austria, (tobias.sauter@uibk.ac.at)

The knowledge of the spatial distribution of meteorological fields in complex terrain is required for a large number of meteorological and glaciological applications. Unfortunately, in most cases the spatial distribution of observations is sparse, and consequently insufficient to reliably estimate the wind field by common interpolation schemes. The synergetic relationship between the complex terrain and local wind systems, can lead to intense gap flows, channeling effects, katabatic flows and even flow blocking events. In order to take these effects into account, the computation of the three-dimensional flow pattern is necessary.
The purpose of the current study is to develop and evaluate the performance of a two-step wind interpolation scheme for stably stratified flows. In a first step, a initial wind field is estimated from in-situ observations and radio-sounding measurements. In the second step, a buoyancy-driven flow solver is used to account for the kinematic effects of the terrain, slope flows and blocking effects. The solver is then initialized by the prior estimated initial wind fields. The steady-state incompressible solver is developed using the open source computational fluid dynamic software OpenFOAM.
The proposed approach was applied and evaluated at the Kongsvegen glacier in Svalbard for the summer period 2011. Dynamical and thermodynamical effects, such as katabatic winds, lee and gap flows were well represented. The results show promising potential for further scientific investigations.