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Observations and interpretation of lee-side accelerated flow in a weak wind situtation

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Observed winds aloft in the lee of Mount Esja in Southwest-Iceland are interpreted and explored with a mesoscale atmospheric model at very high resolution as well as using surface based observations of wind and pressure. The winds aloft were observed on 15 July with a small unmanned aircraft (SUMO) as a part of the international MOSO-project in Iceland. In addition to the observations from the SUMO, observations from a small mesonet of automatic weather stations observing wind, temperature and pressure were available during the project.

The synoptic winds at mountain top level were weak from the northeast but nevertheless, the observed low-level winds in the lee were northerly, gusty and accelerated with far weaker winds further aloft and near mountain top. The wind maximum does not reach the surface thus making only surface based observations inadequate in this situation. In spite of the weak winds at mountain top level the observations indicate gravity wave activity aloft with a weak gravity-wave induced downslope "windstorm" with a maximum in wind speed at approx. 100 m in the lee of the mountain. Succesful mesoscale simulations support this theory. The simulations depend strongly on the parameterization of turbulence and surface friction, with non-zero friction destroying the simulated wave activity. It is expected that an assimilation of the observed profiles from the SUMO would improve the performance of the mesoscale model.