



The impact of assimilating data from a remotely piloted aircraft on simulations of the atmosphere

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Orographic winds near a 900 m high mountain in Southwest-Iceland are explored using unique observations made aloft with a small remotely piloted aircraft, as well as with traditional observations and high-resolution atmospheric simulations. There was an inversion well above mountain top level at about 2 km with weak winds below. Observed winds in the lee of the mountain were indicative of flow locally enhanced by wave activity aloft. Winds descended along the lee slope with a prevailing direction away from the mountain. They were relatively strong and gusty at the surface close to the mountain, with a maximum at low levels which weakened and became more diffuse a short distance further downstream. The winds weakened further aloft, with a minimum on average near mountain top level. This situation is reproduced in a high-resolution atmospheric simulation, forced with atmospheric analysis as well as with the observed lee-side profiles of wind and temperature below 1.4 km. Without the additional observations, the model fails to reproduce the winds aloft as well as at the surface in a region in the lee of the mountain. A sensitivity simulation indicates that this poor performance is a result of the poorly captured strength and sharpness of the inversion aloft. The study illustrates, firstly, that even at very low wind speed, in a close to neutral low-level flow, gravity waves may still be a dominating feature of the flow. Secondly, the study presents an example of the usefulness of lee-side atmospheric profiles, retrieved by simple model aircraft, for improving numerical simulations and short-term weather forecasting in the vicinity of mountains.