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Forecasting wind gusts in complex terrain

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Wind gusts are calculated in a large collection of simulated atmospheric flows in complex terrain in Iceland. The gust prediction method is based on turbulence kinetic energy, static stability and wind speed in the atmospheric boundary layer. The atmospheric data is a part of realtime numerical simulations used for forecasting in Iceland. It is generated at horizontal resolutions of 9 and 3∼km, and in one sensitivity test at 1∼km, using initial and boundary conditions from the ECMWF. The gust prediction method is implemented as post-processing. The calculated gust strength is compared with wind gust observations from several automatic weather stations. The estimated gusts are strongly dependent on the quality of the simulated flow and are on average well captured when the mean winds are correctly simulated. Maximum gusts in downslope windstorms are however frequently underestimated. The error is presumably related to an inadequate simulation of the downslope surface winds which are also too weak. The windstorms in the current study appear to be related to gravity wave activity aloft and are better reproduced at higher resolutions. There are cases of overestimated gusts on the upstream side of the mountain, which may be related to an inadequate simulation of the upstream deceleration of the flow and overestimated surface winds. Gustiness in mountain wakes is frequently too great, which appears to be related to overestimated turbulence in the wakes.