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Nocturnal circulations during calm and cloudfree weather over a mountainous high-latitude island

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The flow over an Island at 65°N at solstice is simulated with the MM5 model for 48 hours with no clouds and no synoptic-scale forcing. The flow fields shown here are from the late night after a warm day.

Main results:

There is no land-breeze. The nocturnal flow at the surface over flat land circulates around and into the left-overs of the daytime thermal low

Both the presence of the sea and the mountain generate quite similar flow patterns: close to cyclonic flow around a heat low at the surface and close to anticyclonic flow aloft. There is strong geostrophic adjustment.

The impact of the mountain and the land/sea contrast add up to widen the flow fields, rather than to increase the maximum flow speed. This is probably quite dependent upon the size and shape of the mountain.

At the foothills of the mountain, the katabatic winds are slightly weaker if there is sea in the simulation. This may be related to the weak onshore flow from the sea into the leftover of the daytime thermal low.