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If there is a mountain nearby, the wind extremes are gravity waves

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Extreme winds are studied from observations of approximately 200 automatic weather stations in the complex terrain of Iceland. In spite of the detrimental effect of surface roughness on low-level winds, hardly any of the extreme windstorms are in winds blowing from the sea. On the contrary, about four out of five extreme windstorms are when winds are blowing downwards from a nearby mountain, indicating that gravity waves are a dominating factor in extreme winds in the complex terrain of Iceland. A second result is that extreme winds are significantly more frequent in the night than during the day. This confirms the importance of gravity waves, as the static stability is greater during the night than during the day.

The pattern agrees with dynamic numerical downscaling of winds over Iceland.