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Local enhancement of latent instability and vertical wind shear in the Alpine foreland during the 1984 Munich hailstorm case

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On 12 July 1984 a long-lived supercell tracked over Bavaria, producing a hail swath 250 km long with hailstones exceeding 10 cm in diameter. The event became famous for large financial losses caused by the supercell over the Munich metropolitan area. The supercell developed on the cool side of a wavy frontal boundary on the forward flank of an unseasonably strong trough. We analyse the pre-storm conditions using a 2.8 km COSMO simulation initilized by ERA-Interim reanalysis. The degree of latent instability (CAPE) and vertical wind shear are studied, two factors associated with supercell development. It is shown that surface pressure to the north of the Alpine range fell ahead of the storm, which was associated with easterly to north-easterly surface flow over much of Bavaria. This change in the lower tropospheric flow both enhanced the degree of vertical wind shear and lower tropospheric moisture, increasing the latent instability. This case is used to demonstrate that mountain induced mesoscale circulations may greatly enhance the potential for severe convective storms. Finally, we present a conceptual model behind the orographic modulation of the convective environment and suggest how to further investigate this topic.