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Characterization of mesocyclonic rotation in severe convection over the Swiss Alps

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Persistent rotation is a strong indicator of severe weather hazards in convective storms. This work presents a multi-year record of mesocyclonic rotation tracks derived from archived operational radar data in Switzerland. In addition to the general occurrence, underlying seasonal and daily trends, as well as the influence of synoptic weather situation and terrain are explored.
The applied mesocyclone detection presents a combination of thunderstorm cell detection and tracking and rotation identification. The thunderstorm cell detection hereby isolates areas of interest, that are then feed into the rotation detection. The complex terrain of the Swiss Alps and the different environmental conditions leading to persistent rotation in convection required some adaptations to the typical definition of mesocyclonic rotation. A combination of rotational velocity, vorticity, vertical extent and temporal continuity are used to detect mesocyclonic rotation and identify their tracks.
The multi-year record shows considerable variability between the years. A large number of rotation tracks however does not necessarily correspond to a large number in thunderstorms. There is no strict preference on rotation direction, with a slightly higher fraction of cyclonic detections over anticyclonic detections. A spatial overview of the identified events clearly shows the influence of terrain. Pre-Alpine valleys, particularly with lakes, seem to provide favorable conditions for rotation in convection. The largest incidence is located to the South of the Alps in the valleys of the lakes Maggiore, Lugano and Como.