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Hail precursors and predictability for regions North and South of the Swiss Alps

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From April to September severe storms regularly affect the Alpine and pre-Alpine region. Heavy precipitation, wind gusts and hail may cause substantial damage and represent high costs for insurance companies. It is therefore of great interest to forecast these phenomena with a lead time as high as possible. Especially in the case of hail, there is big potential for damage mitigation, since on the one hand much of the damage usually affects movables and on the other hand even relatively small and frequent hail poses a risk to sectors such as agriculture.
To this day explicit forecasting of hail remains a challenge for operational numerical weather prediction (NWP). In the latest limited area NWP model of MeteoSwiss (COSMO-1), operational since spring 2016, explicit prediction of hail remains to be evaluated after the first convective season. As an alternative to direct forecasting of hail, prediction of hail potential through statistical models relying on atmospheric parameters and indices, especially those readily deducible from radio sounding observations, have widely been used in the past as well as today. The temporal and spatial representativity of radio soundings, which are routinely lunched between one and four times a day from a network of about 50 sites across continental Europe, is however too ambiguous, to optimally describe the state and evolution of the atmosphere. NWP model analyses, with assimilated observational data from e.g. ground weather stations, radar as well as radio soundings, comprise information on both higher spatial and temporal scale and represent a further data source that can be employed to identify and study principal atmospheric indicators of daily hail probability, such as CAPE, moisture availability and triggering mechanisms as e.g. areas of (low-level) horizontal convergence.
A simple statistical model, specifically a binary regression model, is proposed for daily hail probability in two distinct regions North and South of the Swiss Alps. Predictors are retrieved from the NWP model (COSMO-2), while the binary predictand, i.e. observations of hail vs. no hail, are determined from the Probability of Hail (POH) algorithm based on radar reflectivity and model freezing level. The Maximum Expected Severe Hail Size (MESHS), closely related to POH, further allows to test an analogous model to distinguish days with small vs. large hail. Moreover, the predictability of hail is addressed by verifying the identified precursors of hail in the forecasting runs at different lead times. Results of these analyses will be presented at the conference.