Hail climatology and risk assessment combining satellite, radar and climate model data

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Hail is the most costly peril associated to convective storms in many regions of the world. Estimates the climatology of hailstorms and expected changes are therefore of substantial scientific and economic interest.

In this study, we compare results from radar- and satellite-remote sensing based methods using the example of Australia. To this end, we have evaluated seven years of 3d radar data for hail signatures using the Waldvogel criterion, and derived hail estimates from overshooting tops in 10 years of MT-Sat imagery, filtered for hail. We highlight benefits and shortcomings of both products, and show how these can be combined into a comprehensive description of hail hazard for insurance risk modeling.

We also show that indices developed for describing the likelihood of severe convective storms based on model data diverge greatly and fail to match observation-based estimates in many regions, in particular in Europe. Nonetheless, model results from reanalysis can play an important role, e.g. in splitting satellite-based observations of storms by hazard. First results from training neural networks with observed hail-and rainstorms from quality-controlled databases are promising in this respect. The added value of using sub-grids of environmental fields around the event as opposed to the nearest grid point only is discussed, along with potential applications in climate change scenarios.