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Role of model resolution and microphysical properties in simulating flash flood induce storms

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Flash flood induce storms are mainly of convective nature and develop at small space and short time scales making their predictability a particularly challenging task. The tremendous societal and economical impact of this hazard necessitates the development of accurate forecasting systems in order to advance warnings and mitigate the risk. To be able to develop a forecasting system that can accurately represent flash flood storms, we need to understand the key elements that control the generation and evolution of this type of events. This study examines the effect of topographic representation, model grid resolution and cloud microphysical properties in simulating three major flash flood storms that occurred in Northern Italy.

To simulate those heavy precipitation events, the high-resolution integrated atmospheric model RAMS / ICLAMS was used with grid resolutions of 250 m, in order to properly resolve the complex physical processes and convective activity. In addition, a high resolution topography dataset of 3 arcsec from the NASA SRTM mission was implemented in the model. The sensitivity of microphysical properties and aerosol cloud interactions towards convection and precipitation over the area were examined through various model setups and simulations. The specific properties proved to play a significant role in the correct estimation of spatial distribution and quantity of precipitation, as indicated from the comparison of the model outputs with bias adjusted radar data.