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Flash floods as result of flow interactions in the atmospheric boundary layer over complex orography

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Heavy precipitation at the atmospheric mesoscale is among the important hazardous meteorological phenomena. Every year, at mid latitudes flash floods cause a considerable amount of damages, injuries and casualties. Furthermore the simulation of high efficiency precipitation weather events is a challenge for numerical models because it is expected they grasp both the microphysical and the dynamical processes involved in the rain formation.

In this work, we give an explanation of the occurrence for a class of events in which deep moist convection persist stationary close to areas with complex orography. The explanation is based on numerical simulations and in situ measurements concerning case studies.
As an example, a real case is reported and used to make concrete the conceptual model adopted for the explanation. That flash flood event interested a few square kilometers in the NE Italy, recording precipitation rates of 15 mm/5min lasting for two hours.

From the meteorological point of view, results show that the boundary layer plays a significant role in maintaining deep atmospheric convection stationary for several hours over the same geographical area; furthermore it is evident the supporting effect given by the interaction between synoptic moist flows and the microscale boundary layer currents driven by orography.

The numerical simulations have been carried out by means of WRF (Weather Research and Forecasting) model, that is running operationally at the Regional Center for Environmental Modeling of ARPA FVG.