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Space-time rainfall variability, flash floods and debris flows in the upper Adige river basin

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The upper Adige river basin, in Northern Italy, occupy a distinctive hydrometeorological niche, characterised by high frequency of orographic thunderstorms. Relatively small-extent flash floods and debris flows are triggered by these storm events. The hydrometeorological and hydrological controls of these events are examined through analyses of two storm systems occurred on October 3-4, 2006 and June 20-21 2007 on the Ridanna river basin. The first storm systems generated a flash flood, whereas the second triggered a large number of debris flows and was characterised by a relatively minor runoff response.
These events are examined by using data from a series of flood events occurred in the same area in the last 25 years, which provide a broader hydroclimatological context for interpreting the runoff response and to evaluate a distributed hydrological model. Reflectivity observations, raingauge and streamflow data, and debris flow observations for the 2006 and 2007 events are used along with the distributed model to examine the hydrological and geomorphic responses to the two storm events. The striking contrast in flood and geomorphic responses between the two floods is related to contrasts in the antecedent moisture conditions and in the space-time structure of the triggering storm events.