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The hydrological response of rocky headwater catchments to summer convective rainfalls

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In the Dolomites area (Eastern Italian Alps), sub-vertical rocky outcrops generate notable discharges during summer thunderstorms, often triggering debris flows in the scree slopes at their base. With the aim of measuring surface runoff, a sharp-crested weir was installed at the outlet of a rocky channel incised on the Dimai Peak in the area of Fiames (Cortina d'Ampezzo – Belluno province). During the period 2013-2017, about ten significant runoff events were measured. Recorded hydrographs are characterized by fast responses, with a very high rising limb. A distributed hydrological model was used to simulate the response of the basin. The forcing rainfalls were measured by means of two rain gauges placed respectively upstream the basin head and downstream the outlet. The hydrological model uses a hortonian simplified law for evaluating excess rainfall and the Muskingum-Cunge method for the propagation of discharges along the channel network. Simulations satisfactorily reproduce the measured hydrographs. Once calibrated, the hydrological model also permitted to replicate the triggering time of four debris flows occurred in two close dolomitic catchments. The recorded measurements are fundamental for improving knowledge about the hydrological response of rocky basins to convective rainfalls. Furthermore, their modelling is as well important for forecasting both flash floods in mountain creeks and triggering conditions and magnitude of runoff generated debris flows.