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High intensity convective rainfalls and corresponding hydrological response in rocky head water basins

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High intensity and short duration rainfalls are able to deliver abrupt runoff in rocky cliffs in few minutes. In the area of Fiames (Cortina d'Ampezzo, Dolomites-North Eastern Italian Alps), a monitoring network composed of rain gauges, pressure transducers and a sharp-crested weir provides precipitation height, water table level and discharge measurements. In a rectangle of about two square kilometers there are nine rain gauges while at the outlet of the rocky channel incised on the walls of Dimai Peak base (altitude 1770 m a.s.l) a sharp-crested weir is installed. Pressure transducers sensors are also buried on the scree beneath the outlet of the rocky channel. Several storms occurred and the precipitation height measurements show a rainfall pattern depending on the wind direction. Both the discharge measurements (provided by the sharp-crested weir) and those of water table level in the scree (provided by the pressure transducers) at the base of Dimai Peak (contributing basin of about 0.032 squared kilometers) show an impulsive hydrological response: discharge or water table level can pass from zero to the peak value in about one minute with a quasi-vertical raising followed by a just less rapid decreasing. A kinematic distributed hydrological model is used to simulate the response of the Dimai headwater basin to the convective rainfalls by using two rain gauges placed just upstream the basin head and downstream the outlet respectively. Rainfall excess is computed through a combination of an hortonian simplified law with the classical SCS-CN method. The computed excess rainfall is transferred from each pixel to the channel network along the maximum slope direction with a fixed slope velocity. Runoff pulses arriving to the channel network are routed to the outlet by using a velocity depending on the peal discharge. Measured runoff hydrographs are satisfactorily simulated by the model.