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Calibrating a semi-distributed hydrological model on Fella river basin (Italian Alps)

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The Northeastern Italy and the therein Friuli Venezia Giulia (FVG) region are frequently hit by heavy and prolonged precipitations, which cause frequent debris flow and diffused shallow landslides. In this study we focus on a mountain sub-basin of the Fella river watershed, the Uque at Ugovizza, located in the northeastern Julian Alps of the FVG, where a disruptive rainfall-triggered debris flow occurred in 2003.

The work aims at pursuing two main targets: (i) implementing a rainfall-runoff and hydro-morphodynamical framework for the analysis of debris flow initiated by intense heavy precipitation; ii) exploiting, for the first time, the flexibility of the GEOframe-NewAge semi-distributed hydrological model simulating high temporal resolution simulations (5-minutes) rainfall-runoff events.

The GEOframe-NewAge is an open-source component-based modeling framework, which simulates the entire hydrological cycle of the study area, including the snow melting, the soil water storage and the runoff production and routing in the river network; the model is suitable for the rainfall-runoff event scale simulations in Alpine environment with scarce measurements.

Specifically, we describe the results of the calibration and validation procedures applied to four selected intense events occurred in the period 2009-2019. Meteorological data at 5 minutes-step are used to rainfall-runoff modeling, whereas streamflow at 30 minutes is used for the model calibration and validation. Preliminary results show that the models is able to capture the temporal and spatial dynamic of extremes short events, providing satisfying Nash and Sutcliffe coefficient values.