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A comparative analysis of meteorological trigger conditions for torrential processes on a daily and sub-daily time scale for Austria

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Precipitation conditions play a major role in triggering torrential processes such as debris flows, debris floods, intensive bedload transport and torrential floods. These four processes are expected to be mainly triggered by high-intensity localized thunderstorm events or long-lasting pressure systems. For a large-scale and long-term analysis, it is problematic that most precipitation time series have a temporal resolution of one day.

In our analysis we compared data from precipitation gauges registering daily precipitation with automated gauges from the synoptic station network registering precipitation in 10-minute intervals. Daily precipitation time series were provided by the Central Institution for Meteorology and Geodynamics (ZAMG, n=631) and supplemented by some newer data provided by Wegener Center for Climate and Global Change (WEGC, n=238). Additional daily data was provided by the national hydrographic survey (EHYD, n=1020). Sub-daily precipitation time series were provided by WEGC (n=169).
Preliminary results for 115 torrential events occurring between 1994 and 2010 show that the mean triggering event rainfall (TER) is underestimated in sub-daily rainfall measurements. The average TER in daily measurements has a duration of 1.47 days (ranging between 1 and 4 days), while comparatively the data from sub-daily rainfall measurements has a mean duration of 1.04 days (range between 30 min and 4 days). About 57% of the sub-daily TERs had a duration of < 1 day. We attribute this is to the fact that there are less sub-daily stations available and thus farther away on average. For daily – sub-daily station pairs with similar distances results show a higher rainfall intensity of the sub-daily TERs. This is attributed to the possibility to determine the timing of the rainfall event more precisely.

We expect to have about 500 events available after finishing our analysis. Based on this data it will be possible to correct for rainfall thresholds analyses for daily data investigated for 7617 events (1900 – 2010) from a previous investigation. The results of our study will contribute to an improved understanding of high intensity triggering rainfall events for torrential processes.