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Analysis of the variation of the 0°C isothermal altitude during rainfall events

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In numerous countries of the world (USA, Canada, Sweden, Switzerland,...), the dam safety verifications for extreme floods are realized by referring to the so called Probable Maximum Flood (PMF). According to the World Meteorological Organization (WMO), this PMF is determined based on the PMP (Probable Maximum Precipitation). The PMF estimation is performed with a hydrological simulation model by routing the PMP.
The PMP-PMF simulation is normally event based; therefore, if no further information is known, the simulation needs assumptions concerning the initial soil conditions such as saturation or snow cover. In addition, temperature series are also of interest for the PMP-PMF simulations.
Temperature values can not only be deduced from temperature measurement but also using the temperature gradient method, the 0°C isothermal altitude can lead to temperature estimations on the ground. For practitioners, the usage of the isothermal altitude for referring to temperature is convenient and simpler because one value can give information over a large region under the assumption of a certain temperature gradient.
The analysis of the evolution of the 0°C isothermal altitude during rainfall events is aimed here and based on meteorological soundings from the two sounding stations Payerne (CH) and Milan (I). Furthermore, hourly rainfall and temperature data are available from 110 pluviometers spread over the Swiss territory. The analysis of the evolution of the 0°C isothermal altitude is undertaken for different precipitation durations based on the meteorological measurements mentioned above.
The results show that on average, the isothermal altitude tends to decrease during the rainfall events and that a correlation between the duration of the altitude loss and the duration of the rainfall exists. A significant difference in altitude loss is appearing when the soundings from Payerne and Milan are compared.