



Rainfall modulated deformation of a mountain front: example from the European Southern Alps

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Changes in groundwater levels cause measurable deformation of the Earth's surface and may affect the stress state at seismogenic depths. We highlight a time-dependent deformation signal interesting a large portion of the European Southern Alps and Dinarides by applying a blind-source-separation algorithm to the position time-series of a hundreds of continuous GPS stations. This signal is characterized by spatially variable amplitudes and directions, implying a time-dependent horizontal deformation that is larger in areas of karst geology, with directions normal to the orientation of fractures detected from a digital elevation model analysis and about parallel to the direction of tectonic strains. The temporal evolution of this signal is correlated with cumulated rainfall values over periods >200 days. The deformation can be explained by pressure changes associated with variable water level within vertical fractures, and water level changes required to open or close these fractures are consistent with the fluctuations of precipitation and with the dynamics of mature karst systems