Geophysical Research Abstracts
Vol. 18, EGU2016-7297, 2016
EGU General Assembly 2016

Gravity Variations Induced by Changing Snowpack Observed at Conrad Observatory (Austria)

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Hydrological processes are usually associated with mass transport. This induces gravity variations observed by superconducting gravimeter (SG) masking the pure geodynamical signal. The present study focusses specifically on gravity variations due to snow accumulation and melting. Measurements of the gravity signal are taken from the SG GWR C025 located at the Conrad Observatory (Austria) in an underground laboratory at about 1000m altitude. In snow rich winters a snowpack of one meter in depth or even more can be observed at this location. Snow height is measured at three different locations to get an idea of its variability. At one place additionally the weight of the snow pack is determined which allows to calculate the snow water equivalent. Gravitational signals are rather different for the accumulation and ablation phase, not only due to the different time scales of these processes but also due to the complex way path of melting water entering the ground beneath of the SG. Two methods, rainfall admittance function and Bouguer reduction, are used to account for the effect of the snow pack. Both have their strengths and weaknesses. They work better for short-term mass transports than for long lasting ones because in the latter case interference with signals of other environmental processes gets more prominent. A few case studies including both accumulation and ablation of snow on different time scales will be discussed.