Permafrost detection at the Glatzbach catchment, Austrian Alps ? Combining high-resolution surface and subsurface information

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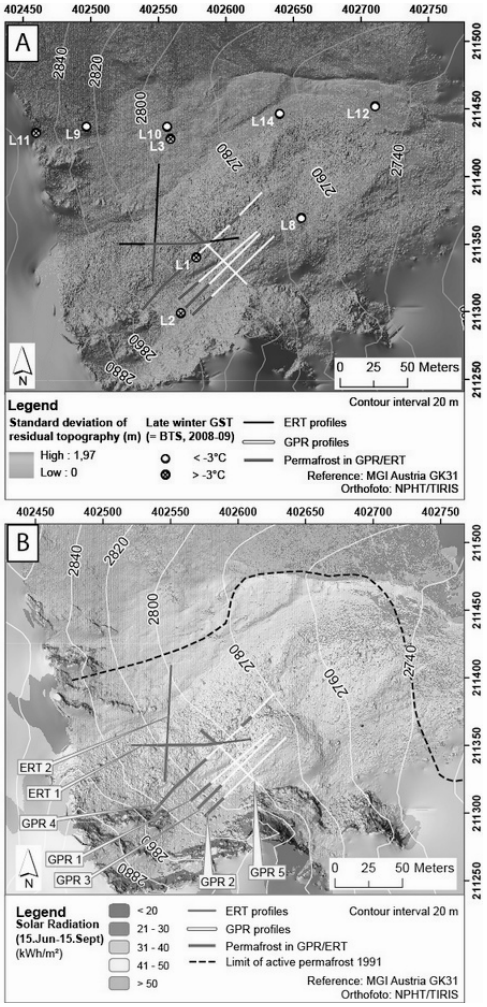
Permafrost distribution in mid-latitude mountains is strongly controlled by solar radiation, snow cover and surface characteristics like debris cover. With decreasing elevation these factors have to counterbalance local positive air temperatures in order to enable permafrost conditions. We combine high resolution surface data derived from terrestrial laser scanning with geophysical information on the underground conditions and ground surface temperature data in order to understand the effects of surface characteristics on permafrost distribution in an alpine catchment in Austria. Ground ice and permafrost is found above an elevation of 2780 m a.s.l. on north-east facing slopes. Analysis of surface roughness as a proxy for grain size distribution reveals that the lower boundary of discontinuous and sporadic permafrost is lowered on rough surfaces compared to fine-grain zones. At the same location modelled potential summer solar radiation in coarse grain zones is reduced by up to 40% compared to surfaces of fine grain sizes. The mostly patchy permafrost distribution found can therefore be attributed to local surface cover characteristics, particularly regolith grain size and its influence on solar radiation. We conclude that the analysis of ground surface characteristics supports the assessment of mountain permafrost by identifying rough surface conditions favouring permafrost occurrence.



Detection of Ice Mass Changes in Patagonia (Argentina) from Grace Data

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Gravimetric satellite missions introduce a new concept in gravitational field modelling, since they provide monthly variations of the gravity field that can be derived in valuable information about the geodynamic behaviour of our planet.
The main objective of this research is to analyze the temporal ice mass variations in the Patagonian region (Argentina) from monthly global gravity solutions provided by four different GRACE processing centers: JPL, CSR, GFZ and BGI.
Time series of ice mass variations are shown together with trend and amplitude maps for the period 2003-2010. A generalized inversion method to derive mass change estimates from gravity trends was used.
An important anomaly can be detected in the glacier's area. The observed mass changes in the zone under study are mainly caused by postglacial rebound and ice redistribution, but also by the climatic change that is generating a great retrocession and loss of mass in most of the Patagonian glaciers (the Upsala glacier has backed down more than 8 Km in the last 25 years, for example).