größerer vertikaler Distanz zu den Vorflutern auf.
General wird angenommen, dass sich „alte Landschaften“ durch eine kontinuierliche Entwicklung seit dem Miozän gebildet haben und glazial geprägt wurden, während die „jungen Landschaften“ erst seit dem Holozän existieren. Neue Studien zeigen, dass die Bildung der „junge Landschaften“ deutlich vor dem Holozän begann. Im Zuge von diesem Projekt dokumentieren wir alte und neue Landschaften im Einzugsgebiet der Salzach (Ostalpen) und verwenden diese Daten um Aspekte zum Alter und Zeitpunkt der Bildung der jungen Landschaft abzuleiten.
In dieser frühen Projektphase präsentieren wir Konzepte, erste Daten und neue numerische Werkzeuge zur Bestimmung von Raten der Landschaftsentwicklung für unterschiedliche räumliche und zeitliche Skalen. Auf der Skala von alpinen Einzugsgebieten und Zeitintervallen von 1 a - 10.000 a wird der diskontinuierliche Prozesscharakter von Einzelereignissen (Hochwasser und Erosion, Muren, Steinschlag) berücksichtigt. Basierend auf der numerischen Beschreibung von Einzelereignissen können kontinuierliche Langzeitmodelle zur Landschaftsentwicklung für unterschiedliche Klimaszenarien kalibriert und in einen tektonischen und klimatischen Rahmen gesetzt werden.

Monitoring of moisture in alpine rock walls and its effects on weathering

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The detachment of rock fragments from alpine rockwalls is mainly assigned to frost weathering. However, the actual process of frost weathering as well as the contribution of further weathering processes (e.g. hydration, thermal fatigue) is poorly understood. Rock moisture distribution during freeze-thaw events is key to understanding weathering. For this purpose different measuring systems are installed in two study areas (Dachstein, a permafrost area, and Gesäuse, a non permafrost area, both in Styria) within the framework of the research project ROCKING ALPS. (1) small-scale 2D-geoelectric survey lines in north and south expositions and (2) high temporal resolution temperature and moisture sensors. The determination of moisture is done by resistivity measurements, which are difficult to calibrate, but provide good time series. Additional novel moisture sensors were developed using the heat capacity of the surrounding rock which is governed by water content. These sensors give point readings from a defined depth and are independent from soluble salt contents. Pore water pressure occurring during freeze-thaw events is recorded by means of pressure transducers (piezometers). The extrapolation from point readings to areal information is done by infrared photography. These results are cross-checked by simulation calculations. Based on meteorologic and lithologic input values, the simulation routine calculates, in an iterative procedure, the hourly energy and water transport at different depths, the latter in the liquid and in the vapor phase. The calculated profile lines and chronological sequences of the rock moisture allow - in combination with temperature data - the detection of active weathering periods. First simulated results at the Gesäuse show, that the thresholds of the – classical - frost shattering theory (a high amount of freeze-thaw cycles and 90% pore saturation) are achieved predominantly in spring and autumn and in north-facing rock walls. Maximum values of pore saturation occur from May to September.

Facies studies on deep-water sandstones of the Altlengbach Formation (Upper Cretaceous, Rhenodanubian Flysch Zone) - outcrop analogues for hydrocarbon reservoirs in the Vienna Basin

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The Rhenodanubian Flysch Zone comprises Alpine deformed deep-water strata within thrust units at the northern margin of the Eastern Alps of Austria and continues into the basement of the Neogene Vienna Basin where they form potential (fractured) reservoirs.
Outcrop analogues of sandstone-prone potential reservoirs have been investigated within the Wienerwald area to the west of Vienna. Here, within the main flysch thrust unit (Greifenstein Nappe), the Altlengbach Formation crops out within several abandoned quarries. Quarries around St. Veit/Gölsen (Lower Austria) have been used to investigate the facies and reservoir properties of the Altlengbach Formation (Upper Campanian-Paleocene). The formation comprises four members: a lower member up to 400 m in thickness rich in thick sandstone intervals, a marl-rich member, an upper sandstone-rich member, and a clay-rich member of early Paleocene age. The lower

sandstone-rich member of late Campanian-early Maastrichtian age is exposed at the St. Veit/Gölsen quarries. Sandstones are rich in quartz with minor feldspar, mica and rare carbonate grains (mainly biogenic). They are strongly compacted and calcite cement fills minor pores, thus resulting in low primary porosity values.
In principle, the massive sandstones have the potential to act as reservoirs in the Vienna Basin basement. However, as primary and secondary porosity of these sandstones is low, fractured reservoirs of the Altlengbach Formation as present near faults and thrust planes may be the primary target for exploration within these rocks.

3D Landslide Change Detection using Terrestrial Laser Scanning

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Landslides are highly dynamic processes, which often appear after long and intensive rainfall events on sloped terrain. Areas with occurrence of landslides suffer from heavy erosion affecting infrastructure, causing loss of soil, degragation of agricultural land, and lowering attractiviness of landscape, with negative impacts on tourism industry. In this study we present a point cloud based method to describe and monitor changes on existing shallow landslide slopes. The test site investigated is located in the Schmirn Valley (Tyrol, Austria). Two terrestrial laser scans from 2011 and 2012 are used to analyse surface changes in 3D. The landslide is characterized by backward erosion at the top scar. First the scans are registered, georeferenced and filtered. Filtering is needed to remove outliers and high objects such as trees. The change detection proceedure is based on a point-based segmentation of landslide sub-parts (object primitives). Statistical features such as roughness and orientation are calculated for each sub-part. The sub-parts are handled as moving and deforming objects, which are tracked between time stamps. The presented poof of concept shows that this workflow is well suited to track changes of natural surfaces over time and can be used to calculate true area and volume changes on the level of object primitives.

Geophysical survey of permafrost lenses under a hanging bog at low elevation (Untertal, Austria)

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Local permafrost distribution is not only dependent on aspect and elevation. Small scale topographic and microclimatic features can cause considerable deviations from the large scale distribution. Numerous investigations have verified the existence of ice lenses or at least ice-rich sediments under the foot of coarse-grained scree slopes. Combined with north-facing orientation, permafrost may occur at surprisingly low altitudes. We report on an interesting example from a sub-cooled scree slope near Schladming in the Untertal, Styria, at 900 m a.s.l. which makes it one of the lowest-lying examples in the Alps. Multi-method geophysical investigations (ground penetrating radar/GPR, 2D-resistivity profiling/ERT, seismics/SR) have been carried out in combination for permafrost detection, flanked by microclimatic measurements and vegetation mappings. Our investigations proved the existence, characteristics and location of permafrost lenses and could relate these occurrences to unique moss vegetation patterns and to the position of cold air blowholes. The change in the extent of frozen ground during the year was surprising because the smallest extent was found in June, and not in autumn as expected before. ERT turned out to be the best suited method for the investigation, while the performance of GPR and SR was poorer.