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Results from the 2009 Investigations at the Global Change Observatory "Gottfried Merzbacher" (Tien Shan, Kyrgyz Republic)

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The Global Change Observatory „Gottfried Merzbacher“, which was installed near the former confluence of the Southern and Northern Inylchek Glacier, served as a platform for intensive field work in August 2009. “Peremitschka” (meaning “the area between”) is a test site in front of the retreating Northern Inylchek Glacier, which regularly is flooded by the increasing glacier-dammed Lake Merzbacher, before it bursts out.

Mapping the micro-geomorphology and conducting electrical resistivity tomography (ERT) profiles resulted in a sound interpretation of the surface morphology and of subsurface layers of the Peremitschka plain, which probably is underlain by both, permafrost and dead ice of the retreating Northern Inylchek Glacier. The flat 780 meters long high resolution ERT-profile reveals an undulated multilayer resistivity distribution. The uppermost 3-5 m of the profile show low resistivities ranging from 10 to about 200 ohm.m, indicating fine clastic sediments. In this area the surface of the whole test area is covered by silt and sand, the weathered material from the surrounding hills, which mainly consist of shists and calcareous shists of Upper Silurian to Lower Devonian age (Jamansu-Formation).

The second “layer” below this low resistivity zone is characterized by resistivities up to 30.000 ohm.m to the final depth of the profile in approximately 45 m, and probably portraits permafrost overlying dead ice of the retreating Northern Inylchek Glacier. The geophysical measurements enable sound interpretations of the local geomorphology which consequently can be mapped in remote sensing images as flooded plain directly underlain by melting permafrost. Time series analysis of oblique aerial photos and remote sensing images allowed for a detailed reconstruction of the glacier retreat from 1943 to nowadays. It is still under discussion, however, if the Northern Inylchek Glacier surged in the late 1990ies.

Compared to other regions in the Tien Shan range the youngest major forwarding period of the Inylchek Glacier occurred during the Little Ice Age (LIA). A first calibrated 14C-analysis of dry roots from ancient shrubs detected near the surface of the Peremitschka plain dates back (with 95.4% probability) to 1630-1960 AD (anno domini; specimen VERA-5185). Although this age only in general allows for dating some vegetation growth 170 $\pm$ 70 years BP (before present), it also indicates the retreat of the Northern Inylchek Glacier, giving space to a lake, which was discovered in 1903 by the German researcher Gottfried Merzbacher. The lake is dammed by the Southern Inylchek Glacier and is well known for its regular outbursts during the last century. Statistically, the outbursts of Lake Merzbacher shifted from september/october to july/august, which might indicate global change in general, and regional warming during summer in particular.

The former confluence of Northern and Southern Inylchek Glacier nowadays represents a unique glacier system comprising differing types of glaciers at the same altitude, latitude and longitude, namely the retreating Northern Inylchek Glacier, the decaying Southern Inylchek Glacier, and the actively forwarding northern part of the latter.