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Mineralogical characterisation of Batizovské pleso sediments and surrounding soils (High Tatras, Slovakia)

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The High Tatras (HT) moraine relief shows a glacier stabilization in two phases, at 26-21 ka and at 18 ka [1], followed by a gradual retreat and formation of the morainic, trough and cirque lakes dated from 10 000 to 16000 cal BP on the northern slopes of the Tatra Mountains and before 10000 cal BP on its southern slopes [2]. Sedimentary record of HT mountain lakes contains two distinct lithostratigraphic sections. The uppermost part is formed of the Holocene brown detrital gyttja with high organic matter content which overlays the Late Glacial mineral light-grey silt and fine-sand which suggest deposition under dry and cold periglacial conditions [2].

The contribution intends to present the first results of the mineralogical analysis of the tarn sediments on the Slovak side of the High Tatras and belonging to complex paleolimnological study of High Tatras tarns with aim to determine a timing of the glacier disappearance and amplitude of climatic and ecological changes on the glacial/interglacial boundary (http://www.geo.sav.sk/en/depovyt-apvv-15-0292/).

Batizovské pleso (1884 m a.s.l) is a mountain lake (tarn) formed by a glacier. Its sedimentary record have been obtained by using a swimming platform. Drilling site was selected after a lake sonar survey, which provided high resolution 2D acoustic image on sedimentary infill. This allowed a selection of the site with the highest thickness of the sediment. Drilling was realized by steel hydraulic corer allowing to get 2 m long core. Total thickness of lake sediments was more than 3 m. Non-destructive micro-CT analysis was used to determine the internal structure of the sediment in the cores before cutting. The cores were devided to 1 cm thick samples. Part of these samples were analysed by particle size and XRD analysis (bulk and clay fraction).

Upper part of Batizovské pleso sediments is composed by gyttja (postglacial sediment with organic matter). Dominant particle size of this sediment is fraction less than 0.063 mm. 40-80 wt% of amorphous phase was determined in gyttja by XRD. The rest is composed by same minerals as were identified in light grey laminated glacial silt. Analysed silt samples are composed of quartz, albite, K-feldspar, muscovite and clay minerals: illite, smectite, chlorite and kaolinite. Most of this mineral assemblage corresponds to the surrounding rocks (mainly biotite tonalites and granodiorites; [3]). Amount of clay minerals varies from 5 to 25 wt% and is independent on depth. Quantitative changes of mineral composition are explained by different dynamics of sedimentation. XRD analysis of clay fraction confirmed presence of illite, chlorite, kaolinite and smectite. While representation of the first three clay minerals in the studied clay fraction of light grey laminated silt is practically unchanged, amount of smectite is variable, from traces to major phase. Mineral assemblage of clay minerals in surrounding soils are very similar to composition of tarn sediments. A structural ordering, however, is significantly less developed in soils.

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