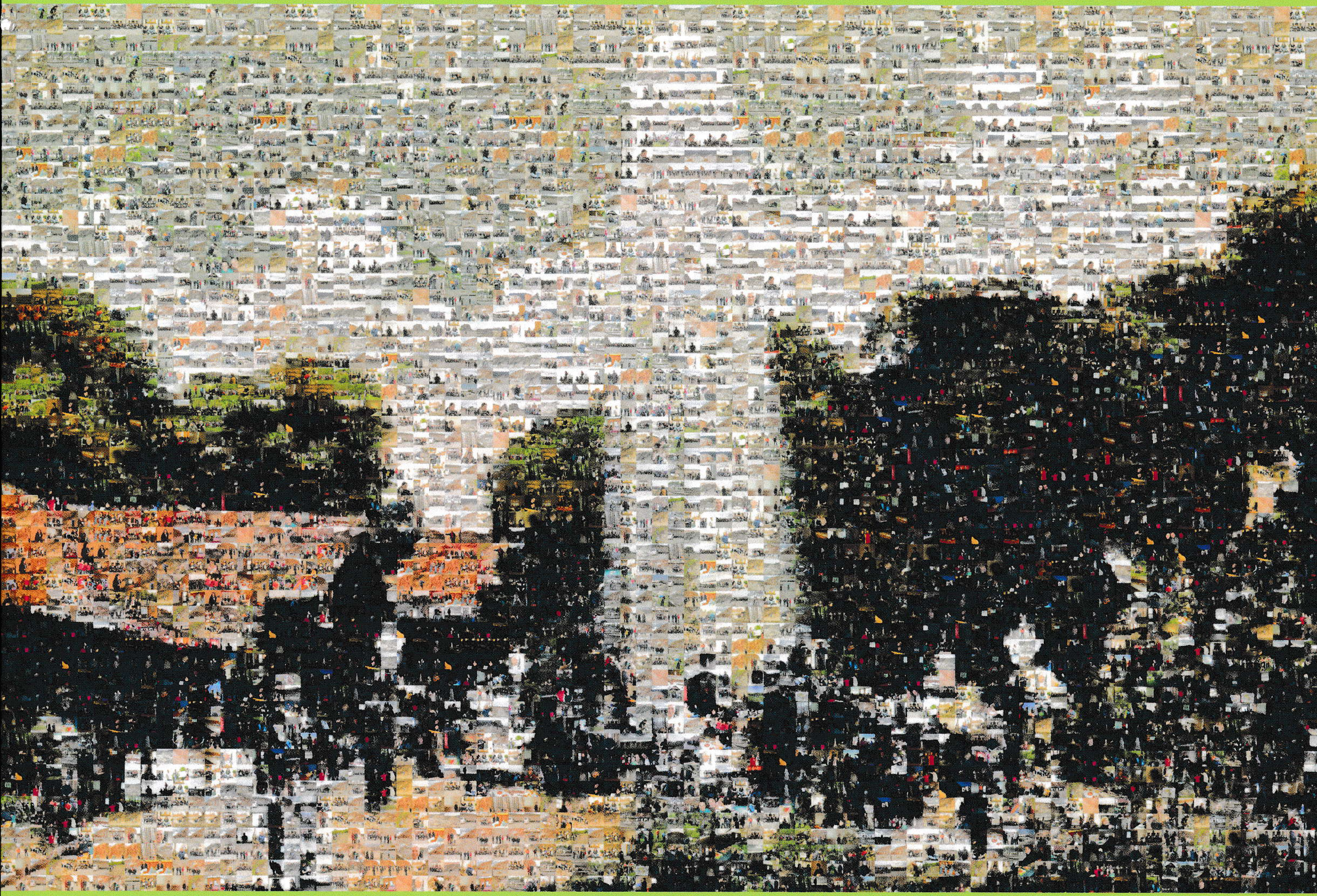
XX[th] International Conference of Young Geologists

April 3-5, 2019
Herľany, Slovakia



ICYG 2019

Abstract Book

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Molecular stratigraphy of glacial lake sediments: case study from Tatra Mountains, Slovakia

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To understand modern climate change it is necessary to obtain paleoclimatic records and develop climate models based on past climate patterns and analyze their relationship to changing global temperatures. Lake sediments are valuable archives of geochemical and microfossil proxies. Variable composition of biomarkers incorporated into bottom sediments can be used in reconstruction of past environmental conditions and evaluation of the history of the climate change. (Eglinton, 2008; Holtvoeth, 2010; Killops, 2013)

The climate evolution in Tatra Mts. lakes is being studied on the basis of paleoclimate proxies. Batizovské pleso is a glacial lake situated in Batizovská dolina at an altitude 1891 m a.s.l. The catchment is partly a barren granodiorite rock, partly vegetated by grassland and shrubby mountain pine. The lake is dammed by bedrock, recharged through debris cones by underwater springs and drained by one outflow. Sediment core was taken by percussion corer in 2016 at depth 6m, length of core is 320 cm. Bottom 150 cm of the sediment pile is a grey clayey silt, overlain by 170 cm of brown organic sediment (gyttja).

The main goal of this study is building a chemostratigraphical record of glacial lake sediment as a part of a large multi-proxy study. Biomarkers, such as lignins, n-alkanes, diatom, algae and cyanobacteria markers will be used to reconstruct the past vegetation and climate changes since deglaciation.

Methods for analyzing the biomarkers in sediments (Fornace, 2014; Freimuth, 2017; Bechtel, 2018) were adapted to a young sediment age.

Lipid markers are analyzed from total lipid extract, which is acquired using Soxhlet extractor. By applying saponification and subsequently column chromatography we obtained five lipid fractions. Lignin biomarkers are extracted as lignin phenols. The lipid-free sediments are oxidized with CuO at 155°C for 3 h in stainless steel pressure vessels, then acidified, extracted and derivatized into a non-polar form (Hedges and Mann, 1979; Hedges and Ertel, 1982; Goňi and Hedges, 1992). Phenolic CuO oxidation products are analyzed as trimethylsilyl derivatives.

Each subsample is analyzed with gas chromatograph Trace GC Ultra coupled to an ion-trap mass spectrometer ITQ 900 (Thermo). Identification of compounds is based on comparing mass spectra with NIST library and verification of retention times for highest score records. Compounds of interest are quantified using intensities of dominant fragments.

Based on the n-alkanes composition in sediments the CPI and TAR index (Bray and Evans, 1961) was calculated. The plot of n-alkanes indices CPI and TAR versus depth is shown in Figure 1. High CPI index of all the samples means very good preservation of biosynthetic signature without cracking of alkane chains. The initial increase of TAR index may reflect development of vegetation cover on surrounding morraines after deglaciation, while its drop at 73,5 cm probably points to onset of Carex/Sphagnum advance into the lake.

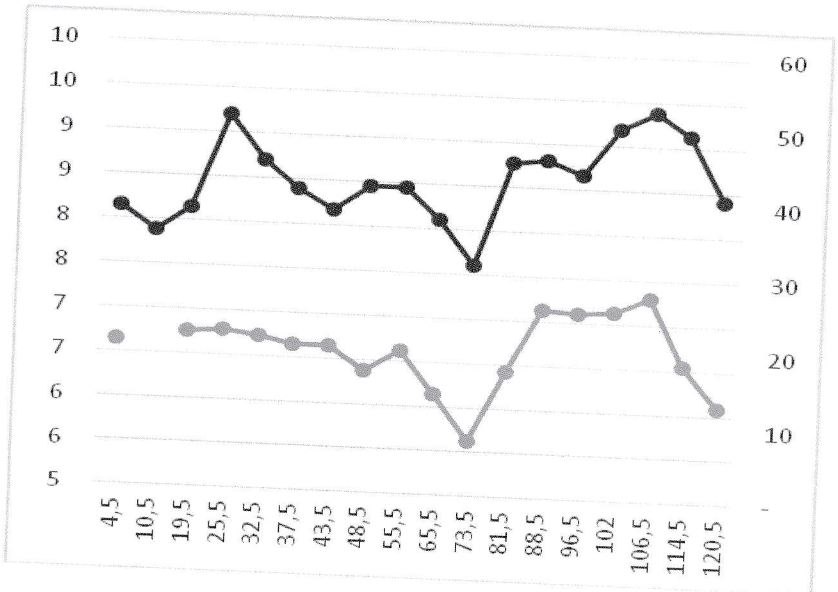

Figure 1. Plot of n-alkane indices CPI and TAR versus depth.

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