Geophysical Research Abstracts
Vol. 20, EGU2018-806, 2018
EGU General Assembly 2018

Meltwater Suspended Sediment and Hydrochemistry of a Diurnal Ephemeral Stream draining from the Maly Azau Glacier, Mt Elbrus

Jessica Vasilchuk (1), Tim Stott (2), Nadine Budantseva (1), and Yurij Vasil'chuk (1)

(1) Lomonosov Moscow State University, Moscow, Russian Federation, (2) Liverpool John Moores University, Liverpool, United Kingdom

Rapid glacier retreat reflects recent climate change and affects river runoff in alpine regions. That impact can be detected by (1) changes in suspended sediment transfer in meltwater streams and (2) stable isotopes that are used for hydrograph separation and assessment of glacial meltwater, groundwater and rainfall events as contributors to the river runoff. In this study, we examine the relatively unusual phenomenon of a diurnal ephemeral glacial meltwater stream on Mt Elbrus.

The aim of the research was to analyse changes in suspended sediment concentration (SSC), $\delta^{18}O$,$\delta^{2}H$ and deuterium excess in the diurnal cycle of the Maly Azau ephemeral stream draining from Maly Azau glacier. Major elements and hydrochemical tracers such as heavy metals were used as supporting parameters. 106 500ml samples were retrieved at 30-min intervals for SSC analysis over the diurnal discharge cycle between 10 and 16 August 2017. Samples were filtered in the field through GF/D 8μ pore size filters. Glacier ice, groundwater and precipitation water were also sampled. SSC was analysed using the standard gravimetric method. Isotope composition was analysed with a Delta-V Isotope MS, ion composition was measured by means of ion chromatography and trace metals were measured by ICP-MS.

Results show that the river water and precipitation contained mostly HCO_3^- and Ca^{2+} ions over the diurnal sampling cycle, but at the highest discharges the Na+ content in river water increased and predominates, and water salinity varied in a range of 4-22 mg/L, and SSC in the range 226-4738 mg/L. River water was enriched in Zn, Zr, Ti in comparison with the global average content in rivers. Ice was enriched in the same elements. The glacial ice salinity varied from 11 to 30 mg/L, SSC varied from 162 to 105420 mg/L, and the ice with the highest SSC was characterized by relatively high Na^+ content. In addition, discharge peaks coincided with SSC peaks, but dissolved salt content increased with discharge faster than SSC. The relationship between H and O isotope ratios in precipitation was close to GMWL (Global Meteoric Water Line), while river water was depleted in $\delta^{2}H$ due to fractionation as the slope of the regression line was 3 (8 in GMWL equation) and the constant term was -47 (+10 in GMWL equation), $\delta^{18}O$ values in river water vary from -12.53 to -15.19‰ $\delta^{2}H$ values vary from -85 to -100‰

The research indicates the low sensitivity of the isotope composition of Maly Azau stream to the regular rainfall events; it mostly depended on the fractionation of glacial ice melted. Our observations showed the time lag of an hour in SSC change in comparison to the dissolved salts content. The isotope composition of Maly Azau river water is similar to that in the Djankuat river in the same region, but the equation for the relationship between H and O isotope ratios for the Maly Azau river in August differs significantly.

This study was conducted within the IAEA Interregional TC Project INT5153. The Russian Science Foundation (grant №14-27-00083) supported the laboratory analyses.