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Analysis of chemical and isotopic data of natural water on King George Island

Bulat Mavlyudov (1) and Igor Tokarev (2)

(1) Institute of Geography, Russian Academy of Sciences, Russian Federation (bulatrm@bk.ru), (2) St. Petersburg State University, St. Petersburg, Russian Federation

King George Island is located near to northern termination of the Antarctic Peninsula. Within the limits of IAEA Project INT5153 in 2014-2017 on Filds Peninsula isotope and chemical researches were carried out on water objects: lakes, rivers, atmospheric precipitation, snow and ice.

At an average background mineralization of snow about 70 mg/l at the beginning of snow melt the brines which are flowing down to the basis of snow thickness have a mineralization up to 1000-1500 mg/l, that is connected with carrying out from snow first of all salt inclusions. During summer warming there is process of increasing of the contribution of melt water in runoff that leads to gradual decreasing of water mineralization up to 50-60 mg/l out of glaciers and up to 5 mg/l on glaciers. With decreasing of snow and ice melting during cold snaps and at the beginning of autumn the water mineralization in the rivers and lakes increases by increase of the contribution of permafrost water.

Growth of air temperature leads to weighting of isotope composition of an atmospheric precipitation in the summer. Separate sharp departures from the general trend are connected with arrival of air masses from various regions. The analysis allows to reveal primary directions of arrival of the air masses forming an atmospheric precipitation: (a) from Pacific Ocean (evaporation, sea aerosols); (b) from Antarctic Peninsula; (c) local and (d) an unknown origin. Among summer and winter precipitation influence of Pacific Ocean prevails, isotopic light fractions (movement from Antarctica) have the small contribution to water balance of area.

The isotope structure of water of different reservoirs belongs to local meteoric water line (LMWL), i.e. influence of processes of nonequilibrium fractionations in this region is slight. Snow, firn and ice, and also superficial and ground water change the isotope compositions in narrower limits than an atmospheric precipitation by averaging in the specified water reservoirs. Variations of isotope composition decrease along line: snow→firn→ice. Among superficial water the maximum variations are noted in separate drainless lakes, the least – are in the rivers and ground water.

By absolute values isotope composition of lake water is close to composition of glacial ice except for separate small lakes, which apparently can have exclusively snow feeding. Groung water has the heaviest isotope composition, which formation is caused, apparently, by absorption of mainly summer liquid precipitation. River water average compositions of all water reservoirs and it is closest to average isotope composition of a glacier.

Correlations between isotope and not isotope (pH and conductivity) indicators of water allow to reliably enough allocates the contribution of glacier melt water in superficial drainage. It allows to hope that at corresponding statement of observations the ice mass balance of a glacier can be controlled also by isotope - hydrochemical markers.