



Regional pattern of snow characteristics around Antarctic Lake Vostok

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Since 1998 Russian Antarctic Expedition has organized several scientific traverses in the region of subglacial Lake Vostok mainly devoted to the radar echo and seismic sounding of the glacier and water (the results have been published elsewhere). Along with the geophysical studies, a number of glaciological investigations have been carried out: snow pit digging, installation of accumulation stakes, snow sampling to study the stable water isotope content. Here we for the first time present a synthesis of these works and demonstrate a series of maps that characterize the snow density, isotope content and accumulation rate the studied region.

A general tendency of the snow accumulation rate and isotope content is a significant increase from south (south-west) to north (north-east) from 35 to 23 mm w.e. per year and from -53,3 ‰ to -57,3 ‰ for delta oxygen-18 respectively, which likely reflects the continental-scale pattern, i.e. increase from inland to the coast. Deuterium excess varies from 11,7 ‰ to 16,3 ‰ is negatively correlated with the isotope content, which is typical for central Antarctica. The snow density demonstrate different pattern: higher values offshore the lake (up to 0,356 g/cm³), and lower values within the lake's shoreline (lower limit is 0,328 g/cm³). We suggest that this is related to the katabatic wind activity: very flat nearly horizontal surface of the glacier above the lake is not favorable for the strong winds, which leads to lower surface snow density.

Superimposed on the main trend is the regional pattern, namely, curved contour lines in the middle part of the lake. We suggest that it may be related to the local anomalies of the snow drift by wind. Indeed, on the satellite images of the lake one can easily see a snowdrift stretching from the lake's western shore downwind in the middle part of the lake. The isolines of delta oxygen-18 and deuterium excess become perpendicular to each other in the north part of the lake which also could be related to wind activity and different time of exposition snow on the surface which potentially leads to changing in d-excess and water isotopes ratio relation.

Another interesting feature is the minimum values of snow accumulation rate and isotope content to the south-east from Vostok station. Before present, the Vostok's close vicinity was the record-holder, but now it is obvious that the pole of the lowest values of these parameters is somewhere else. This finding may be important in terms of the search of the oldest ice in frames of the IPICS "1.5Ma" project.