

Climate change at the Caucasus highlands over the past 200 years derived from the ice cores' isotopic composition

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Here we present the results of isotopic investigations of several ice cores obtained in the Caucasus Mountains in southern Russia, Mount Elbrus and Mount Kazbek. There is a distinct seasonal cycle in the isotopic composition record of these cores. We discuss the isotopic composition of the Elbrus deep ice core (182 m) obtained in 2009 as well as several shallow cores obtained in 2012 and 2013. The cores were dated using annual layers counting. We present the data covering the period from 1816 till 2013.

These values were compared with available meteorological records from 13 weather stations in the region, and also with atmosphere circulation characteristics, back-trajectories calculations and GNIP data. We worked out the possible mechanisms of the formation of the isotopic composition of precipitation and of ice deposits in the Caucasus region.

It was shown that in the summer season, the isotopic composition depends on the local temperature, while in winter, it depends on the atmospheric circulation. The snow accumulation rate correlates well with the precipitation rate in the region all year round. We reconstructed the summer temperature and precipitation records at the Caucasus highlands from 1816 till 1930 when the meteorological observations at high elevation began.

The research is supported by Russian Science Foundation grant 17-17-01270. This work was also conducted in the frame of the International Associated Laboratory (LIA) "Climate and Environments from Ice Archives" linking several Russian and French laboratories and institutes, and with additional support from the French embassy in Russia.