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Stable isotopic composition of pedogenic carbonate in soils of Minusinsk Hollow

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The purpose of the research is to characterize the isotopic composition of carbonate neoformations in soils and estimate its correlation with isotopic composition of water and parent material. The study site is located in the Minusinsk Hollow that is situated among Kuznetsk Alatau and Sayan Mountains. Three key-sites with in different parts of hollow, under mainly steppe vegetation with calciphilic grasses and diverse parent material were studied including: 1) Kazanovka Khakass state national reserve in foothills of Kuznetsk Alatau 2) Hankul salt lake that is considered as natural monument 3) region of Sayanogorsk aluminum smelter on a left bank of the Yenisei river. The samples of pedogenic and lithogenic carbonates as well as water samples were analyzed using the Delta-V mass spectrometer with a standard option of a gas bench according to standard methods. Carbonate coatings (also called pendants or cutans) is one of the most common types of carbonate neoformations occurring in the region. Fine coatings' layers one over another usually can be found on the bottom sides of rubble and gravel inside the soil profile colour varies from white to brownish and yellowish (probably depending on the impurities of organic matter). In Petric Calcisols, Chernozems and Kastanozems δ18O values of coatings vary in a rather small range from − 8.9 to − 10.1 ‰ PDB. This probably shows that their forming took place approximately in the same climatic conditions. While δ18O values of carbonate parent rocks are close to them and are vary from − 11.1 to − 11.9 ‰ PDB. Also, δ13C values of coatings strongly decrease from inner (older) to outer (younger) layers, that can indicate differences connected with the diffusion of organic material. River waters' δ18O values also show a small range from − 16.62 to − 17.66‰ SMOW, while salt lakes' waters due to the fractionation evaporation effects demonstrate much heavier values from − 4.73 to − 9.22‰ SMOW. The groundwater shows δ18O values in between: − 14.98‰ SMOW. The modern salt crust, forming on the bank of Hankul lake shows the following values δ13C = − 2.3‰ PDB and δ18O = − 6.3‰ PDB.

Obtained data indicates: 1) differences between isotopic composition of carbonates from modern crust and carbonate coatings; 2) mainly uniform origin of carbonate coatings; 3) the main source of carbonates is local carbonate rocks.

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