



Cryoconite: a novel environmental monitor for atmospheric deposition?

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Cryoconite is the dark, granular sediment, that is globally found on the ablation surface of mountain glaciers and ice sheets. It gained attention from many branches of Earth Sciences, Microbiology and Geochemistry. Cryoconite sediments are composed by a mineral fraction, whose origin can be local or remote and that accounts for 80-98% of total mass, and by an organic one which ranges from 2 to 20 % (Cook et al., 2016). Recently, different studies reported very high, and unexpected, concentrations of specific substances in cryoconite, both natural and anthropogenic. An extreme case is represented by radionuclides: the activity of specific radioactive species in cryoconite samples is orders of magnitude higher than the ones observed in other environmental matrices. Only samples from nuclear test and accident sites show similar values. But radionuclides are not the only species that were found to exceed environmental background levels: heavy metals, organic pollutants and carbonaceous matter were also reported to be in excess in cryoconite. The mechanism responsible for the accumulation is not yet clear. We present here preliminary evidences about cryoconite samples from the Alps, suggesting that an important role in these processes, is played by the interaction between meltwater, organic and mineral matter. During the melting season, cryoconite is in contact with meltwater running downstream along the surface of glaciers. Exactly like a sponge, it retains and concentrates the substances originally stored in glacier ice and transported toward the glacier terminus by meltwater. In this context cryoconite can be thus considered as a novel and efficient environmental monitor for atmospheric deposition, since the impurities that are present in glacier ice mostly have an atmospheric source.

References:

Cook et al. (2016) "Cryoconite: the dark biological secret of the cryosphere" *Progress in Physical Geography* 40:66-11