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Preliminary results on the comparison between spectral, physical and chemical properties of West Greenland and Antarctica (Dry Valleys) cryoconites.

Marco Tedesco (1,2), Christine Foreman (3), Nick Steiner (2), and Tristan Schwartzman (1)

(1) CCNY-CUNY/NASA, Earth And Atmospheric Sciences, NY, United States (mtedesco@sci.ccny.cuny.edu), (2) The Graduate Center, CUNY, New York, NY , USA, (3) Montana State University, Bozeman, MT, USA

Cryoconite holes are common to glaciers worldwide, and probably represent the most active microbial habitat on snow-free, melting ice. The Swedish explorer Nordenskjöld coined the term ‘cryoconite’ on the return from his 1870 Greenland expedition; “cryo” being ice and “conite,” dust. Differences exist in the composition and amount of cryoconite sediments in maritime and inland glaciers. These properties have also been found to vary from glacier to glacier, and continent to continent. In contrast to the open holes found in the Arctic (e.g., West Greenland) and in more temperate environments in summers, cryoconite holes found in the McMurdo Dry Valleys, Antarctica are sealed with an ice lid up to 30 cm thick. Once established, cryoconite holes in Antarctica are frozen solid for 9-10 months of the year and melt internally in summer due to the penetration of solar radiation and subsequent absorption by the trapped sediment and biota.

To our knowledge, a comparison between Antarctica and Greenland cryoconites has not been carried out. In this study, we report preliminary results concerning the comparison between the spectral, physical and chemical properties of cryoconite systems from West Greenland and Cotton Glacier (Dry Valleys, Antarctica).
Beside the chemical composition, we study the spectral properties and the particle size distribution of sediment collected from different cryoconite holes. Preliminary analysis shows that cryoconite from Greenland has a much smaller particle size than that collected in Antarctica. Also, the range within which the particle size varies is smaller in the case of Greenland, with greater size variability found in the material from the holes in Antarctica. In our preliminary analysis, we found that cryoconite from West Greenland has a lower reflectance than that in Antarctica, as a consequence of the higher percentage of organic matter content. Conversely, once organic matter is removed the cryoconite in Antarctica has a lower reflectance than materials from Greenland. This implies that high biological activity in West Greenland cryoconite systems is responsible for increased absorbed solar radiation. Moreover, in absence of biological activity, cryoconite holes in Antarctica may absorb more solar radiation than those in Greenland.