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Water-soluble organic carbon measurements at Summit, Greenland

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Photochemical processing of organic aerosols in snow modifies the concentration and composition of the organic compounds that are archived in glacial ice. In order to better understand the cycling of organic compounds in Arctic surface snow, measurements of water-soluble organic carbon (WSOC) compounds were made during the 2006 summer season at Summit, Greenland. Firn air measurements of WSOC gases revealed concentrations within the snowpack to be nearly an order of magnitude higher than in the air just above the snow. Simultaneous measurements of WSOC gases at 2 cm and 150 cm above the snow suggest a gradient that would support a flux of WSOC out of the snow. Concentrations of WSOC gases and aerosols did not exhibit a consistent diel cycle throughout the 6 week campaign, however during one period, 4 out of 5 consecutive nights showed concurrent decreases in WSOC gases and increases in WSOC aerosols. This behavior seems to be the result of temperature dependent gas-to-particle partitioning, as these episodes occurred during the coldest part of the early morning. From early June to early July, WSOC gas and aerosol concentrations at 150 cm above the snow averaged 833 ng/m3 and 130 ng/m3, respectively. This value for WSOC gas is very similar in magnitude to published acetic and formic acid gas concentrations made during previous summers at Summit, suggesting that these two monocarboxylic acids constitute a large fraction of the mass of water-soluble organic gases at Summit.