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Taylor Glacier basal ice, Antarctica; a biogeochemical hot-spot in a glacial environment

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Increasing evidence points to a significant role for microbes in mediating the dissolution and oxidation of minerals in sediments beneath ice masses (i.e., subglacial weathering). Subglacial microbial ecosystems are local hotspots of microbial activity relative to the glacial ice overlying them due to the presence of liquid water and finely comminuted rock debris, providing nutrients and chemical energy sources. Eight different ice units from a 4 m basal ice sequence (ice temperature, -17°C) at the Taylor Glacier, McMurdo Dry Valleys, Antarctica, were identified and sampled for microbiological and geochemical analysis. The vertical profile of cell and gas concentration in basal ice from Taylor Glacier indicates that the debris-rich ice layers have higher CO_2 and cell concentrations relative to the glacier ice, but are depleted in O_2 relative to atmospheric values. Acetate mineralization experiments were undertaken on a subset of glacial and basal ice samples with varying debris content, CO_2 concentration, and cell biomass to assess

heterotrophic activity at 2°C. Our results show that ^{14}C-acetate was respired to CO_2 in all the melted debris-rich ice samples analyzed, but little activity was observed in glacial ice samples of meteoric origin. Together, these data suggest that microorganisms entrapped within the debris-rich basal ice may be metabolically active in situ.

0414 Biogeochemical cycles, processes, and modeling (0412, 0793, 1615, 4805, 4912)
0448 Geomicrobiology
0716 Cryobiology (0475)
1827 Glaciology (0736, 0776, 1863)
Biogeosciences [B]
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