Dynamics of carbon-based gas flux from glacial sediments at a retreating alpine glacier

TERRA M. SPOTTS[1]*, MARK L. SKIDMORE[1], ERIC S. BOYD[2] AND JOHN E. DORE[3]

[1]Department of Earth Sciences, Montana State University, Bozeman, MT, 59717, USA (*correspondence: scheerterra@gmail.com)

[2]Department of Microbiology, Montana State University, Bozeman, MT, 59717, USA

[3]Department of Land Resources and Environmental Sciences, Montana State University, Bozeman, MT, 59717, USA

Research over the past decade has demonstrated the presence of microbial communities in glacial sediments [1, 2]. The active components of the microbial community have been identified in glacial sediments at Robertson Glacier (RG), Canadian Rockies, where elevated CO_2 and CH_4 concentrations have been measured [3, 4]. However, there is a dearth of empirical data on the net contribution of carbon based gases (CO, CO_2 and CH_4) from glacial systems to the atmosphere.

In this study we measured the flux of CO, CO_2 and CH_4 from recently exposed subglacial sediments at RG using the static chamber method and shallow sediment cores. Gas analyte concentrations were measured from samples collected from gas flux chambers placed on the sediment surface along transects both parallel to and perpendicular to the glacier terminus. Over 300 measurements were made during the July to September, 2012 melt season which were used to determine both spatial and temporal variability in the gas fluxes at this retreating, temperate glacier. Shallow sediment cores were collected adjacent to the static chambers and vertical gas concentration profiles were measured from the thawed cores. Linkages between core profile gas concentrations and net gas analyte fluxes are discussed based on diffusion and biogeochemical processes in the sediments as revealed by 16S rRNA gene analysis.

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