WEATHERING AND MAJOR-ION CHEMISTRY IN GLACIAL MELTWATERS, SOUTHEASTERN ALASKA.

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The Herbert, Eagle, and Mendenhall Glaciers are outlet glaciers of the Juneau Icefield. They are located approximately 25 km north of Juneau, Alaska, in the Coast Mountains Complex—a series of Mesozoic granodioritic and tonalitic sills, bounded on the west by late Paleozoic/early Mesozoic metasedimentary units: slates, quartzites, schists, and phyllites, with interlayered beds of marble, layered gneiss, and amphibolite. These temperate wet-based glaciers cause substantial physical weathering, producing large volumes of rock flour and glacial till. Rock flour has an extremely high amount of reactive surface area that permits increased rates of chemical weathering. This study examines the nature of chemical weathering in these three glacial environments.

Water samples were taken at several points along the meltwater channels, as well as at nearby meteoric streams. Suspended sediments were collected for X-ray analysis. Their mineralogy helps to constrain the weathering reactions occurring in this system. Oxygen isotope analysis is used as an indicator of water source.

Analysis of the major-ion chemistry of these waters reveals a sharp divide between meltwaters and meteoric waters. Meltwaters tend to be very dilute (less than 25 µS specific conductance), whereas meteoric waters show a higher concentration of solutes (40-120 µS), though both are dominated by calcium and bicarbonate. The strongest influence on these waters is the weathering of carbonates—even though carbonates only represent a trace amount of the overall bedrock. Additionally, there appears to be different solute-acquiring mechanisms acting in the meteoric and meltwater environments.

Keywords: meltwater, glaciers, weathering, chemistry.