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The range of chemical denudation rates on Svalbard

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There is a 50 years history of research upon chemical denudation rates on Svalbard. The last twelve years of this period there has been a statistically significant climate warming in the Arctic. The first estimates were made by Corbel (1957) based on single water analyses and assuming that the volumes of water dissolving rocks could be extrapolated from meteorological data. The first glacierized basin investigated for both chemical and mechanical denudation was Austre Lovenbreen, Kongsfjorden, (79˚N), during French expeditions of 1964-1967. We now have rates from 14 glacierized and five ice-free basins, located mostly along the west coast of Spitsbergen, the main island. The range of chemical denudation rate estimates in the glacierized basins is wide, with data from the 1970s and 1980s generally being higher (10-35 m^3 km^{-2} yr^{-1}) than those from the 1990s (4-14 m^3 km^{-2} yr^{-1}). However, two different methods were used to obtain these estimates. At the beginning of the research period the concentration of total dissolved solids was calculated from specific conductivity alone. In the basins investigated in the '90s and after complete chemical analyses of the water were undertaken with modern methods (ion chromatography and atomic absorption spectrometry). Total solute loads were also separated into atmospheric, marine and crustal components by procedures proposed by Sharp et al. (1995). This detailed chemistry coupled with equivalent ion relationships has also enabled estimates of the amount of carbon dioxide consumed in the weathering of carbonates and silicates/aluminosilicates. Data from two glacierized basins: the Bayelva basin in 2000 and 2003, and the Scottelva basin in 2002 are used to determine whether the difference in methods explains the differences between the two sets of chemical denudation rates. New equations for calculating crustal ion concentrations from specific conductivity in glacierized basins are also presented.