Sources of solutes to the proglacial Watson River (Akuliarusiarsup Kuua) near Kangerlussuaq, West Greenland

INTRODUCTION

Chemical weathering & climate
- Chemical weathering of siliciclastic in glacial forelands may be either a sink or source of atmospheric CO2 dependent on rock type1, intensity of weathering2, and the availability of carbon in the region3,4.
- As ice sheets recede, the chemical weathering of newly exposed regions could affect the long-term carbon cycle (Fig. 1).

FIELD SITE

Watson River flows ~40 km from the Russell and Leverett glaciers through Kangerlussuaq into Søndre Strømfjord.
- Water is derived from sub- and supra-glacial melt that flows via channels and continuous permafrost conditions (Fig. 2).
- River water appears to be infiltrating top portion of PW as indicated by excess Na+ compared to that available due to silicate weathering.
- PW concentrate different ions: PW are enriched in Ca2+ & SO42- compared to WR (Figs. 6-8).

RESULTS & DISCUSSION

METHODS

Proglacial water collected at 6 sites along Watson River (WR) flow path near Kangerlussuaq, Greenland (Fig. 3a, 4).
- PW transects collected at 2 WR sites with vapor probe at various depths (~20, 45, 69, and 97 cm; Fig. 3b, 4).
- River water appears to be infiltrating top portion of PW as indicated by excess Na+ compared to that available due to silicate weathering.
- PW concentrate different ions: PW are enriched in Ca2+ & SO42- compared to WR (Figs. 6-8).

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REFERENCES


FUTURE WORK

Proglacial systems: Studies of water, suspended load, and bedload are ongoing as well as mineralogical analysis of bedload.

HYPOCRHEIC ZONE EXCHANGE

Chemical weathering occurring within the WR and within the HZ as represented by PW concentrations. However, the downstream composition of the WR does not appear to be influenced by exchange with the HZ. Thus, the predominant source of solutes to the WR during the initiation of summer flooding must be through in-channel weathering of suspended sediments and bedload. Pressure data in wells indicates that at the time of the sample collection, WR water was flowing into the HZ. These gradients may change on a seasonal timescale based on the stage of the WR. High concentrations of S-bearing minerals are transported to the WR as a result of the WR. Thus, the predominant source of solutes to the WR during the initiation of summer flooding must be through in-channel weathering of suspended sediments and bedload.

Field site
- Sites 4 and 6 are locations of PW transect samples. No relationship indicated that at the time of the sample collection, WR water was flowing into the HZ. These gradients may change on a seasonal timescale based on the stage of the WR. High concentrations of S-bearing minerals are transported to the WR as a result of the WR. Thus, the predominant source of solutes to the WR during the initiation of summer flooding must be through in-channel weathering of suspended sediments and bedload.