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The impact of dam construction on material delivered to the oceans

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Silicate weathering rates are primarily controlled by lithology, temperature and rainfall creating a dynamic link between weathering and climate. Metals are transported to the oceans either as dissolved species in the water or as suspended particles. Estimates suggest that some 26% of the global suspended material delivered to the oceans is trapped behind dams. Data from rivers in NE Iceland show clear evidence of increases in chemical and physical weathering accompanying increases in temperature and runoff over the past 40 years, and that the suspended material flux is much more dependent on discharge and therefore climate than the dissolved species. Recent dam construction on some of those rivers will filter out the largest suspended particulate load changing the nature and chemistry of the metals transported to the ocean. Furthermore, it can be predicted that regulating the flow of the river systems with dams will alter the delivery of dissolved nutrients like silica to the coastal waters. In pristine direct runoff rivers the main flux of silica is in the spring and summer but late in the summer and early fall in glacial fed rivers. Spring fed rivers are more like regulated rivers, with even flux of silica throughout the year. By damming a river, the much needed flux of nutrients for algal blooms in the spring and summer time at high latitude will most likely be partly shifted to the winter time when there is less need for the flux. This project will document the natural elemental and isotopic variations in weathering accompanying seasonal changes in runoff prior to dam construction, and compare these with the present-day (post-dam) variations seen in both the dissolved and suspended particulate flux. These data will allow us to assess the impact of dam construction on chemical weathering in these rivers catchments and on the elemental and isotope composition of material delivered to the oceans.

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