The International Polar Year project 317:

“Flux of sediment-associated chemical elements in rivers draining to the Arctic Ocean”

Global Geochemical Mapping and Sediment-Associated Flux of Major World Rivers

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Flux of sediment-associated chemical elements in rivers draining to the Arctic Ocean

Method: analyses of overbank sediment of floodplains and deltas

Project objectives:

Estimate the modern and historical fluxes of sediment-associated chemical elements

Determine the large-scale patterns in the distribution of chemical elements in regions draining to the Arctic Ocean

Impact of man-induced changes on sediment sources and sediment flux

Predict the impact of future climate changes on the fluxes.
The chemical composition of overbank sediments from floodplains and deltas may be analysed with Cs137, Pb210 or C14 to identify young and older layers within the sedimentary sequences.
Overbank sediment maps large-scale patterns in the distribution of chemical elements.
Sampling strategy for the large deltas

- Number of samples, location
- Long term delta development, selection of samples for dating purposes
Overbank sediment sampling on arctic floodplains

High concentration of Arsenic was found in the core

Samples in cross section
Investigate large-scale patterns in the distribution of chemical elements in regions draining to the Arctic Ocean.
Relationships between the fluxes and the distribution of sediment sources, and particle bound elements within the drainage basins

- Processes of erosion deliver particle bound matter to the river channels

Map of locations of sampling points

Map of Cd distribution in China, 590 samples

Yangtze river basin
Climate changes may increase channel erosion and mobilize polluted material

River Innerste, Germany
Floodplain polluted by old mining activity

Norway 2000 BP-1680 BP
Change from dry to wet climate caused channel changes

20000 mg/kg Pb
15000 mg/kg Pb
1600 mg/kg Pb
145 mg/kg Pb

Old: $Q_b = 880 \text{ m}^3/\text{s}$
Recent: $Q_b = 1165\text{ m}^3/\text{s}$
Climate change: melting of the permafrost will mobilize particle bound pollutions

Dams: 20% reduction of sediment flux on a global scale
Project status:

- Green and red dots: Sampling locations
- Delta samples and floodplain samples in rivers draining to the Arctic ocean
- Sampled areas: Europe and China, Cu-distribution

First IPY project meeting held in Longyearbyen, Svalbard 22-25 August 2006

- A detailed sampling protocol unified for all rivers. Sampling strategy for large deltas
- Preliminary sampling locations in Arctic drainage basins have been determined
- Funding from participating institutions. Some funding from the NRC
- The Russian Interuniversity Council on Erosion and Fluvial processes will participate
- Next meeting in Shanghai October 2007

Europe: need lower sample/sediment flux samples
Predict the impact of future climate changes on the fluxes to the polar sea.

Climate change in Norway towards 2100 according to RegClim prediction

- Summer maximum temperatures 2.5–4°C higher
- 5% to 20% increase in total annual precipitation largest increase in the western part
- Extreme rainstorm frequency will increase throughout the country