Uranium content in rivers of the Narssaq area, South Greenland

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The use of small bags filled with ion exchange resin placed in running water (Asmund, 1974) has proved to be a most useful method for investigation of the distribution of dissolved Zn, Cd, Pb, Cu, Cr, Ni and U in fresh water streams in a 2000 km² area around Narssaq, South Greenland.

Methods

The geochemical method employed appears to be particularly well suited to the detection of uranium. Of the two ion exchangers in use, type 1 concentrates uranium 19 700 times, which means that water with 1 ppb uranium yields an ion exchanger with 19.7 ppm uranium, while ion exchanger type 2 has a concentration factor of 32900. These values have been determined at the Danish Atomic Energy Commission's Research Establishment, Risø, by adding 10 μ g of U^{233} to 40 l of water and bringing the ion exchanger into contact with the water until equilibrium was reached. The proportion of U^{233} taken up by the ion exchanger was then determined by mass spectrometry.

Table 3. Uranium content of fresh water in the Narssaq river basin

	ppm U in ion exchanger		ppb U in water		
River station	Type 1	Type 2	Type 1	Type 2	Average
Narssaq Elv					
at the glacier alt. 880 m	310		15.7		15.7
alt. 488 m	145	196	7.4	6.0	6.7
alt. 250 m	27		1.4		1.4
alt. 125 m	33		1.7		1.7
below Kvane Elv					
alt. 79 m	13.7	18.9	0.6	0.6	0.6
below Taseq Elv					
alt. 59 m	22.4		1.1		1.1
Kvane Elv at the mouth	2.9		0.15		0.15
Taseq Elv at the mouth	41	70	2.08	2.13	2.10

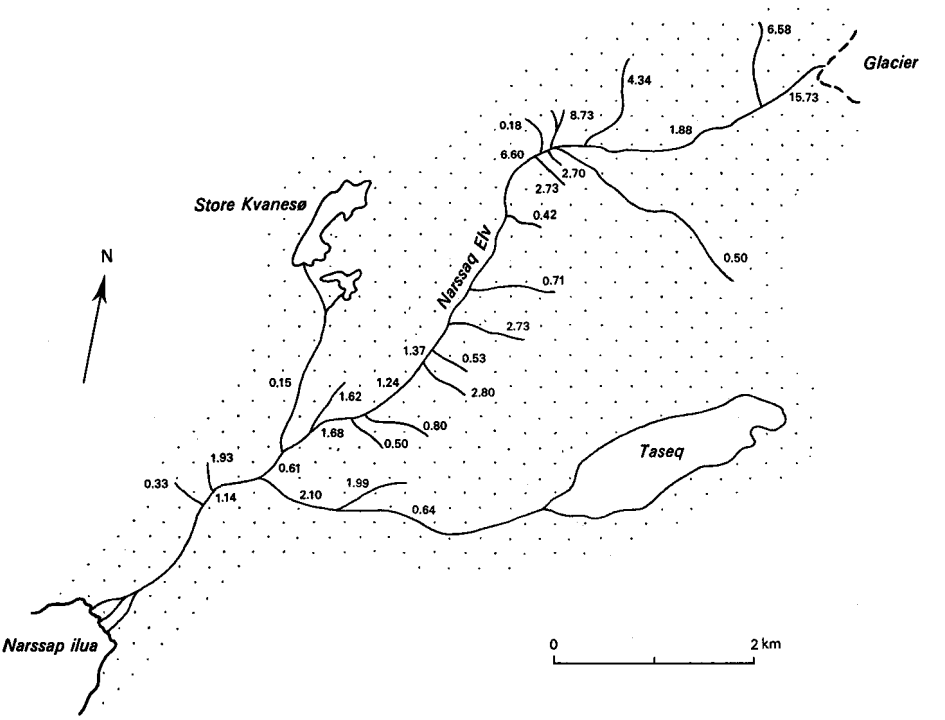

Fig. 17. Distribution of uranium (ppb) in the Narssaq river basin.

Results from the Narssaq river basin

The hydrology and hydrochemistry of the Narssaq River Basin have been investigated since 1965 (Larsen, 1973) and a uranium deposit at Kvanefjeld is located inside the basin. This deposit is drained by Kvane Elv which joins Narssaq Elv at an altitude of 80 m after having passed Store Kvanesø. At an altitude of 60 m Taseq Elv joins Narssaq Elv (fig. 17).

The two first columns in Table 3 give the content of uranium in the type 1 and 2 ion exchangers after equilibrium with the stream water has been reached. These have been analysed by the delayed neutron method at Risø. In columns 3 and 4 these numbers have been divided by the concentration factors, mentioned above, giving the calculated concentration of dissolved uranium in the water. The corresponding numbers in columns 3 and 4 should be equal, the relatively small difference reflects the accuracy of the method.

It is surprising to see that the uranium concentration is highest (15.7 ppb) near the glacier, which is at a higher elevation than the known uranium deposit at Kvanefjeld. However, high surface radioactivity has recently been found in the same area (Sørensen, in press). The concentration of uranium decreases as the river descends through the valley, probably due to absorption in organic material. Kvane Elv, having passed Store Kvanesø which is rich in vegetation, is nearly free of uranium (0.15 ppb)

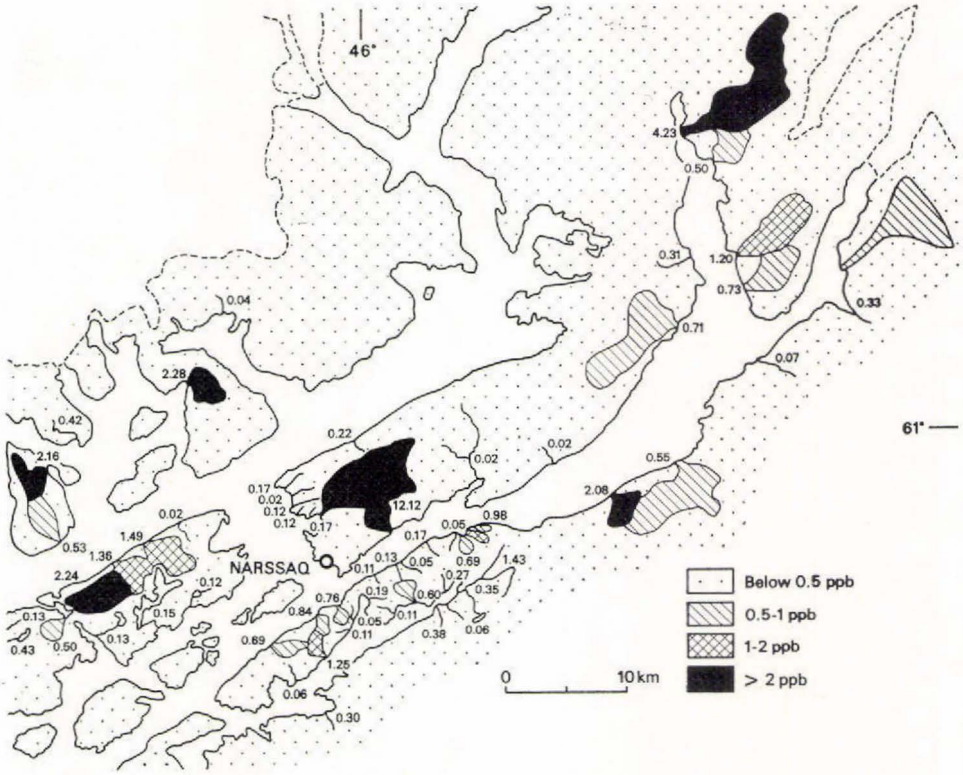

Fig. 18. Uranium content (ppb) in rivers of the Narssaq area.

and its inflow into Narssaq Elv causes a dilution from 1.7 ppb to 0.6 ppb in uranium content. However, following the junction with Taseq Elv (2.1 ppb) the uranium concentration in Narssaq Elv again increases (1.1 ppb).

Other results

The results of similar geochemical surveys for a larger area are shown in fig. 18. A particularly interesting case concerns the river Qôrnup kûa 8 km north of Narssarssuaq where the uranium content at the mouth is 4.23 ppb compared to 1.1 ppb at the mouth of Narssaq Elv.

References

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