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The Distribution of Mercury in North Atlantic Deep-sea Sediments

Klein and Goldberg[1] have attempted to identify potential reservoirs for the toxic element Hg in the oceans, but they listed only one set of Hg values for deep-sea sediments[2]. Here we present data on the distribution of the element in a series of North Atlantic deep-sea sediments.

Table 1 Sampling Location and Analytical Data from North Atlantic Deep-sea Sediments

Core	Location	Total carbonate content (wt. %)	Hg content (p.p.b.)
E3	22° 04′ N; 35° 34′ W	1	55
E7	22° 06′ N; 69° 05′ W	5	450
F1	25° 06′ N; 70° 22′ W	12	755
F3	25° 12′ N; 57° 24′ W	6	80
H4	31° 02′ N; 45° 13′ W	26	250
J3	37° 46′ N; 55° 00′ W	15	825
K1	40° 02′ N; 10° 52′ W	29	350
K20	39° 59′ N; 10° 49′ W	28	440
O2	52° 00′ N; 17° 50′ W	13	70
R1	61° 00′ N; 29° 08′ W	11	105
S3	64° 02′ N; 28° 57′ W	11	120
N3	48° 40′ N; 24° 31′ W	20	415
C2	16° 02′ N; 29° 43′ W	54	230
E4	22° 06′ N; 43° 02′ W	91	700
F4	24° 55′ N; 49° 15′ W	58	160
F7	25° 11′ N; 19° 44′ W	66	100
I2	33° 52′ N; 19° 17′ W	58	1,400
J2	36° 39′ N; 63° 10′ W	42	405
J5	37° 15′ N; 27° 40′ W	74	505
L4	43° 03′ N; 23° 16′ W	55	310
L5	43° 01′ N; 17° 14′ W	88	470
K4	39° 58′ N; 45° 58′ W	65	315
M2	46° 09′ N; 19° 04′ W	55	270
M3	45° 59′ N; 32° 11′ W	45	435
N2	48° 52′ N; 34° 12′ W	32	40
N4	48° 55′ N; 17° 12′ W	64	1,475
O1	52° 01′ N; 12° 40′ W	37	305
P1	55° 00′ N; 11° 10′ W	63	305
P2	55° 09′ N; 22° 45′ W	49	690
P3	54° 56′ N; 35° 30′ W	45	90
Q3	57° 56′ N; 29° 08′ W	57	900
R4	61° 04′ N; 32° 30′ W	32	75
Average of all deep-sea sediments			410 p.p.b. Hg
Average of deep-sea clays (< 30% total carbonate)			325 p.p.b. Hg
Average of deep-sea carbonates (> 30% total carbonate)			460 p.p.b. Hg

The material analysed, which included associated sea salt, was taken from the top portions of various NAVADO[3] cores, and Hg was determined by a cold vapour atomic absorption procedure[4]. The sampling locations and their Hg contents are given in Table 1. Our more important findings are summarized below.

(i) The average Hg content of the North Atlantic deep-sea sediments analysed is 410 p.p.b. (p.p. 10^9).

(ii) Our deep-sea sediment Hg values are, on average, considerably higher than those found by Boström and Fisher[2], who reported maximum Hg contents of approximately 400 p.p.b. (on a carbonate-free basis) for sediments from the East Pacific Rise. This difference probably arises from the use of different analytical techniques since Boström and Fisher heated their samples only to 500° C; work in this laboratory[4] has shown that although Hg is progressively lost from rock and sediment samples with increasing temperature, less than about 50% of the total Hg is released at 500° C. In order to obtain near quantitative release of Hg the samples should be heated to 900° C.

(iii) Our results show that the average Hg content of deep-sea carbonates (450 p.p.b., or 350 p.p.b. if the two exceptionally high Hg values are excluded) is of the same order of magnitude as that of deep-sea clays (325 p.p.b.). Because of this it is clearly incorrect to attempt to describe the distribution of Hg in deep-sea sediments in terms of calculated carbonate-free analyses.

(iv) There are no apparent geographical trends in the distribution of Hg in North Atlantic deep-sea sediments.

(v) The Hg contents of surface near-shore and river sediments are apparently in the range <20–1,000 p.p.b.[1,5,6]; values which are reasonably similar to those of our deep-sea sediments, showing that Hg is not concentrated in deep-sea sediments relative to those deposited in the near-shore environment. There may be exceptions to this; for example, deep-sea sediments from regions of active sea-floor spreading[2] or from areas of upwelling[1] may contain relatively high contents of Hg.

(vi) Near-shore and deep-sea sediments have similar Hg contents but because the former are deposited at a much faster rate it may be concluded that an increased input of Hg to the oceans by pollution will have its immediate impact in near-shore areas.

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S. R. Aston
D. Bruty
R. Chester
J. P. Riley

Department of Oceanography,
The University,
Liverpool L69 3BX

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Analyses of a Sedimentary Iron Ore Pisolith from Lake Storsjöen, South Norway

Sedimentary lake iron ores were mined in Scandinavia until about fifty years ago, but no reliable estimates of Swedish or Norwegian outputs have been made. The total output of Finish lake ores, however, seems to have been some 8 to 10 million tons. The shallow Lake Storsjöen with an average depth of 10 m is a typical ore-bearing lake—deep lakes rarely bear sedimentary ores.

A detailed description of the ores of Lake Storsjöen was given by Vogt[1] who pointed out that the ores may be divided into two principal types; first, iron ore with 2% or less of manganese, and, second, ores with manganese contents of up to 30%. The iron-rich ore sometimes occurs as a conglomerate embedded in manganese-rich ores, clearly demonstrating that