DEUTERIUM ABUNDANCE OF NATURAL WATERS IN THE ANTARCTIC*

Toshizo TITANI**, Yasuo HORIBE** and
Mituko KOBAYAKAWA**

南極の水成分の重水素分布*

千谷利三**・堀部純男**・小早川美津子**

Deuterium content of the surface water samples of the West Pacific, the Antarctic and the Indian Ocean were measured mass spectrometrically. The results are summarized in Table 1. As was pointed out by FRIEDMAN[1], it was found that the deuterium content of marine water in the frigid zone is slightly less than that in the equatorial region. For example, marine water off east coast of Mindanao and from the Indian Ocean has the deuterium

Table 1. Deuterium content of surface and deep water.

Sample No. or station	Location		Depth (m)	δD (‰) on the SMOW-scale	Date of collection
	Lat.	Long.			
Pacific					
E 102	N: 32°40′	E: 137°08′	800	−0.2	Feb. 1958 (collected
			1000	−0.2	by Dr. SAIZYO)
			1200	+0.3	
			1500	−0.1	
			2000	0.0	
			3000	0.0	
E 104	N: 31°58′	E: 135°52′	2000	−0.5	
			3000	+0.1	
			4000	−0.3	
B—0	N: 37°46.4′	E: 143°07.6′	0	+0.1	20, June 1958 (by the
B—1			200	+0.6	French Naval FNRS-
B—2			600	0.0	III)
B—3			800	+0.4	
B—4			1000	+0.4	
B—5			2500	+0.5	
B—6			3000	+0.3	
Off east coast of Mindanao					
1	N: 15°05′	E: 125°06′	0	+0.6	11, Nov. 1956
2	N: 12°00′	E: 126°00′	0	+0.3	
3	N: 08°30′	E: 127°18′	0	+0.5	
4	N: 04°14′	E: 128°55′	0	+0.5	

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** Department of Chemistry, Tokyo Metropolitan University.

Sample No. or station	Location		Depth (m)	δD (%) on the SMOW-scale	Date of collection
	Lat.	Long.			
Indian Ocean*					
6	S: 12°48′	E: 78°63.8′	0	+0.6	
7	S: 15°11′	E: 64°34.5′	0	+0.1	
13	S: 29°00.5′	E: 39°03′	0	+0.7	
14	S: 39°00′	E: 20°26.0′	0	+0.3	
15	S: 06°25′	E: 73°11.0′	0	−0.1	
Antarctic*					
9	S: 65°04′	E: 52°49.5′	0	−0.8	
10	S: 67°08′	E: 38°37.5′	0	−0.8	
11	S: 68°52.5′	E: 25°33.5′	0	−1.1	
12	S: 68°12′	E: 23°31′	0	0.0	
13	S: 59°10.5′	E: 27°05.0′	0	−1.2	

* The First Japanese Antarctic Research Expedition, 1956–57.

Table 2. Deuterium content of deep water in the Antarctic.*
(δD % on the SMOW-scale)

Depth (m)	Location		
	S: 66°46′ N: 41°18′ (23, Dec. 1957)	S: 67°46′ N: 38°53.5′ (9, Jan. 1958)	S: 68°32′ N: 36°30′ (9, Feb. 1958)
0	−0.7	−0.2	+0.9
10	+0.1	−0.7	−0.4
25	+0.3	+0.4	−1.0
50	−0.5	−0.9	+0.3
100	−0.5	−0.5	+0.3
150	−0.8	−0.5	−0.1
200	+0.4	−0.3	0.0
300	+0.5	+0.8	−0.1
400	+0.5	+0.1	0.0
500	−0.3	+0.1	+0.4
600	−0.6	+0.6	−0.3
800	+0.3	+0.3	−0.2
1000	+0.1	+0.1	
1200	+0.4	−0.3	
1500	−0.2		
2000	−0.3		

* Collected by the Soya (The Second Japanese Antarctic Research Expedition, 1957–58).

content ranging from −0.1 to +0.5 per cent, but the deuterium content of the Antarctic and off south coast of the Aleutian Islands lies between −0.7 to −1.4 per cent on the SMOW-scale[2].

This fact must be due to the more rapid loss of light hydrogen during evaporation and condensation in the equatorial region than in the frigid zone.

Deuterium content of deep water at some points in the Antarctic and in the Black Current of the Pacific are shown in Tables 1 and 2. No

appreciable change in deuterium content could be observed in the Black Current. On the other hand, deep water in the Antarctic shows random variation of deuterium content ranging from +0.9 to −0.9 per cent on the SMOW-scale. This must be due to the streaming of current from various sources, that is, deep melt water, warm current from the Indian Ocean and surface melt water must be mixing quite irregularily.

Deuterium content of pool water of Ongul Island was found to be much lower than the surface water in the Temperate Zone. This suggests that the origin of the pool water may be not the moisture evaporated from the Antarctic, but that transported from remote places.

Puddle waters show very different deuterium content ranging from −4.3 to −10.3 per cent. The fact that its deuterium content is higher and salts concentration is almost equal to that of pool water of Ongul Island suggests that puddle water is a mixture of melt water from ocean ice and of land water.

Reference

1) I. Friedman: Geochim. et Cosmochim. Acta, 4, 89 (1953).
2) Y. Horibe and M. Kobayakawa: Geochim. et Cosmochim. Acta, **20**, 273 (1960).