alpha and beta forms at mutarotation equilibrium in water. On the other hand, the behavior of sucrose would support the view that the effects observed here are due to events involving the anomeric carbon.

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Contribution of Hardtack Debris to Contamination of the Air during 1959

Abstract. A comparison of the concentrations of tungsten-185 and strontium-90 in the air at various times after the 1958 U.S. nuclear tests in the Pacific indicates that debris from this test series contributed less than 10 percent of the total Sr^{90} content of the ground-level air at Miami and Washington during the spring of 1959.

The detection at sites along the 80th meridian (west) of W^{185} produced uniquely in the U.S. Hardtack series of nuclear tests at the Pacific Proving Grounds in 1958 showed the rapidity with which radioactive debris could be disseminated by atmospheric processes (*1*). By making certain assumptions regarding the relative amounts of W^{185} and Sr^{90} produced during these tests, the quantitative determination of these isotopes at later times can lead to a rough estimation of the contribution of Sr^{90} from Hardtack to the total Sr^{90} in a given sample.

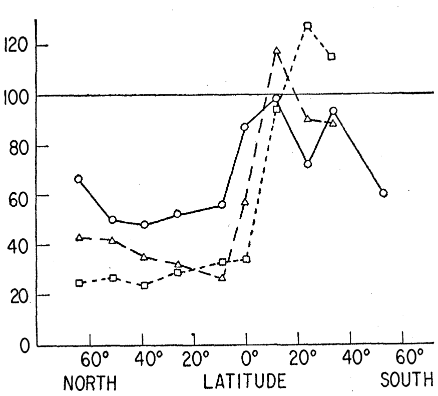

Fig. 1. Latitudinal variation in the W^{185}/Sr^{90} activity ratio. Vertical axis describes the ratio, W^{185} corrected for decay to 15 July 1958. Circles, January readings; triangles, March readings; squares, May readings.

Radiochemical analyses of debris from the Hardtack test series indicated a possible value of 1000 to 1200 for the W^{185}/Sr^{90} activity ratio of the tungsten-containing shots (*2*). If it is assumed that this value is typical of all the tungsten-containing shots, and, furthermore, that one-half the total fission yield of the series resulted from shots of this nature, a W^{185}/Sr^{90} activity ratio of near 500 is obtained as a reasonable characterization of this series. Thus, airborne debris in filter collections made at various sites during 1959, upon radiochemical analysis for W^{185} and Sr^{90}, and with suitable decay corrections, can be assigned to Hardtack or non-Hardtack nuclear tests. Some data on the measured air concentrations of W^{185} and Sr^{90} at several sites along the 80th meridian are listed in Table 1.

As may be seen in Fig. 1, the W^{185}/Sr^{90} activity ratio varies with latitude and with time. This ratio is considerably lower in the Northern than in the Southern Hemisphere—about one-half to two-thirds as high in January 1959 and only about one-fourth as high in May, during the time of peak air activity from the previous series of nuclear tests, by the U.S.S.R., in the Arctic (October–November 1958).

Simple calculations indicate that during May 1959 only about 5 percent of the Sr^{90} activity in the North Temperate Zone, along the 80th meridian, originated in the U.S. Hardtack tests. During earlier and later periods, when radioactivity from the U.S.S.R. tests was not so prevalent in the ground-level air, Hardtack debris contributed perhaps 10 percent of the total Sr^{90} (Table 2). In the Southern Hemisphere during early 1959, while the actual W^{185} concentration in the air was only one-quarter that in the Northern Hemisphere, the Hardtack series contributed nearly 20 percent of the total airborne Sr^{90}. This points up the fact that the stratospheric burden of debris both from Hardtack and from other nuclear test series is considerably lower in the Southern than in the Northern Hemisphere. Furthermore, it is evidence that the transequatorial mixing process in the stratosphere, as in the troposphere, is a relatively slow one.

Table 1. Air concentrations of W^{185} and Sr^{90} at several sites along the 80th meridian (W^{185} corrected for decay to 15 July 1958). Activity is registered in disintegrations per minute per 100 standard cubic meters.

Washington		Miami		Antofagasta	
Sr^{90}	W^{185}	Sr^{90}	W^{185}	Sr^{90}	W^{185}
		July 1958			
2.9	53	1.5	43	0.88	46
		September 1958			
1.6	179	1.2	186	1.3	77
		November 1958			
2.4	222	2.2	193	0.69	60
		January 1959			
5.7	274	5.9	308	1.01	73
		March 1959			
6.6	234	10.4	330	0.41	37
		May 1959			
9.0	214	6.7	198	0.30	38
		July 1959			
2.7	98	1.4	73		

Table 2. Contribution of Hardtack Sr^{90} to total Sr^{90} in the air, expressed as percentage.

Total Northern Hemisphere	Washington (39°N)	Miami (26°N)	Antofagasta (24°S)	Total Southern Hemisphere
		July 1958		
4.7	4	6	10	12
		September 1958		
	22	31	12	
		November 1958		
	19	18	17	
		January 1959		
10.7	9.6	10.4	14.5	17.5
		March 1959		
7.0	7.1	6.4	18.0	
		May 1959		
5.5	4.8	5.9	25	18.2
		July 1959		
8.5	7.3	10.4		

The usefulness of W^{185} (74-day half-life) as a tracer for Hardtack debris is rapidly nearing an end because of the isotope's depletion through radioactive decay (*3*).

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