CARBON ABUNDANCES IN ANTARCTIC METEORITES. Everett K. Gibson, Jr., SN7, Geochemistry Branch, NASA Johnson Space Center, Houston, TX 77058

Recent measurements of carbon abundances in Antarctic meteorites (Gibson and Yanai, 1979) have shown that the carbon contents of carbonaceous chondrite finds in Antarctica are lower than previously measured carbon abundances for the same carbonaceous chondrite class. In order to determine if the depletions of carbon occurred in other meteorite types, 23 additional Antarctic meteorites (one C3, five H-Group, 15 L-Group chondrites, and two ureilites) were analyzed. Previously, two C2 and one C4 carbonaceous chondrites, one E4 enstatite chondrite, and one ureilite had been analyzed by Gibson and Yanai (1979).

Total carbon analyses were performed with a LECO IR-12 total carbon analyzer using the general procedures of Moore et al. (1979). Samples ranging in size from 20 mg to 200 mg were heated to 1600°C in a flowing stream of purified oxygen and all of the carbon converted to carbon dioxide. An infrared Luft-cell was used to measure the resulting carbon dioxide. Detection limits were 1 μg carbon. NBS steels 55e and 33d were used for calibration standards. Samples were analyzed in triplicate. Total sulfur abundances will be reported on these samples at the conference.

Total carbon abundances for the Antarctic meteorites are given in Table 1. A comparison of the analytical data with previously reported carbon values (Moore, 1971) for similar stone meteorites is given in Figure 1. The C3 chondrite AL77307 contains 0.828% total carbon, which is similar to carbon abundances found for the C3v chondrites (range of 0.60% to 1.12% carbon, Gibson et al. 1971). Analysis of two ureilites (AL77257 and AL78019) indicate that they contained similar carbon (3.134% and 3.757% carbon) to previously analyzed ureilites (Gibson, 1976). Twenty ordinary chondrites range in carbon abundances from 110 to 3080 μgC/g. The 15 L-Group chondrites have carbon abundances of 110 to 2180 μgC/g, while the five H-Group chondrites range from 260 to 3080 μgC/g. As expected, the lowest carbon abundances were found for the higher petrologic grades (e.g., L6 and H6).

The initial description of the 1977 suite of meteorites noted that five L6 specimens (AL77273, AL77277, AL77280, AL77281, AL77282) were identical in their mineral compositions and textures and may represent fragments from a single fall. The total carbon abundances found in this study support this observation. For chondrite 77269 an analysis of both the fusion crust and interior material was possible. The interior of AL77269 contained 160 ± 15 μgC/g, while the fusion crust sample had 260 ± 10 μgC/g. The enrichment in carbon content for the fusion crust samples is to be expected because of the enhanced weathering possibilities. The most severely weathered chondrite, AL77214, contained the greatest carbon abundances (9450 ± 500 μgC/g) of any of the samples studied.

The carbon measurements on the Antarctic meteorites suggest that for the vast majority of the samples studied, the weathering processes which have operated in the Antarctic environment have not significantly caused enrichment in the total carbon abundances. This observation is different from the Moore and Lewis (1967) observation that carbon abundances for ordinary chondrite finds from terrestrial environments have greater carbon abundances than fresh falls. As noted by Moore (1971), the distribution of carbon is very susceptible to the conditions of the environment under which the samples have been subjected. However, for those samples which have carbon in greater abundances and in a variety of forms (e.g., carbonaceous chondrites) the measurements suggest that selective depletion of the carbon may have occurred. The Antarctic weathering processes do not seem to have modified the carbon concentrations found in the ureilites.

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TABLE I

Carbon Abundances in Antarctic Meteorites

Specimen	Meteorite Type	Total Carbon µg C/g
AL77001,26	L6	160 ± 15
AL77002,23	L5	650 ± 25
AL77002,30	L5	370 ± 25
AL77003,40	L3	2180 ± 40
AL77208,21	H4	650 ± 90
AL77214,28	L or LL	9450 ± 500
AL77224,15	H5	560 ± 20
AL77230,16	L4	390 ± 30
AL77257,52	Ureilite	31240 ± 800
AL77269,13	L6 (Interior)	160 ± 15
AL77269,13	L6 (Fusion Crust)	260 ± 10
AL77271,12	H6	220 ± 40
AL77272,26	L6	440 ± 20
AL77273,14	L6	140 ± 20
AL77277,13	L6	180 ± 30
AL77278,21	L3	1070 ± 40
AL77280,12	L6	160 ± 20
AL77281,12	L6	250 ± 20
AL77282,12	L6	200 ± 70
AL77288,12	H6	620 ± 50
AL77299,28	H3	3080 ± 150
AL77305,15	L6	110 ± 20
AL77306,15	C2	13240 ± 400
AL77307,11	C3	8280 ± 300
AL78019,11	Ureilite	37570 ± 1500
Studied Previously (Gibson and Yanai, 1979)		
Yamato 74662	C2	15140 ± 500
Yamato 693	C4	610 ± 40
Yamato 691	E4	4190 ± 200
Yamato 74659	Ureilite	30220 ± 200

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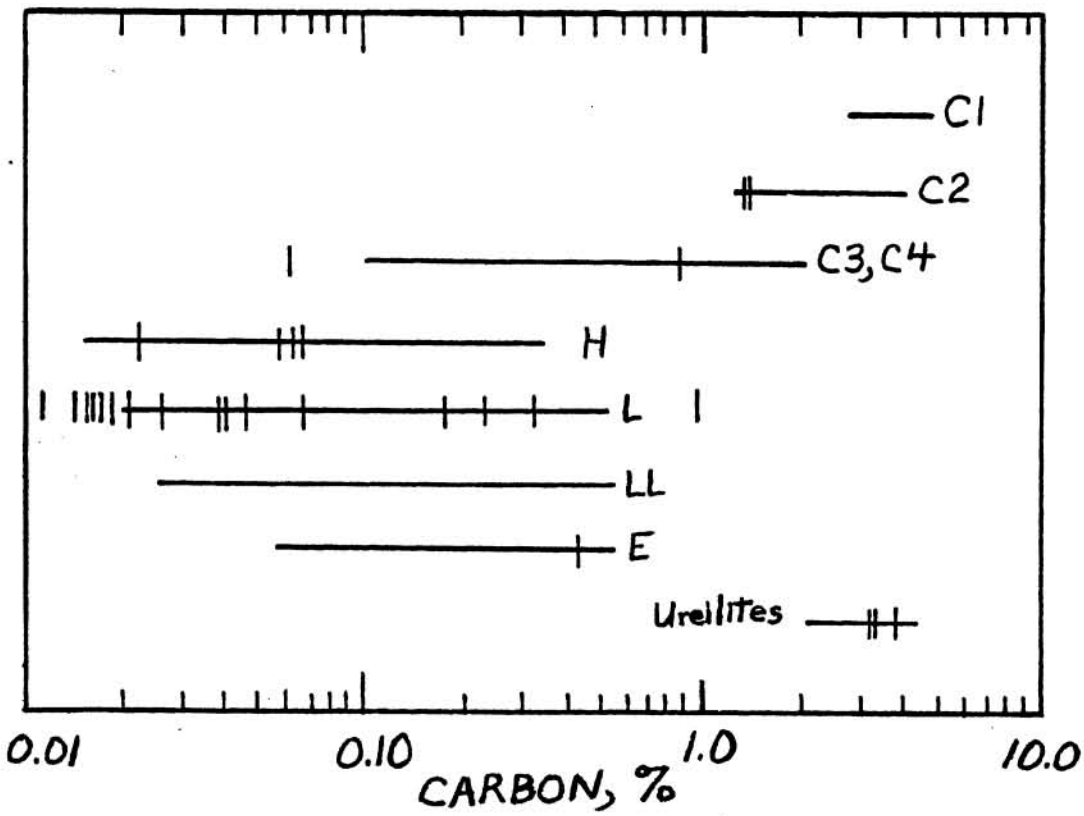

Figure 1. Carbon abundances for Antarctic meteorites. The horizontal lines represent the ranges for previously analyzed meteorite falls as reported by Moore (1971). The vertical dashes represent analyses of Antarctic meteorites reported in this study and by Gibson and Yanai (1979).

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