

**CARBON IN WEATHERED ORDINARY CHONDRITES FROM ROOSEVELT COUNTY;** R.D. Ash<sup>1,2</sup> and C.T. Pillinger<sup>2</sup> (1) Dept. of Geology, University of Manchester, Manchester M13 9PL. (2) Dept. Earth Sciences, Open University, Milton Keynes MK7 6AA.

A suite of Roosevelt County ordinary chondrites of known terrestrial age have been analysed for carbon content and isotopic composition. Initial results indicate that significant carbon contamination is evident only in samples with a terrestrial age greater than 40ka. These samples are of weathering grade D and E and contain three times more carbon than the less weathered samples. The soil in which they were preserved has a carbon content of *ca.* 1.5%.

Over 200 meteorites have been recovered from a series of soil depleted areas of New Mexico and west Texas. Most have been recovered from blowouts near Clovis in Roosevelt County (RC) on the high plains of New Mexico (1). The mineralogical and petrological effects of weathering upon these samples have been studied previously and show that the degree of weathering is largely dependant upon the terrestrial residence time (2).

Ordinary chondrites from Antarctica show no significantly different carbon contents from non-Antarctic samples, but may be isotopically altered due to the growth of secondary minerals (3,4). Studies of samples of the Holbrook (L6) chondrite, recovered at various times over a sixty year period, showed that the weathering of the meteorite was accompanied by an increase in carbon content (5). However the carbonaceous chondrites from the Sahara show a depletion in carbon content compared to their non-Saharan equivalents due to the loss of organic material being greater than the gain of carbon from evaporitic carbonate (6). The unequilibrated ordinary chondrite, RC 075, has a carbon content higher than any other whole rock ordinary chondrite. When the sample was analysed by stepped combustion results suggested that terrestrial organic material may account for *ca.* 50% of the carbon inventory (7).

The current study was undertaken to determine the effects of prolonged exposure to the soil and climate of Roosevelt County upon ordinary chondrites in the hope that this will enable a better understanding of the problems associated with the collection of meteoritic falls. A suite of ten grade 4 to 6 H, L and LL ordinary chondrites were analysed for carbon content and isotopic composition. These meteorites had previously had their weathering grade assessed petrographically and their terrestrial ages determined using <sup>14</sup>C contents (2).

It has been shown that the petrologic type 4, 5 and 6 ordinary chondrites have lower carbon contents than the type 3s, typically below 0.25wt% C (8,9) and that there is no discernible pattern for distinguishing between falls and finds. Most of the Roosevelt County samples show a similar range of low carbon contents, between 0.09 and 0.3wt% carbon, but the two oldest samples, with terrestrial ages in excess of 44000 and 46000 years (2), have carbon contents of 0.7 and 0.85wt%

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(Fig.1) Although it was shown that there is a dependence of weathering grade upon terrestrial residence time (2) one of these samples is of weathering grade D, the other E, hence the carbon contamination is not simply related to the degree of weathering (Fig.2).

The soil from Roosevelt County in which the meteorites were preserved has a higher carbon content of *ca.* 1.5 wt% carbon hence with the meteorites seem to become more soil-like in their carbon characteristics. The stratigraphic units below the RC soil have an age between 53 and 95ka (10) hence the soil must have acquired its carbon budget in less than this time.

The  $\delta^{13}\text{C}$  values have the same range as those of the type 3 ordinary chondrites, between -20 and -30‰ (9) and show no clear correlation with either carbon content, age or weathering grade. Thus far the high carbon samples show no apparent differences in  $\delta^{13}\text{C}$  from the low carbon samples, coherent with the main source of contaminant carbon being from organic material in the soil, which would be expected to have a  $\delta^{13}\text{C}$  of *ca.* -25‰.

Thus the degree of carbon contamination in Roosevelt County samples is primarily determined by their terrestrial residence time, with some weathering grade D and E samples showing no excess carbon. It is also seems likely that the contamination by organic material is a complex process dependant not only upon time, but also local conditions such as temperature soil type and soil water content.

Refs: (1) Zolensky *et al.* (1990) *Meteoritics* **25**, 11. (2) Jull *et al.* (1991) *L.P.S.C.* **XXII**, 667. (3) Grady *et al.* (1983) *Meteoritics* **24**, 1. (4) Grady *et al.* (1983) *Meteoritics* **24**, 147. (5) Gibson & Bogard (1978) *Meteoritics* **13**, 277. (6) Ash & Pillinger (1992) *Meteoritics* **27**, 199. (7) Ash & Pillinger (1992) *Meteoritics* **27**, 198. (8) Moore & Lewis (1967) *J. Geophys. Res.* **72**, 6289-6292. (9) Grady *et al.* (1982) *J. Geophys. Res.* **87**, A289. (10) Zolensky *et al.* (1992) *Meteoritics* **27**, 460.

