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Short Note

Carbonate Contents in CRP-1 Samples - Initial Results

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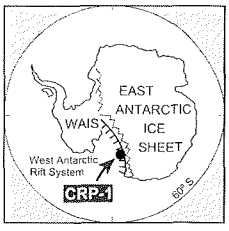
INTRODUCTION

Determinations of total carbonate content yield additional information, in the context of integrated investigations, thus enabling or enhancing the interpretation and characterisation of the depositional environment, the processes of sedimentation and the diagenesis of sediments. In the case of drillcores, they help us to discern vertical gradations of facies sequences that have repeating patterns or show changes through time.

This report presents initial results of carbonate investigations on a total of 32 bulk samples from the Quaternary and Miocene strata of the CRP-1 borehole, which reached a final depth of 147.69 metres below sea floor (mbsf). Fifteen out of a total of 18 lithostratigraphic units in the core were sampled (Tab. 1). Fourteen samples (24.85-43.85 mbsf) belong to the Quaternary, whereas 18 samples (44.53-146.51 mbsf) originate from the Miocene strata. The sampling intervals varied from 1-5 m for the Quaternary, and 1-15 m for the Miocene. All the samples originated



Tab. 1 - Sample intervals and initial results of carbonate content of CRP-1 samples (notes of lithology combined after Cape Roberts Science Team, 1998).

Box (No.)	Sample Depth (mbsf)	(No.)	Lithostratigraphic Subdivision Unit (No.)	Sediment Type in Sampled Section	Carbonate Content (Wt - %)
2	24.85	1	2.2	Clast-rich muddy diamicton; locally fossiliferous	2.0
2	26.85	2	2.2	Sandy mud; moderately fossiliferous	2.8
3	31.34	3	2.3	Diamicton. sandy mud; minor fossil fragments	1.9
4	32.56	4	3.1	Muddy Packstone; biogenic calcareous sand	58.8
4	33.30	5	3.1	Calcareous sandy mud; highly fossiliferous	29.4
5	35.41	6	4.1	Clast-poor muddy diamicton; unfossiliferous	0.9
5	36.66	7	4.1	Clast-poor muddy diamicton; unfossiliferous	1.6
5	37.58	8	4.1	Clast-poor muddy diamicton; unfossiliferous	1.8
5	38.55	9	4.1	Clast-poor muddy diamicton; unfossiliferous	1.5
6	39.37	10	4.1	Clast-rich muddy diamicton; unfossiliferous	1.9
6	40.37	11	4.1	Clast-poor muddy diamicton; fossil fragments (?)	6.2
6	41.44	12	4.1	Clast-poor muddy diamicton; fossil fragments (?)	1.6
7	42.49	13	4.1	Clast-poor muddy diamicton; fossil fragments (?)	2.0
7	43.81	14	5.1	Fine-grained sandstone; fossil-bearing (?)	6.3
7	44.53	15	5.1	Fine-grained sandstone; fossil fragments (?)	2.3
12	59.63	16	5.2	Silty fine sandstone; fossil-bearing	3.0
13	66.09	17	5.4	Silty sandstone; laminated; soft deformed	0.7
15	70.68	18	5.5	Silty fine sandstone; deformed; laminated	0.8
19	85.50	19	5.7	Massive siltstone; bioturbated; shell debris (?)	2.3
21	91.24	20	5.7	Coarse to fine graded sandstone	0.6
22	94.65	21	5.8	Mudstone; clayey siltstone	1.0
22	96.57	22	5.8	Mudstone; very fine sandstone	1.2
25	104.36	23	6.1	Diamictite; clast-bearing silty fine sandstone	0.9
26	108.67	24	6.1	Clast-bearing muddy diamictite	1.0
30	122.80	25	6.3	Clast-bearing sandy diamictite	1.4
34	130.65	26	6.3	Clast-poor muddy diamictite	1.1
34	131.66	27	6.3	Clast-rich muddy diamictite; fossil-bearing	2.2
35	133.47	28	6.3	Clast-poor muddy diamictite	0.9
36	137.73	29	6.3	Clast-poor muddy diamictite	1.5
37	139.76	30	6.3	Clast-poor diamictite; fossil-bearing	1.4
37	142.33	31	7.1	Clayey siltstone; laminated; fossil-bearing (?)	2.1
39	146.51	32	7.1	Very fine siltstone; laminated; fossil-bearing	2.2

from sections of core representing not more than 1 cm thickness.

METHODS

The 32 bulk samples were freeze-dried, ground, and homogenised before analysing for carbonates. In order to determine the total carbonate content, a method was applied which measures the CO_2 set free in the carbonate-acid reaction, rather than volumetrically, as in standard gasometric analyses. This method involves measuring the pressure in the reaction vessel as a function of time, using pressure sensors and a PC-based data aquisition system for the digitised data (Klosa, 1994). In evaluating the pressure curves, temperature and vapour pressure of the acid used (*e.g.* 12% HCl) are taken into account automatically. In addition, it is possible to discriminate semiquantitatively between calcite/aragonite and dolomite, siderite and carbonate mixtures because of the different reaction rates of the carbonates which influence the shape of the pressure time curves. The relative accuracy of the results of the determinations is ± 0.5-1% of the total carbonate content between 20-100% in weight, with good reproducibility. At lower carbonate contents (1-10% in weight), a relative error of +2 to -8% in weight can be expected according to test measurements.

RESULTS

A higher percentage of carbonates was measured in the CRP-1 profile only in one section (Unit 3.1), with peaks of about 30-60% by weight (Fig. 1). The remainder of the sediments in the profile shows significantly lower carbonate contents. With the exception of Unit 3.1, the carbonate content in the Quaternary sediments are in the range 0.9 to 6.3% by weight. These values are somewhat higher than those of the Miocene sediments (0.6-3.0% by weight). The plot of carbonate contents *versus* depth does not exhibit any general increasing or decreasing trends of carbonate content with depth. However, because of the rather coarse sampling in some units or subunits, and the limited number of determinations made especially in the Miocene strata, nothing can be said concerning dependencies of carbonate content on stratigraphic units or with depth. However, it is obvious from table 1 that the carbonate content in the

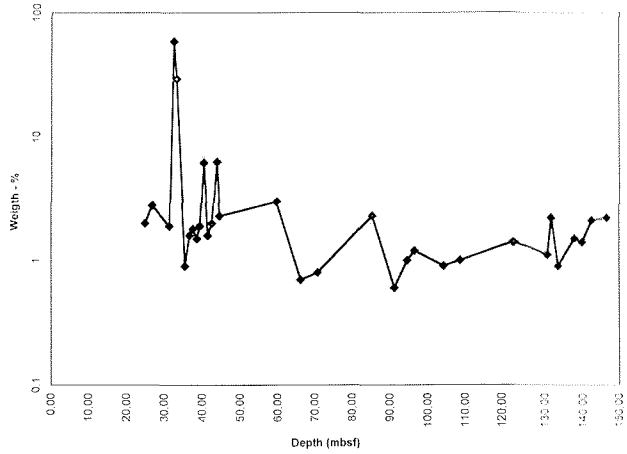


Fig. 1 - Profile of total carbonate content in CRP-1 bulk samples.

range *c.* 2-6% in weight have been usually determined in samples from horizons that are either moderately fossiliferous or bear fossils in some places. The carbonate-component analyses reported here so far allow only detailed and substantitiated assertions with respect to both of the samples of Unit 3.1 (32.56-32.57 mbsf, and 33.30-33.31 mbsf). The former sample has 82% calcite and 18% dolomite. The latter sample has 65% calcite and 35% dolomite. Correlations of these initial results with the results of those from the detailed palaeontological, sedimentological, mineralogical, petrographical, and geochemical investigations will be undertaken as soon as the data are compiled. For this purpose, because of the low carbonate contents, the measurements of calcite and dolomite content will be repeated. In addition, the results obtained so far will be supplemented by bulk chemical analyses (using XRF apparatus) and selective dissolution of the carbonates in the sediment combined with ICP-MS analyses, in order to be able to determine the carbonate components of the samples quantitatively.

REFERENCES

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