

### 3. LIGHT HYDROCARBONS IN HOLES 361 AND 364, LEG 40

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#### ABSTRACT

Light hydrocarbons in the C<sub>4</sub>-C<sub>7</sub> range have been found in quantities ranging from 13 to 4915 ng/g (PPB) in six cores of lower Aptian age in Hole 361 and four cores ranging from upper Albian to upper Aptian in age from Hole 364. Light hydrocarbon yields in Hole 361 were higher than in any DSDP holes studied to date.

#### RESULTS AND DISCUSSION

The distribution of individual hydrocarbons in the C<sub>4</sub>-C<sub>7</sub> range has been determined in six samples from Hole 361 and four samples from Hole 364, Leg 40. The samples from Hole 361 are all lower Aptian in age and range in depth from 1037 to 1222 meters below the sea floor. The samples from Hole 364 range in age from upper Albian through upper Aptian in the depth range from 674 to 1035 meters below the sea floor. Analytical data are shown in Tables 1 and 2. The analytical techniques were previously reported in DSDP Leg 22.

TABLE 1  
C<sub>4</sub> - C<sub>7</sub> Hydrocarbons in Hole 361, Leg 40

Sample Depth (m)	29-5 1037	34-4 1084	36-3 1100	40-3 1148	42-0 1181	44-2 1222
Hydrocarbons	Concentration (ng/g)					
Isobutane	5.8	172	76	154	215	45
n-Butane	29.6	177	84	172	336	61
Isopentane	10.4	107	18.7	28.9	173	19.2
n-Pentane	14.4	65	8.9	9.1	142	2.4
Neopentane	3.4	0	0	1.5	0	0
2, 2-Dimethylbutane	0.4	5.3	0.6	0.5	2.3	0
Cyclopentane	1.7	20.1	2.6	0	76.9	18.3
2, 3-Dimethylbutane	1.0	79.8	5.3	4.0	30.5	6.1
2-Methylpentane	6.0	115	1.7	0.8	69.2	0.9
3-Methylpentane	3.1	56	0.2	0.9	30	1.1
n-Hexane	5.8	115	1.3	0.5	70	0.5
Methylcyclopentane	5.1	439	7.7	0.8	28.4	227
2, 2-Dimethylpentane	0.6	13.1	0.4	0.1	0	0
2, 4-Dimethylpentane	0.7	29.7	0.5	0.1	19.5	14.1
2, 2, 3-Trimethylbutane	1.1	0	0	0	0	0
Cyclohexane	2.7	135	10.5	8.0	129	96
3, 3-Dimethylpentane	0.6	5.6	0.45	1.4	7.1	--
1, 1-Dimethylcyclopentane	0.7	15.6	1.1	0.4	10.2	1.5
2-Methylhexane	2.0		1.0	5.1		0
2, 3-Dimethylpentane	5.5	280	9.4	0.4	156	9.8
3-Methylhexane	5.8	563	25.4	9.8	366	70
1-t-3-Dimethylcyclopentane	1.6	424	20.3	8.2	232	51
1-t-2-Dimethylcyclopentane	6.4	873	67.2	13.5	510	171
3-Ethylpentane	0.3	0.1	7.0	1.2	0	0
n-Heptane	4.1	125	0.9	--	149	--
1-c-2-Dimethylcyclopentane	0.9	178	8.0	2.3	113	71
Methylcyclohexane	6.0	695	38.2	14.4	494	115
Benzene	0.5	3.6	0.5	0.1	1.85	0.8
Toluene	84	223	16.7	0.6	183	19
Total (ng/g)	210	4915	415	439	3544	1001
Organic carbon wt %	0.75	4.5	1.4	1.2	3.6	2.5

The total yield of C<sub>4</sub>-C<sub>7</sub> hydrocarbons in the two holes varied with the organic carbon content of the sediments, indicating that these hydrocarbons are forming in situ by low temperature degradation of the organic matter. Total yields were 13 to 4915 ng/g of sediment. Hole 361 off Capetown had the highest yields. The yields in this hole averaged 57 μg of

TABLE 2  
C<sub>4</sub> - C<sub>7</sub> Hydrocarbons in Hole 364, Leg 40

Sample Depth (m)	24-1 674	39-5 975	41-3 1010	43-1 1035
Hydrocarbons	Concentration (ng/g)			
Isobutane	26.8	15.2	12.3	1.1
n-Butane	24.4	22.5	15.7	2.1
Isopentane	31.6	18.5	15.1	1.0
n-Pentane	7.9	20	11.9	1.2
Cyclopentane	0.9	4.8	1.4	0.1
2, 3-Dimethylbutane	0.6	4.8	2.4	0
2-Methylpentane	5.1	29.7	11.2	0.6
3-Methylpentane	1.1	5.8	0.4	0.1
n-Hexane	1.7	26	8.6	0.5
Methylcyclopentane	3.2	34.2	24.8	0.4
2, 2-Dimethylpentane	0	1.2	0	0.1
2, 4-Dimethylpentane	0.6	2.8	1.1	0.1
2, 2, 3-Trimethylbutane	0	3.2	1.1	0
Cyclohexane	0.6	7.0	2.4	0.3
3, 3-Dimethylpentane	0	0.3	0.2	0.1
1, 1-Dimethylcyclopentane	0.1	0	0.3	0.1
2-Methylhexane	0.4	0		0.3
2, 3-Dimethylpentane	3.5	5.9	9.5	0.6
3-Methylhexane	2.7	7.7	21.3	0.9
1-t-3-Dimethylcyclopentane	1.5	3.8	12.0	0.2
1-t-2-Dimethylcyclopentane	2.5	6.5	17.0	0.4
n-Heptane	1.7	10.2	7.6	0.9
1-c-2-Dimethylcyclopentane	0.4	2.8	8.7	0.1
Methylcyclohexane	3.7	6.0	10.9	1.2
Benzene	0.1	14.5	5.7	0.7
Toluene	0.3	--	4.3	0.3
Total (ng/g)	121	251	206	13
Organic carbon (wt %)	0.14	1.4	0.7	0.2

hydrocarbon per gram of organic carbon. For comparison, the yields in Hole 364 averaged 35 μg/g, in Hole 282 off Tasmania 23 μg/g, and in Hole 233 in the Gulf of Aden 3 μg/g.

The ratio of paraffins to naphthenes (cycloparaffins) varied widely in these samples. The samples from Hole 361 were highly naphthenic, whereas those from Hole 364 were more paraffinic. For example, the paraffin to naphthene ratio in Section 361-44-2 is 0.3 compared to a ratio of 3 in Section 364-39-5.

Only two aromatic hydrocarbons, benzene and toluene, are present in this hydrocarbon range. The quantity of toluene exceeded the benzene by a large factor in all samples in Hole 361. Also there was far more

toluene in the samples of Hole 361 than in those of Hole 364. The reasons for these distributions are probably related to differences in the source of organic matter.

Neopentane (2,2-dimethylpropane) was identified in two samples in Hole 361. This is a relatively rare

hydrocarbon. We had previously identified it only in one hole in the Black Sea.

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