CONFIDENTIAL

BP Petroleum Development of Norway A/S

# Oil Source Correlation

## NOCS Wells 7/12-2 and 7/12-3

Report No GL/NO/178

D-23

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TABLE 1.

STABLE CARBON ISOTOPE RATIOS OF OILS

FROM 7/12-2 AND KEROGENS FROM 7/12-3

| DEPTH | SAMPLE TYPE | $\delta^{13}C_{PDB-1}$ ‰ |
|---|---|---|
| NOCS Well 7/12-2 | | |
| 3398.75m | Core Extract | - 29.0 |
| 3416.3 m | " " | - 28.5 |
| DST 3A | Oil | - 28.8 |
| NOCS Well 7/12-3 | | |
| 3310 | Kerogen | - 25.9 |
| 3495 | " | - 26.4 |
| 3498 | " | - 27.3 |
| 3500 | " | - 28.6 |
| 3525 | " | - 28.1 |
| 3555 | " | - 25.9 |

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FIGURE 1: STERANE DISTRIBUTIONS

NOCS WELL 7/12-2

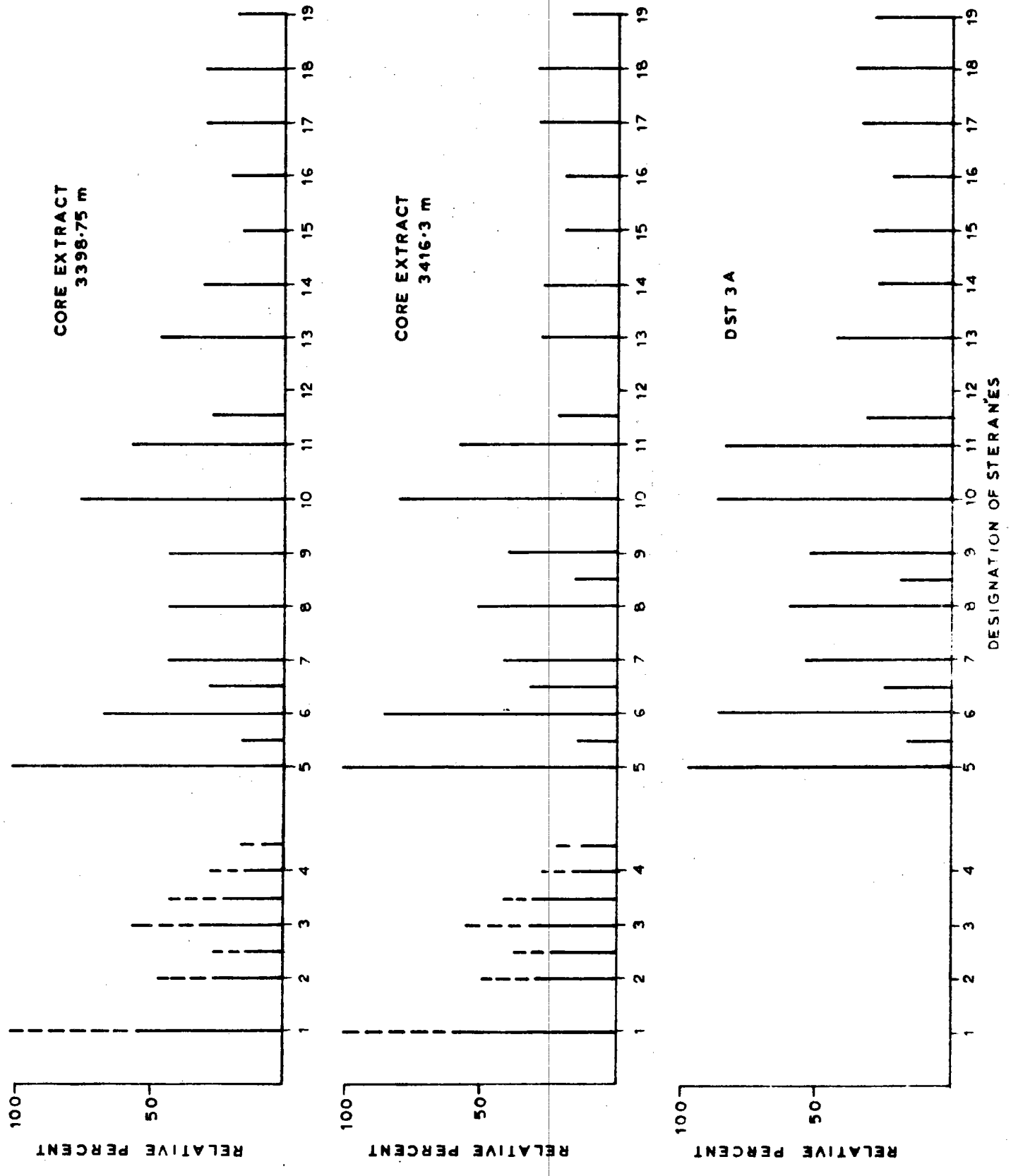

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FIGURE 2 : PENTACYCLANE DISTRIBUTIONS

NOCS WELL 7/12-2

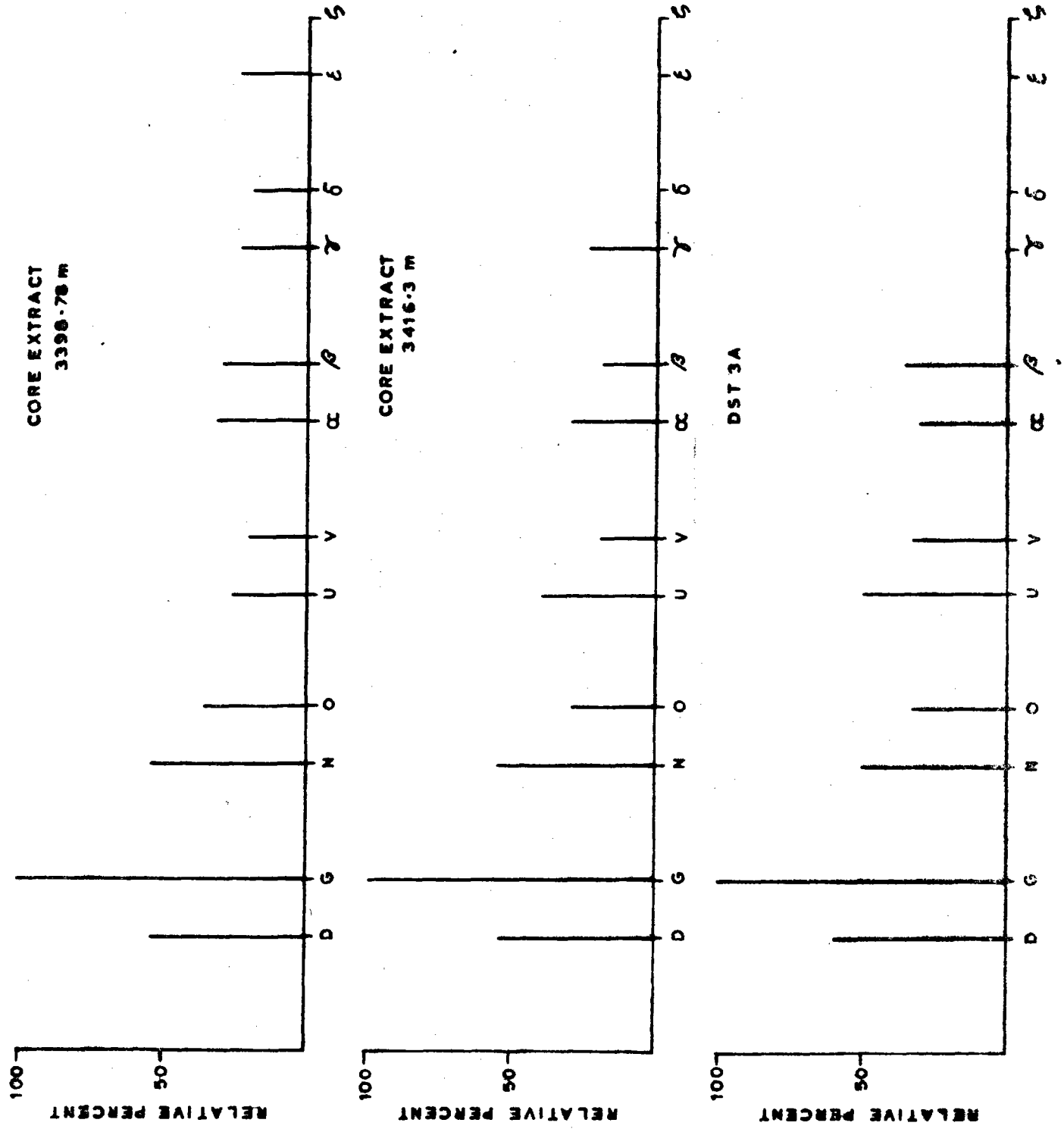

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FIGURE 3 STERANE DISTRIBUTIONS

NOCS WELL 7/12-3

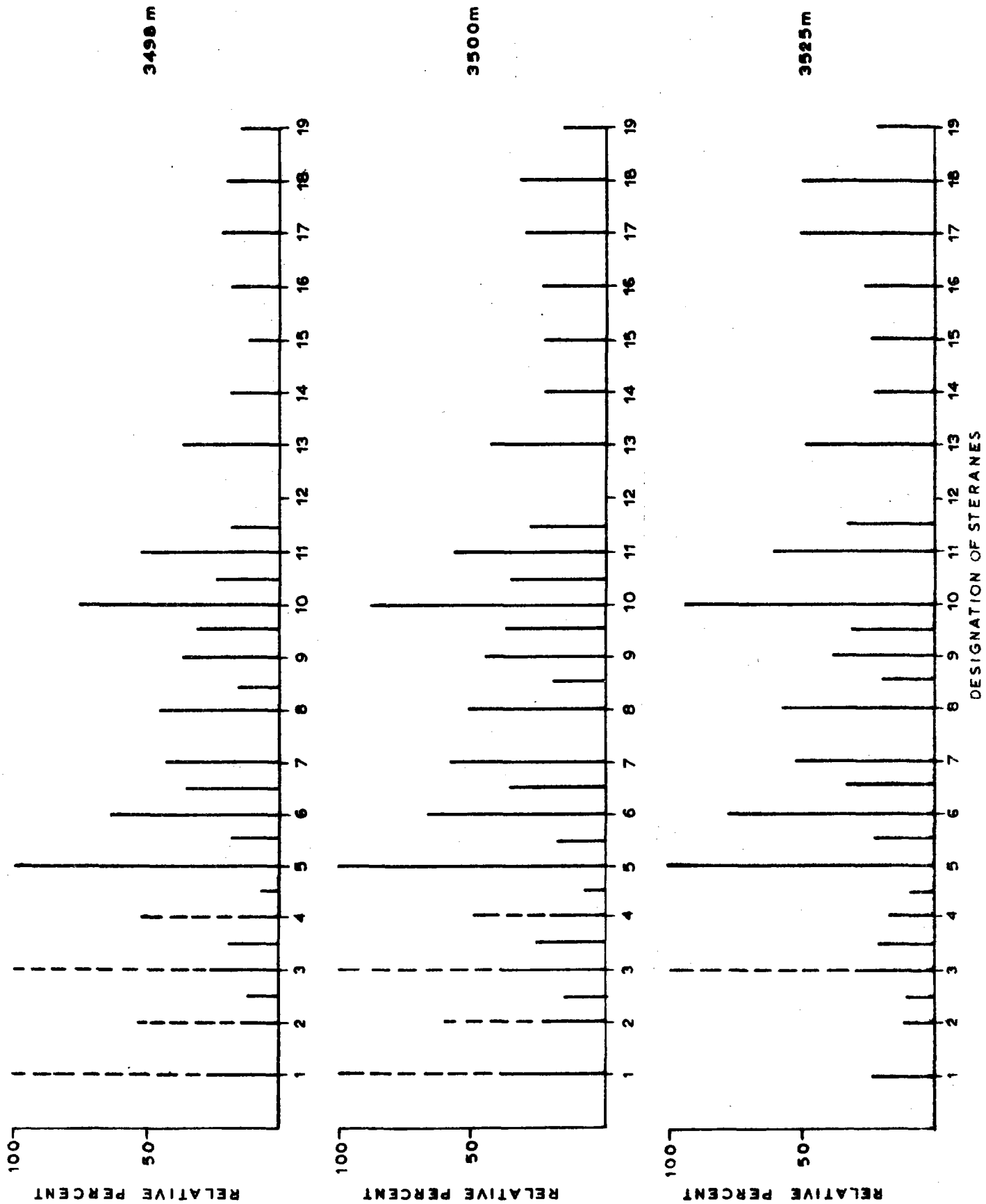

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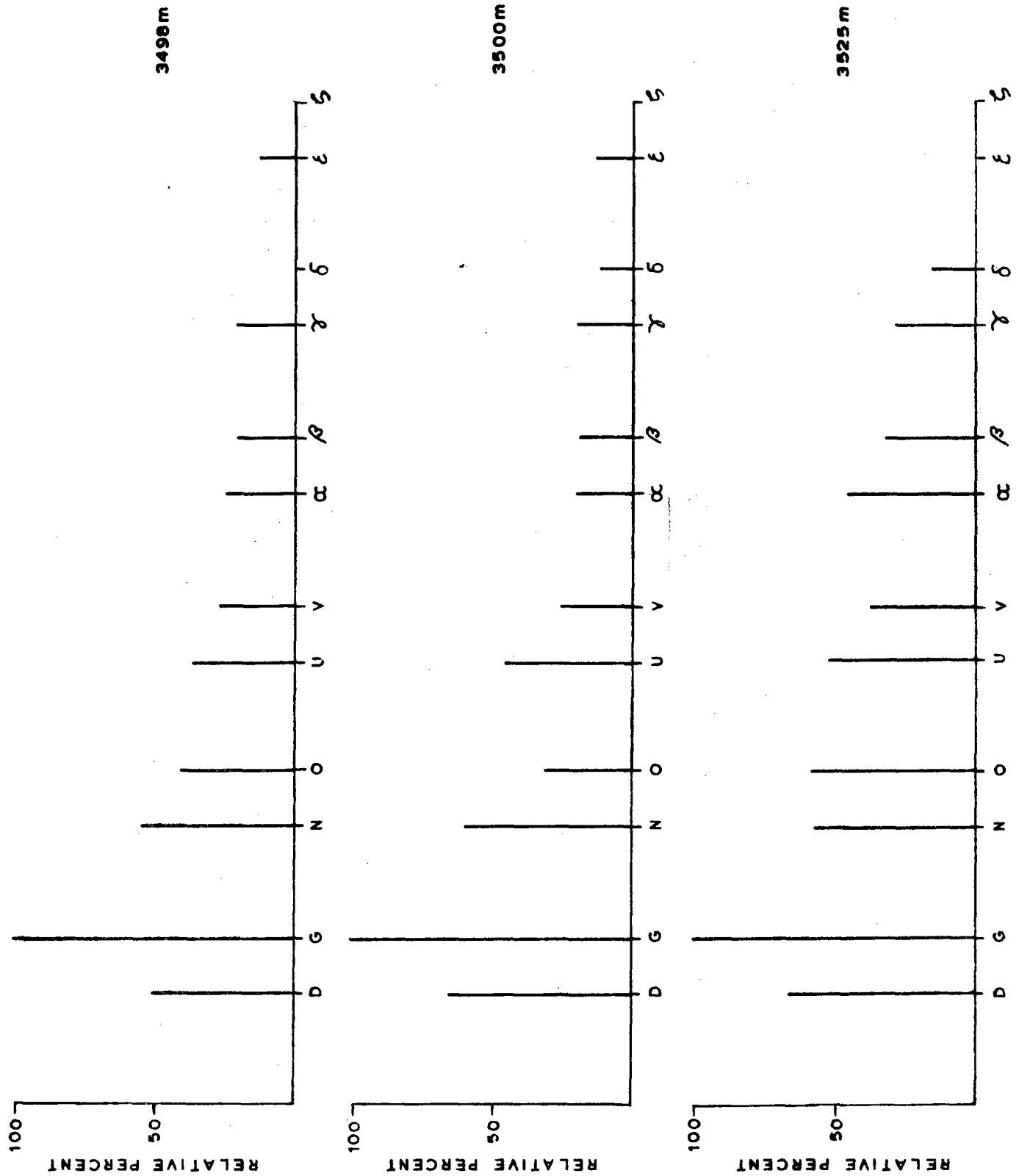
FIGURE 4 PENTACYCLANE DISTRIBUTIONS

NOCS WELL 7/12-3



# OIL-SOURCE CORRELATION : NOCS WELL 7/12-2 AND 7/12-3

Dr. J.A. Miles

Correlation parameters commonly used in source rock - oil correlations include sterane and pentacyclane "fingerprints" and stable carbon isotope ratios of kerogens and crude oils.

Major problems with sterane and pentacyclane comparisons are that components can be contributed to an oil from a number of source rock units and, if hydrocarbons have migrated through or into the source rocks examined, traces of additional hydrocarbons will have contaminated the autochthonous components, and will tend to produce misleading correlations.

These problems do not greatly affect correlations using stable carbon isotope ratios as determinations are undertaken on source rock kerogens i.e. insoluble organic material, but this parameter does not provide such specific indications of source-oil relationships.

Sterane and pentacyclane distributions and stable carbon isotope ratios for core extracts and oil from NOCS Well 7/12-2 were obtained and reported in EPR/TN 7037 "Properties of Crude Oil Samples from NOCS Well 7/12-2" by B. Hickmott, P.D.J. Park and G.C. Speers in October 1977 (Figures 1 and 2, Table 1). Subsequently, sterane and pentacyclane distributions for the N+P fraction of the Total Soluble Extracts from 3 sidewall cores from 7/12-3 were obtained by C-GC-MS, and kerogen stable carbon isotope ratios were determined for a number of swc samples from this well. (Figures 3, 4, and Table 1).

It should be noted that the possibility of migrated hydrocarbons below 3500m in 7/12-3 was noted in the Report produced by Geochem Laboratories UK Ltd., on this well for BP Petroleum Development of Norway. It is possible, therefore, that source-oil correlations may have been affected by any significant migration of trace quantities of hydrocarbons into these shales which may have occurred.

The sterane and pentacyclane distributions of the oil samples from 7/12-2 and sediment extracts from 7/12-3 show very close similarities. Although there are slight differences between the distributions of the individual extracts of swc's 72, 71 and 69 (3498, 3500, 3525m), they are close enough to be considered the source of the oil examined from Well 7/12-2. The patterns observed are fairly typical of mature North Sea crudes derived from a marginal marine source facies. Hence, the results suggest that the oil could have been derived from the Portlandian both on and buried deeper off structure.

Stable carbon isotope ratios ($\delta^{13}C_{PDB-1}$) suggest that the closest correlation of source to oil is between the Portlandian, as represented by swc 69, 71 (3500, 3525m) and the oil samples from 7/12-2 (Table 1).

(continued) :-

In conclusion, the 3 source oil correlation parameters studied suggest a close relationship between the oil accumulated in 7/12-2 and source rocks from the "Kimmeridge Clay Formation" of the Portlandian, provided that the latter are not contaminated by trace quantities of migrated oil.

JAM/JMP
11th August 1978