

Paper 12

Surface geochemistry as an exploration tool in frontier, deep water areas: a case study from the Atlantic Margin

MALVIN BJØRØY¹ AND IAN L. FERRIDAY²

¹Surface Geochemical Services AS
P.O. Box 5740, 7437 Trondheim
Norway

²Geolab Nor AS
P.O. Box 5740, 7437 Trondheim
Norway

In surface geochemistry the sample collection and preservation aspects are paramount not only for getting the most meaningful data but also for cost. The correct techniques must be used according to the area to be sampled,

Warta Geologi, Vol. 29, No. 6, Nov-Dec 2003

the most expensive techniques not necessarily being the best regarding sample quality. Ignoring these aspects can lead to an expensive survey, at worst with poorer quality samples. An overview of the sampling criteria are presented and demonstrated in a case study from the Færoes-Shetland area on the North East Atlantic Margin.

The Færoe-Shetland headspace- and occluded gas data indicate mainly only biogenic hydrocarbons, while the adsorbed gas data show greater detail for the heavier, oil-associated hydrocarbons, highlighting definite areas of thermogenic interest. A large area of wet thermogenic gas is shown forming a NE-SW belt in UK quadrants 176 and 204 and Færoes quadrants 6004 and 6005, extending into 6104. To the north of this there occurs a larger, more dispersed and almost fan-shaped spread of dry thermogenic gas in Færoes quadrants 6105, 6104 and 6103 and UK 213.

The liquid hydrocarbon data (GC and GC-MS) similarly highlight areas of seepage which generally coincide with the above. In addition there is shown the presence of two basic source types of oil, together with high maturity condensates of possible mixed origin. The oils comprise a well mature (?U. Jurassic) marine type and a less mature more terrestrial (?M. Jurassic) type.

The greatest concentration of seeping marine type oil is shown within an area in quadrants UK 204 and Færoes 6004 to the west and north of the Foinaven and Schiehallion fields that also have dominantly 'marine' oils. Otherwise there are more scattered occurrences in the central part of the survey area in Færoes quadrant 6104. The greatest concentration of the more terrestrial oil occurs in the central parts of the area, quadrants 6104, 6105 and northernmost 6004. However there appears also to be a belt offset to the north from the marine seepages, close to the Færoes/UK border in quadrants 6005 and 6004.

Regarding drilling, in the UK sector, apart from the fields shown, the wells have returned practically only gas according to available information. Virtually all these wells occur eastward of the survey area, apart from in UK 213, where the dry well shown is in biogenic territory according to the gas data; and in UK 204 where the recent 10-1 oil/gas discovery well is in Type E oil seepage territory according to the extract data. In the Færoes sector, only three wells have been drilled and reported, all since the completion of the surface geochemical survey. Of these, that in 6005 occurs in an area of biogenic hydrocarbons according to both the gas and liquid HC data, and this returned dry. In 6004, the 12-1 well is located in an area with wet thermogenic gas and close to significant Type D oil, this well having shows. In the same quadrant, the 16-1z well, close to the UK-Færoes boundary, is in an area with both abundant wet thermogenic gas and abundant seeps of both Type D and E oils. This well returned with a 170 m oil column, of marine type, similar to the Type E of this study.

The Færoes-Shetland surface geochemical data are therefore so far in good agreement with the drilling results. In addition, some localities to the north in Færoes quadrant 6104 are shown by the geochemical data to have seeped oil-associated hydrocarbons. Only future drilling will show whether these sites contain oils from as yet undiscovered commercial deposits.