Oil and source rock correlations within the Delfin Nord 1 well, offshore Romania

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A combination of fluid inclusion and geochemical analyses were conducted on cuttings samples within the Delfin Nord 1 well, offshore Romania, to develop an improved understanding of hydrocarbon migration and seals. Of particular focus were the Cretaceous deposits of the Moesian platform encountered in the well. Several wells have been drilled in the past targeting pre-Oligocene traps and reservoirs in the Romanian offshore part of the Moesian platform, but no hydrocarbon discoveries have yet been reported. However, the overlying siliciclastic deposits are proven to host hydrocarbons in two relatively recent dry gas discoveries, Doina and Ana.

FIV technologies utilize mass spectrometry to analyze evolved volatiles derived primarily from fluid inclusions during crushing of cuttings under a vacuum. The FIV results from the Delfin Nord 1 indicate that oil and wet gas have migrated through the Cretaceous carbonate rocks (1660 – 1905m depth interval). The Eocene-Oligocene shale (Maykop formation) immediately above the Cretaceous appears to be a good seal with some indications of minor fluid leakage upward. Migrated hydrocarbons extracted from Cretaceous cuttings have biomarker signatures indicating an origin from a pre-Tertiary oil prone marly or carbonate source. The source environment appears to be stressed, suggesting a restricted lagoon or sabkha-type depositional environment.

Much shallower in the section at <540m (Upper Pontian, Dacian, Romanian), dry gas (>95% methane) migration is interpreted within thin sands. The origin of the dry gas is suggested to be a result of oil or wet gas that has migrated to shallow depths and been altered by microbial activity. FIV responses in the sands indicate the presence of C_4+ hydrocarbons (oil/wet gas) accompanied by dry gas and high CO_2. These relationships imply that microbes have metabolized the higher hydrocarbon groups to make methane-rich (dry) gas and carbon dioxide.

This work indicates that pre-Tertiary oil-prone source rocks have been responsible for at least some of the hydrocarbon charge in the Moesian platform areas offshore Romania. The regionally well-known Oligocene (Maykop) source rock appears to play a minimal role on the platform, but may become more important further to the east in the Romanian Black Sea.