

Hydrocarbons of cold seeps of the Black Sea offshore Georgia as indicators of subsurface source and maturity

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Sediments of cold seeps offshore Georgia, Black Sea (Batumi seep area, Colkhetti Seep, and Pechori Mound), which contain migrated fluids, have been sampled for geological and geochemical investigations. Concentrations of extracted hydrocarbons and organic carbon content suggest that the sediments are impregnated by migrated hydrocarbons. Compositions of aliphatic fractions indicate that microbial degradation has altered the original molecular composition. However, individual biomarker molecules do not show significant imprints of microbial alterations. Although the samples originate from different seep sites, biomarker compositions indicate that the migrated hydrocarbons represent similar precursor types. Hopane and sterane biomarkers suggest that the hydrocarbons have likely been generated from lacustrine source rocks deposited under low-salinity conditions. C27 to C29 iso-steranes indicate that the depositional system was dominated by aquatic material with small contributions from diatoms and terrestrial organic matter. The influence of terrestrial organic matter is also obvious from the presence of oleananes (angiosperm marker), which also indicate Late Cretaceous to Tertiary ages of the precursors. Stable carbon isotope ratios of aliphatic and aromatic fractions support the assumption that aquatic organic matter is the dominant hydrocarbon precursor. Carbon isotopes also indicate that the aquatic organic matter has been deposited before the Miocene global isotope shift. We assume that the hydrocarbon precursors have likely been deposited between Late Cretaceous and Middle Miocene, and speculate that they could be related to the lower parts of the Maikop Formation, which represents an excellent hydrocarbon source rock of the greater region. Maturity indicative biomarkers as well as stable carbon isotope ratios of light hydrocarbons methane and ethane in the shallow deposits indicate that their sources have reached the stage of the early oil window.