Confirming the Presence of a Working Petroleum System in the Eastern Black Sea Basin Using Sea Surface Slicks

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ABSTRACT

As new plays emerge in deepwater settings, one of the more difficult tasks facing the exploration geologist is to find evidence confirming the presence of a working petroleum system. Geologic evaluation of the Eastern Black Sea Basin, offshore Georgia, indicates the elements of a petroleum system are likely present. Potential source rocks of Oligo-Miocene age in the Maykop Formation could charge Middle Miocene deepwater channel-levee sands in fold and thrust system traps. But to reduce the exploration risk in this frontier area, direct evidence of hydrocarbon generation and migration is needed. To provide confirmation of charge, a diverse set of data was used. Synthetic aperture radar satellite images revealed the presence of large recurring sea surface slicks over the prospective structures. 3-D seismic data was then used to image the seafloor and found potential seep features including pockmarks, near seafloor sediments with high impedance contrast suggesting authigenic carbonates, and mud volcanoes located below the apparent origin points of the slicks. The 3-D seismic imaging also demonstrated that there are potential migration pathways from the observed traps to these seafloor features. Finally, geochemical analysis of sea surface slick samples was done. Data from these analyses showed the slicks were composed of biodegraded thermogenic hydrocarbons and their compositional characteristics were very similar to known Maykop sourced oils in the region. These highly similar compositional characteristics suggesting both the slicks and oils were generated from the same or geochemically similar sources. This combination of data provides a high level of confidence that the seismically imaged traps in the Eastern Black Sea Basin in offshore Georgia are charged. What it cannot tell us is how much petroleum may be in these structures. This question can only be answered by the drill bit.