



A review and assessment of gas hydrate potential in Çınarcık Basin, Sea of Marmara

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The Sea of Marmara (NW Turkey), an intracontinental sea between the Mediterranean and Black Seas, is located in a tectonically active region with the formation of shallow gas hydrates and free gas. It is widely known that, Sea of Marmara sediments are organic-rich and conducive to production of methane, which is released on the sea floor through active fault segments of the North Anatolian Fault (Geli et al., 2008). Here we study the gas hydrate potential of the Çınarcık Basin using published data and our core analyses together with gas hydrate stability relations.

The gas sampled in the Çınarcık Basin is composed mainly of biogenic methane and trace amounts of heavier hydrocarbons (Bourry et al., 2009). The seafloor at 1273 m depth on the Çınarcık Basin with temperature of 14.5°C and hydrostatic pressure of 127.3 atm corresponds to the physical limit for gas hydrate formation with respect to phase behavior of gas hydrates in marine sediments (Ménot and Bard, 2010). In order to calculate the base of the gas hydrate stability zone in Çınarcık Basin, we plotted T (°C) calculated considering the geothermal gradient versus P (atm) on the phase boundary diagram. Below the seafloor, in addition to hydrostatic pressure (10 Mpa/km), we calculated lithostatic pressure due to sediment thickness considering the MSCL gamma ray density values (~1.7 gr/cm³). Our estimations show that, gas hydrate could be stable in the upper ~20 m of sedimentary succession in Çınarcık Basin.

The amount of gas hydrate in the Çınarcık Basin can be determined using the basinal area below 1220 m depth (483 km²) and average thickness of the gas hydrate stability zone (20 m) and the sediment gas hydrate saturation (1.2 % used as Milkov, 2004 suggested). The calculations indicate the potential volume of gas hydrate in Çınarcık Basin as ~11.6x10⁷ m³.

Such estimates are helpful for the consideration of gas hydrates as a new energy resource, for assessment of geohazards or their impact on climate change.