



Gas hydrate formation from low-saline mud volcano fluids in the Gulf of Cadiz

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The Gulf of Cadiz (NE Atlantic) was investigated during the several TTR expeditions (“Training Through Research Programme”) onboard of R/V “Professor Logachev”. A lot of mud volcanoes are discovered from 1999 to 2006 in this area. Some of them are situated in the gas hydrate stability zone and gas hydrates were discovered in the sediments within several of mud volcanoes. More than 400 samples of pore water were analyzed for the chemical and isotopic composition. Major elements geochemistry of the water samples was determined in Chemical Laboratory of VNIIOkeangeologia. Cl, Ca, Mg were determined by titration (argento-, acide-, and complexometry, respectively), SO₄ species was determined by weight, and Na and K using the flame-photometric method. The same samples were chosen for the isotopic study. Oxygen ($\delta^{18}\text{O}$) and hydrogen (δD) isotopic analyses of the pore water were carried out using an instrument MI – 1201 in the Laboratory of VSEGINGEO (Moscow) and in the Centre of Isotope Studies of VSEGEI (St-Petersburg). The results are represented in per-mil delta notations (‰) relative to Standard Mean Ocean Water (SMOW).

Gas hydrate-bearing intervals are well correlated with the pore water anomalies due to the gas hydrate decomposition in the sample. Such indirect indicator was observed before in other regions. One of the most interesting peculiarities of these mud volcanoes are the composition of mud volcano fluids. They are characterized by unusual isotopic composition of oxygen and hydrogen. Last investigation has shown that these fluids are two times fresher than surrounding seawater. Such composition of the fluids is

typical for the mud volcanoes in the Mediterranean Sea, Barbados accretionary prism, Haakon Mosby mud volcano (Norwegian Sea) and others. Most probably, this could be explained by the dewatering of the clay minerals at the sedimentary depth of about 2000 m.