



## **Hydrocarbon gases and gas hydrates from the mud volcanic deposits of the Gulf of Cadiz area**

**V. Blinova** (1), M. Ivanov (1), A. Stadnitskaya (2), E. Bileva (1), L. Pinheiro (3)

(1) UNESCO-MSU center for Marine Geology and Geophysics, Faculty of Geology, Moscow State University, Russia (vblinova@mail.ru), (2) Royal Netherlands Institute for Sea Research, Texel, the Netherlands, (3) Departamento de Geociencias, Universidade de Aveiro Campus de Santiago, Portugal

During five TTR (Training Through Research) cruises from 1999 to 2004 more than twenty mud volcanoes were discovered and studied in the Gulf of Cadiz. Based on the geophysical and geochemical data relatively active and passive ones were distinguished. Passive mud volcanoes are covered by hemipelagic sediments and have very low (about 0.01 ml/l) concentrations of hydrocarbons. Sulphate content does not change much with the depth. Sulphate reduction zone (SRZ) usually does not observed in sediments recovered by gravity corer (3-6 m). In active mud volcanoes such as the Captain Arutyunov methane concentration reaches 130 ml/l. Deposits recovered from these mud volcanoes represented by high gas saturated mud breccia. Concentration of the heavy homologues is larger than in passive ones ( $C_1/C_{2+}$  ratio is about 15). Moreover, carbon isotopic composition varies from -49 to -37.2‰, PDB for methane and does not change much with the depth. Sulphate content decreases very fast with the depth (from 80 until almost 0 mM/l at the first 10 - 30cm).

Detailed sampling of several active mud volcanoes showed gas hydrates occurrence. Gas hydrates were observed in three mud volcanoes: Ginsburg, Bonjardim and Captain Arutyunov. In the Ginsburg and Bonjardim mud volcanoes gas hydrates occur from the depth 1,5 m as small concretions. In the Captain Arutyunov mud volcano they present from the top of the section and are composed from almost methane with  $\delta^{13}C = -49\text{‰}$ , PDB.

Several differences between western and eastern mud volcanoes in the Gulf of Cadiz were established on based of study molecular and isotopic composition of hydrocar-

bon gases. Mud volcanoes from western part (Bonjardim and Carlos Ribeiro) are characterized by similar gas composition with high concentration of heavy hydrocarbons (wet gas). This gas is probably generated in the upper and central part of the “oil window”.  $\delta^{13}\text{C}$  of methane samples is from  $-50.2$  to  $-64.3\%$ , PDB, it being ascertain possible its initial  $\delta^{13}\text{C}$  changes from  $-46$  to  $-50\%$ , PDB conformably. Mud volcanoes from central and eastern parts of the basin are characterized by more diverse molecular and isotopic composition of the gas. Most probably such gas was originated from the immature organic matter, above “oil window” zone.