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Deep underground structure of mud volcanoes in North-Western Caucasus revealed by means of geological and geophysical studies

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According to modern concepts, the roots of mud volcanoes in the Taman mud volcanic province are not older than Oligocene and rocks containing the hydrocarbon component of gases are not older than Cretaceous. However, according to petrographic data, mud volcanic breccia in the Taman province contain quartz porphyries, glassy obsidians, trachytoids, and igneous rock fragments of Late Jurassic or even older age. Gaseous exhalations from mud volcanoes of the West Kuban longitudinal and Kerch-Taman transverse troughs contain carbon dioxide with the mantle carbon signature.

Results of complementary geological and geophysical studies of mud volcanic phenomena in North-Western Caucasus (Taman mud volcanic province) are presented. Geophysical field works have been carried out in 2005 – 2010 on the two different mud volcanoes: the Gora Karabetova and the Shugo mud volcano.

Usage of methods of vibroseismic sounding, traditional magneto-telluric sounding and relatively new method of low-frequency microseismic sounding allows obtaining several independent vertical cross-sections for the two different mud volcanoes down to the depth of 25 km. For the two different mud volcanoes their deep subsurface structure has been revealed and discussed with respect to regional tectonic settings, geology and geomorphology.

The Gora Karabetova mud volcano is one of the most active mud volcanoes in the Taman peninsula with primarily explosive behaviour while the Shugo mud volcano's activity pattern is different, explosive events are rare and both types of phenomena may be explained by the configuration of their feeding systems, tectonic position and deep pathways of migration of fluids.