How Submarine Gas Seeps and Mud Volcanoes Affect Geo-Environment of the Black Sea

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About 4000 submarine gas emissions - gas seeps and flares, and more than 60 mud volcanoes were found and described at the Black Sea bottom as a result of its geological and geophysical studies (including the authors of this reports) during the last 30-40 years. As analysis of available published and original data has been shown, the gas seeps and mud volcanoes as well as gas hydrates in the Black Sea were caused to some extent by the specific of its geological, tectonic, and geodynamic activity and the thermodynamic conditions near the seabed.

Gas seeps, mud volcanoes and gas hydrates as a Black Sea unified bottom geo-ecosystem components, as has been established, are between themselves in a position of relationship and interaction. Minimal changes in boundary conditions (decrease of pressure and temperatur, etc.) being in a stable solid hydrates (as a component of this geo-ecosystem) lead to the destruction of their structure with separation of the gaseous component, mostly free methane and water, first in sedimentary geo-ecosystem and then - in the aquatic ecosystem.

Changing of the phase state of the seabed geo-ecosystem gas component and the following migration to an adjacent aqua-ecosystem certainly affect the geo-ecological conditions of the Black Sea. This influence is realised through the changes in both the content and the process sub-systems of basin-scale environmental system.

The emergent – physico-chemical, colloid-chemical and physico-mechanical – properties of geo-ecosystem are changing too. The consequence of these transformations can provoke a number of geo-ecological, including catastrophic, phenomena. Among them there are underwater landslides, avalanches, mud flows, activation of anaerobic methane oxidation within geo-ecosystem itself, and on the boundary of "geo-ecosystem-aqua-ecosystem" where the formation of specific carbonate structures, which change, in particular, the morphology of the seabed, its structural and geophysical and geotechnical properties.