



Assessments of gas emission from the mud volcanoes in Azerbaijan

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In spite of fact that mud volcanism is considered as a planetary phenomenon, it has the restricted enough distribution. The mud volcanoes are basically corresponded to the Alpine-Himalayan mobile belt (including the Black Sea and Caspian Sea basins), the accretionary wedges (Mediterranean region, Makran Zone) and the oil-gas bearing regions. The morphology is also variable and includes different forms from nearly flat bubbling pools to conical or mountain-like edifices with some hundreds meters in base. Among other countries, Azerbaijan is the unique territory where all types of mud volcanoes can be observed. They are extremely diverse in morphology, size, and activity patterns, and can be divided conditionally into two main groups: they either undergo intense and continuous gryphon-salse activity and weak eruptions or have low to absent venting activity but higher eruptive potential, accompanied by the release of enormous volumes of gas, mainly methane (85-99%). Strong eruptions of mud volcanoes are catastrophic events, and direct gas flux measurements are therefore difficult, but it is much easier to estimate gas flux during quiescent periods.

Natural geological emissions of methane is the second natural source of CH₄ that makes 8.5% of all methane volume after wetlands (25%). It can be compared with or higher than other anthropogenic sources like transportation, industry, and agriculture. The Intergovernmental Panel on Climate Change included methane emissions in the natural sources of methane category in the Fourth Assessment Report in 2007. At present two main geological processes are considered as the main sources for methane emissions. The first one is hydrocarbon generation in sedimentary basins. The second is geothermal and volcanic exhalations. Atmospheric methane may also come from mud volcanoes, but their role as alternative natural source of methane was unknown before detailed gas flux measurements from onshore mud volcanoes until recently. However, quantitative estimation of gas emission from mud volcanoes is still a task to be solved.

In Azerbaijan, the technically-advanced attempts to assess the methane emissions had been carrying out since 1960s. In particular, the recent investigations had been carried out at two distinct mud volcanoes Dashgil and Shikhzarli in dormant and post-eruptive state respectively. In the first case, the special floating monitoring station with a custom-built flux meter system, solar panel and data logger was used to measure the methane flows from the mud lake. The results had showed that the degassing of quiescent mud volcanoes continuous from the deep sedimentary reservoirs via the branched conduit system to the surface. The studies in Shikhzarli mud volcano included the assessment of the gas volume burnt during the strong eruption in 2011. Using the algorithm of SigmaFlow software and set parameters of eruption, such as flare height, burning time, gas and environment temperature, ground temperature at depth, etc. it had been defined that the volumes of burnt methane was about 96 000 m³. This number agrees well with alternative calculations using the special formula.