

MUD VOLCANISM AND EARTHQUAKES

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Academician G.W. Abich (1863) mentioned linkage of mud volcanism with earthquakes still in the second half of the XIXth century. In the last century the linkage of mud volcanoes with seismicity was considered in papers of N.V. Malinovski (1938), F.S. Akhmedbeili (1975), Z.Z. Sultanova (1969, 1986), B.M. Panakhi (1987, 1998) et al. In the 80s and in the beginning of the 90s in the mud volcanoes in Azerbaijan which are characterized by gryphon-salse activity we conducted monitoring of change of composition of evacuated fluids (gas and water) and their day and week discharge. As a result it was determined that some gas components (CO₂, N₂, He) and water components (B, SO₄, Cl) grow abnormally during activation of mud volcanoes before and during seismic events (M=3-4). Hence they may serve gashydrogeochemical precursors of earthquakes. Besides, gas components: CO₂ – is "a short precursor and He – is long precursor".

Recent investigations based on numerous data demonstrated that strong earthquakes (M>4) "initiate" paroxysms of mud volcanoes eruptions, i.e. the latter should be considered as earthquakes consequences. This can be illustrated by a record number of eruptions fixed in 2001 in 15 mud volcanoes in Azerbaijan in the Absheron peninsula, in the Caspian Sea and especially in Gobustan after strong Caspian earthquakes of 2000 (November 25 and December 6) and further seismic events in the South Caspian, South and south-east of Baku city. Process of preparation of mud volcanoes eruptions was reflected in anomalies of hydrochemical fields of ground waters in objects of seismo-geochemical monitoring conducted by Republican Centre of Seismologic Survey of the Azerbaijan National Academy of Sciences to solve some problems of seismic prediction.

Correlation of data about earthquakes and recorded eruptions of mud volcanoes which have taken place in Azerbaijan for the last two centuries allowed to express opinion about genetic linkage between activation of mud-volcanic activity and seismicity because these natural phenomena are due to tectonic tension accumulated in the earth crust. With account of magnitude of the earthquake, depth of the source, energetic class, distance between epicentre and location of volcanoes it was determined that strong earthquakes, as a rule, played a role of "a trigger" in the mud-volcanic process. The cause is determined most clearly when the earthquake source and volcano are located within one fault structure subject to the volcano has been calm for a long time (Lockbatan erupted in 11 years, Durandag – in 42 years, etc.) and accumulated enough energy for paroxysm of eruption.

Activation of mud-volcanic activity in Azerbaijan in the beginning of a new millenium after seismic activity of autumn 2000 is additional confirmation of the above-mentioned about close relation of mud volcanism with earthquakes. Their interaction is determined by location of either adjacent microplates or tectonic blocks where seismoactive layers are in analogous or close geodynamic setting. Numerous eruptions of mud volcanoes in 2001 which were recorded in the South Gobustan within the Towragai microblock were associated with two fault structures and mainly are bent on one of them, namely to the cross of submeridional Gijaki-Solakhai fault with local anticline structures of a latitudinal strike where erupted mud volcanoes are located (Solakhai, Akhtimer, Durandag etc.).

