Geophysical Research Abstracts
Vol. 20, EGU2018-15747, 2018
EGU General Assembly 2018

A special type of mud volcanism in Lake Baikal

Adriano Mazzini (1), Oleg Khlystov (2), Jeffrey Poort (3,4), Grigorii Akhmanov (5), Hirotsugu Minami (6), Akihiro Hachikubo (6), and Marc De Batist (4)

(1) Centre for Earth Evolution and Dynamics, University of Oslo, Norway (adriano.mazzini@geo.uio.no), (2) Limnological Institute of Siberian Branch of Russian Academy of Sciences, Irkutsk, Russian Federation, (3) Sorbonne University, Paris, France, (4) Renard Centre of Marine Geology, University Gent, Belgium, (5) Lomonosov Moscow State University, Moscow, Russian Federation, (6) New Energy Resources Research Center, Kitami Institute of Technology, Japan

Baikal is the only freshwater sedimentary basin containing gas hydrate accumulations, many of which are associated with mud volcano activity. Twenty-two mud volcanoes have already been identified in different areas of Lake Baikal, but the formation process and source depth are still disputed due to a lack of conclusive evidences. Here we discuss a set of geological and geophysical data to report the discovery of a new mud volcanic complex in the Academician Ridge in central Lake Baikal. Further, we present a multidisciplinary study including petrography, geochemistry and tomography conducted on a set of gravity cores collected from various mud volcanoes in the Lake. The results are integrated with available geophysical data to investigate the structural characteristics of these deposits and to elaborate a conceptual model to infer the roots of the studied piercements.
Sediment core observations revealed the presence of semi-lithified clayey clast broadly distributed in the structureless sediments. Petrography studies of the individual clast reveal that they differ in mineralogical composition, and their poor lithification indicates that they originate from shallow sediments. CT-scan of the cores confirms the abundance of semi-lithified clasts displaying different backscatter and thus mineralogical content. The absence of sedimentary structures and a completely chaotic matrix indicates a vigorous mechanism (i.e. typically ongoing in mud volcano conduits) able to amalgam different lithologies. Dating of selected cores from the deep basin areas where the mud volcanoes are located reveal that most of the erupted sediments originate from a depth of 200-300 mbsf. This depth coincides with the base of the gas hydrate stability field. Most of the mud volcano sites reveal anomalously high geothermal gradient indicating that the base of the gas hydrate stability zone has been shifted upwards.
The acquired data are consistent with a scenario envisaging two main phases: a) the focussed rise of deeper and warmer fluids reaching shallow depths, b) the gas hydrate dissociation and, in turn, rapid generation of overpressured shallow mud chambers. The ultimate piercing and triggering of the mud volcanoes activity resulted in the overpressure release and eruption of mud breccia. This “Baikalian” type of mud volcanism differs significantly from the classic, deeply rooted one known from other mature sedimentary basins.