Geophysical Research Abstracts
Vol. 15, EGU2013-405, 2013
EGU General Assembly 2013

Possible reasons of the enhanced methane emission from the permafrost part of Russia

Svetlana Reneva (1), Julia Strelchenko (1), Oleg Anisimov (1), and Vasily Kokorev (2)

(1) State Hydrological Institute, Climatology, St.Petersburg, Russian Federation (svetren@gmail.com), (2) Saint-Petersburg State University, St.Petersburg, Russia Federation (vasilykokorev@gmail.com)

Our last study was focused on researching into the methane emission from Russian frozen wetlands and evaluation of this effect on global radiative forcing. Results for the mid-21st century indicate that the annual emission of methane from Russian permafrost region may increase by 6–8 Mt y^{-1}. Resulting from such an increase additional radiative forcing may raise the global mean of annual air temperature by 0.012 ^{o}C.

In this research we developed a conceptual model explaining enhanced methane emission at the shelf of the East Siberian Arctic Seas (ESAS). Although observations are infrequent in time and space, they clearly indicate the presence of strong sources of methane at selected locations on the ESAS-shelf. Natalia Shakhova with co-authors hypothesized in numerous publications that enhanced methane emissions are attributed to recent thawing of sub-aquatic permafrost at ESAS, and predicted catastrophic environmental changes in the nearest future, which was called the “methane bomb” scenario. We don’t share this point of view. According their results, the annual methane emission from ESAS is 7,9 Mt. But if we refer to our research of emission from wetlands, we can see that this amount is not so catastrophic for global temperature.

So we focused on the concept indicating that observed enhanced fluxes are not related to recent changes in the subaquatic permafrost but are rather attributed to other mechanisms, which are yet to be studied. In our primarily opinion those mechanisms are associated with the geological history of ESAS. The ultimate goal is to combine them into conceptual model that explains methane observations at ESAS in the context of the past, present, and future environmental changes.

We shall explore the hypothesis which suggests that observed methane venting is mostly bound to unfrozen bottom sediments surrounding fault zones and paleo river beds, while elsewhere on the inner ESAS shelf sediments remain frozen and impermeable for gases since the last glacial maximum. We checked this hypothesis by collecting published geological and paleo data, including those on high resolution batimetry, analysing of genesis of the bottom sediment samples, and constructing the digital high resolution map of the fault zones and paleo river and lake beds at ESAS, which is compared with locations of the hydrographic stations where enhanced methane fluxes have been observed.

Our hypothesis suggests that the methane emission at ESAS is controlled by geological factors rather than by recent changes in permafrost. This study made a step towards bridging the gap between the two competing positions of Shakhova’s team and our group, and in the follow-up discussion we agreed that the analysis of the geological history and paleo data from bottom sediments is a key to understanding the mechanisms of methane venting at ESAS.