

The East Siberian Arctic Shelf as a Source of Atmospheric Methane: First Approach to Quantitative Assessment.

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Investigators from three institutions propose to study methane release over the East Siberian Arctic shelf (ESAS), the largest (about 10% of the world ocean shelf area) and the shallowest (mean depth less than 50 m) continental shelf of the world ocean. The ESAS stores the world's largest hydrocarbon stocks, mostly as shallow Arctic hydrates, and thus represents a large potential methane atmospheric source that could result from global warming-triggered permafrost degradation. Increased methane fluxes could occur as numerous weak seeps or as strong bubble plumes over large areas. Due to the shallow depth of the ESAS, it is possible that the majority of methane released avoids oxidation and escapes to the atmosphere. The PIs will investigate the migration pathway characteristics and identify the controlling factors of methane flux from the seabed, in the water column, and to the atmosphere. The central hypothesis is that seabed methane fluxes are significant year-round sources while atmospheric fluxes are only significant during ice-free periods. The questions of methane sources, sinks, spatial and temporal variations in fluxes will be addressed through summer and winter expeditions to sample the water column and seabed, and helicopter surveys to sample the atmosphere. The PIs will also assess seafloor direct bubble flux over 6 control and 2 test sites on a nested range of sonar scales and using a combination of bubble video imaging and bubble modeling. Modeling will aim to develop a regional flux model. Broader impacts of the proposed activity include international collaboration, graduate and undergraduate student training, and public outreach.