Air-Water CH4 gradient in the East-Siberian and Laptev Seas

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Statement of problem

- Sub-sea hydrates release?
- Thermo-erosive transforming of these sedimentary areas

Coastal erosion and sea lagoons

- Due to rapid coastal erosion during warming events the slope may be transformed into a lagoon through the thermo-erosion abrasion of the current channels from the lakes (Romanovski, 2001) (Fig.2).
- Locations of water plume number 6 (Fig.2b) corresponds with possible locations of methane gas hydrates deposits. Intensity of the plume is comparable to reported magnitudes of plumes resulting from天然气 gas hydrates decay in the Barents Sea and the Sea of Okhotsk.

Permafrost-the basic component of Arctic Siberian seas shelves

- Studies by Rogers and Marais (1969) on the sub-sea permafrost and sea level history led to the inference that offshore permafrost clay penetrates beneath the top of the Arctic shelves beneath them about the 90th parallel.
- Methane hydrates contain a huge amount of ancient organic material that might be involved in current biological transformations if the water temperature of the upper permafrost and retarding the activity of sulfate-reducing bacteria preserved in permafrost (Bartlett et al., 1998).
- Methane hydrates are able to perform methanogenesis at colder temperatures in permafrost than in sub-permafrost. Methane hydrate formation is observed at 4 °C (Tice et al., 2000).

Sub-sea hydrates release?

- The concentration of dissolved methane in the surface layer ranged from 2.1 nM to 24.2 nM in 2003.
- The average surface concentration was 10.5 nM.
- This represents super-saturation of the water layer; up to 87% higher than present atmospheric methane content of 0.8 ppm, while the bottom concentration of dissolved methane reached anomalous high value of 24.2 nM in 2003.
- The extreme methane anomalies in plume areas indicate the presence of bottom methane deposits which might be strongly affected by geological, hydrological and climate factors.

Conclusions

- The East-Siberian and Laptev seas represent two of the broadest and shallowest shelves in the World Oceans. The observed distribution of dissolved methane suggests that both these shelves are important natural sources of methane to the atmosphere.
- The extreme methane anomalies in plume areas indicate the presence of bottom methane deposits, which might be strongly affected by geological, hydrological and climate factors.
- In contrast to other global sources of methane the Arctic Oceans is thought to be a small source for adding carbon dioxide being possible in participate in answering the still open question about the atmospheric methane maximum located over the Arctic.