AAPG Annual Convention
Salt Lake City, Utah
May 11-14, 2003

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Near-Surface Hydrocarbon Anomalies in Aerobic Sediments Off Coastal Svalbard

As global warming occurs, the dissociation of bound methane on Arctic shelves due to ocean current temperature changes may become a major contributor to the global methane budget, and thus contribute to strong positive climate feedback mechanisms. However, little is known about the magnitude and fate of methane emissions from shallow submarine sediments to the atmosphere.

Of greatest concern are large pools of free gas trapped below gas hydrates on Arctic shelves that may be labile with respect to global warming. A sequence of large emissions from pockmark blowouts, well known from the Barents Sea, indicate that periods with great and rapid impact on the global methane budget have occurred. However, field observations of methane release rates from Arctic shelves are scarce. Consequently, the role of these large polar methane sources for the present marine carbon cycle and their impact on the methane budget of the atmosphere remain poorly understood.

Recent pilot investigations in the Norwegian Arctic have documented active venting of thermogenic hydrocarbons along tectonically active fault systems off western Svalbard. In addition, unexpected methane anomalies (up to 400 μM) apparently of biogenic and thermogenic origin in near-surface sediments were detected in several fjord transects off western Svalbard. A significant proportion of sedimentary methane, which is not oxidised within the sediment, is released into the water column. The signature of out-gassing sediments could be traced to the overlying water column, where the concentration is up to two magnitudes higher than the marine background value.