Geophysical Research Abstracts, Vol. 9, 10177, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-10177

Variable Holocene methane emissions from cold seeps in the Okhotsk Sea - links to seismo-tectonic activity?

L. Lembke-Jene (1), R. Tiedemann (3), D. Nuernberg (1), A. Obzhirov (3), C. Dullo (1)

(1) IFM-GEOMAR Leibniz-Institut fuer Meereswissenschaften, Kiel, Germany, (2) Alfred-Wegener-Institut fuer Polar- und Meeresforschung, Bremerhaven, Germany, (3) V.I. Il'ichev Pacific Oceanological Institute, Vladivostok, Russia, (llembke@ifm-geomar.de).

Planktic and benthic foraminifera from sediment cores recovered from a Giant Cold Seep Area (GCSA) at the NE Sakhalin margin, Okhotsk Sea, were studied with respect to stable carbon isotopes for paleo-methane venting. Two representative cores show recurring intervals of depleted δ^{13}C during the past 3,500 and 7000 cal. yr BP, respectively. Minima values reach -32 ‰ in deep endobenthic species *N. labradorica*, and -4 ‰ to -6 ‰ in epibenthic *Cibicides* spp. Parallel timeseries of the planktic *N. pachyderma* (sinistral) show according anomalies, though with differing timing and intensity. The more depleted values are derived by secondary carbonate overgrowths that occurred synsedimentary with ongoing methane venting, within the error uncertainties of the age models.

In constraining the lateral influence of the methane vents, two additional sediment cores several hundred kilometres to the south of the GCSA show distinct depletions in planktic foraminiferal δ^{13}C. Thus, methane anomalies within the water column were large enough to get transported over large distances to the downstream region of the GCSA, presumably in subsurface mixed layer, dichothermal water masses. The likely causes for variable methane venting on the Sakhalin margin are periods of increased seismo-tectonic activity along the Japan-Kuril-Kamchatka trench system and its connection to the tectonic settings in the Okhotsk Sea via the East Sakhalin and West Derugin Shear Zones. Intervals of increased methane venting often coincide with times of increased tsunami frequency at the Hokkaido and Kamchatka coasts as well

as with volcanic and emergence events on Kamchatka and Hokkaido. Specifically the most prominent time of active methane venting at the GCSA between 1,200 and 1,800 cal. yr BP correlates with one of the most active periods of Shiveluch Volcano, Kamchatka, the widespread Jomon regression in Japan, and a three- to fourfold statistical increase in tsunami deposits at Kamchatka.

Though uncertainties remain as consequence of potential dating errors in the marine records or reliability and significance of terrestrial references, these initial results suggest that a tectonic forcing of venting activity on the Sakhalin margin may have been persistently operating during the last 7,000 yr. This may have consequences for assessing causes of venting variability on active continental margins. In addition, submarine and onshore methane emissions did likely not stay constant through the Holocene, as is presently assumed in some budget estimates for geological methane sources.