International Seminar on Natural Hazards in the Marine Area
28-29 July 2008, Bucharest, Romania

GAS SEEPS AND GAS HYDRATES IN THE BLACK SEA AND OTHER MARINE ENVIRONMENTS

Bohrmann Gerhard*[1], *Sahling Heiko, Pape Thomas, Klapp Stepahn
[1]MARUM, DFG-Research Center and Cluster of Excellence at University of Bremen, Post Box 330 440
D-28334Bremen, Germany, Phone: ++49(0)421-218-8639, Fax: ++49(0)421-218-8664, gbohrmann@marum.de

Keywords: Methane hydrates, gas seeps, greenhouse gas, gas hydrate structure, bubble release

Methane is a powerful greenhouse gas with a Greenhouse Warming Potential (GWP) 23 times that of CO_2 on a per-molecule basis. Sudden release of methane from gas hydrate therefore has the potential to affect global climate, and current hypotheses attribute past climate variations to methane release from gas hydrates in response to ocean warming and/or sea level change. However, these hypotheses have yet to be confirmed and more research is needed to evaluate hydrate response to environmental change; the fate of steady fluxes of methane from hydrate reservoirs to the seabed, ocean surface and the atmosphere; and the forcing of methane on climate change. The impact of gas hydrate on seafloor stability is important for evaluating the safety of offshore structures as well as for understanding its role in rapid release of methane, which may affect climate change. Since gas hydrate encases large volumes of methane, when destabilized, these deposits may transform the host sediment into a gassy, water rich fluid. However, any build-up of overpressure from excess gas will depend on the balance between hydrate dissociation and pressure dissipation through possible permeability barriers. Freshening of the pore water may trigger slope instabilities through a possible „quick clay" behavior, which in turns would depend on the clay mineralogy of the sediment. Although massive landslide triggered by gas hydrate destabilization has not been directly observed, various investigators have shown that vast stretches of the oceanic margins where there is evidence for major large-scale slides and slumps coincide with deep water gas hydrate horizons. There are still gaps in our understanding of the mechanisms through which decaying hydrate may affect slope stability, on the triggering mechanisms for gas hydrate decay, and on the environmental response to slope failure, in particular the possible generation of tsunamis.
Since 2002, we are performing research on the distribution of gas and gas hydrates in sediments of the Black Sea in order to understand more about the geological and oceanographic processes linked to the large reservoir of methane produced in sediments of that basin. Our focus was set on the structural analyses, quantification and the impact of the dynamic methane reservoir. Using autoclave technologies we have been able to quantify the amount of methane hydrate more accurately in seep areas. During the talk some examples from the Sorokin trough in Ukraine and from the continental margin offshore Georgia will be presented.

International Seminar on Natural Hazards in the Marine Area
28-29 July 2008, Bucharest, Romania

STABILITY OF NV CONTINENTAL SLOPE OF THE BLACK SEA IN THE AREA OF GAS HYDRATE ACCUMULATIONS

***Ion G.*[1], *Duțu F.* [1], *Ion E.* [1], *Radulescu V.* [1], *Popa A.* [1], *Stănescu R.*[2], *Batali L.* [2], *Ungureanu V.Gh.*[3]**
[1]Istitute of Marine Geology and Geoecology, 23-25 D. Onciul Street, Bucharest, Romania,
gion@geoecomar.ro

Keywords: Black Sea, multibeam bathymetry, gas hydrates, submarine landslide, turbidity currents

In the framework of national research programmes MENER and CEEX-2006, GeoEcoMar has studied the NW part of the continental slope of the Black Sea in order to asses the importance of gas hydrate accumulations and the stability of the continental slope in the area of these accumulations. To asses the stability of the continental slope, the area has been investigated by means of multibeam bathymetry and sub-bottom profiling; shallow sediments have been sampled with a gravity corer and analyzed for geotechnical charactersitics. The DTM obtained as a result of multibeam investigations revealed the pathways of turbidity currents, slide and collapse like morphologies. It has been observed an area of about 14 sqKm affected by slide processes.

In the last decades gas hydrates (methane hydrates) are seen as an important energetic natural resource, but also as a potential factor for producing geological hazards and influence the global climate.

Geological hazards produced by gas hydrates are related to the instability of the sediment pile due to the decomposition of clatrates or possible violent releases of methane in the water column, and further in the atmosphere. The decompostion of clatrates has to be rapid enough in order to trigger hazard producing phenomena. At geological scale, rapid enough, means a certain dynamics of the decomposition processes able to sudden influence the consolidation process of marine sediments. During the decomposition the porosity of host sediments decrease and the water content increase. Due to this factors the pore pressure could increase at a level able to trigger a submarine landslide.

The slide of sediments on the continental slope, due to other factors than clathrate dissociation, can also trigger gas hydrates decomposition. We can argue that the submarine landslide phenomena and gas hydrates dissociation is a linked and auto-feedback process.

The gas hydrate accumulations are placed bellow 600 m water depth, to the NE paleo-Danube canion. In this area the continental slope presents three major pathways for turbidity currents and a landslide-like sea-bottom morphology is present in the SE part of the area (about 140 sqKm, see image).

We can conclude that the NW continental slope of the Black Sea, in the area of methane hydrate accumulations, is not affected by major submarine landslides.

REFERENCES

G. Ion, G. Lericolais, H. Nouze, N. Panin, E. Ion, „Seismo-acoustics evidence of gases in sedimentary edifices of the paleo-Danube realm" CIESM Workshop Series 17, 2002, pag. 91-95

I. Lerche, E. Bagirov, "Guide to gas hydrate stability in various geological setting", *Marine and* Petroleum Geology 15, 1998, pag. 427-437

E. D. Sloan (Editor), "Clathrate Hydrates of Natural Gases", Marcel Dekker Inc, NY, 1990, 641p.