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SEISMIC AND HYDRO-ACOUSTIC EVIDENCE FOR SUBSURFACE CONTROLS OF METHANE SEEPAGE IN THE DNEPR PALEO-DELTA, BLACK SEA

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The Dnepr paleo-delta in the NW Black Sea is characterized by an abundant presence of methane gas seeps. The presence of these seeps was first registered by Polikarpov et al. in 1989. During the CRIMEA 2003 expedition 1062 new plumes were detected using a SIMRAD EK 500 echosounder. All newly found plumes are located on the transition zone of the continental shelf and continental slope in water depths between 70 and 725 meters. A further exploration of the area included the collection of hydro-acoustic and geophysical datasets. For this presentation we have used these new data to get a better insight in the relation between the presence of gas seeps, seafloor morphology and subsurface structures.

From the integration of the new datasets (multibeam bathymetric map, side-scan sonar mosaic, seep locations and several sparker, GI-gun and sub-bottom profiles) we could make some interesting observations:

1. seeps are often located at crests of sediment ridges and at edges of canyons;
2. seeps are located in areas characterised by high sea-floor backscatter values;
3. the depth limit for the presence of seeps (725 m) almost coincides with the stability boundary of pure methane hydrate;
4. there is a clear correlation between the depth of gas fronts within the sediments and the presence of seeps at the seafloor.

These observations and the apparent absence of major faults on our seismic data

suggest that the subsurface controls on methane seepage in our study area are mainly stratigraphic/sedimentary in nature.

Whether the presence of seeps at the crest lines of the sediment ridges is due to the presence of more resistant coarse sediments (i.e. location of seeps is controlled by morphology) or whether these crest lines stand out due to enhanced methane-derived carbonate cementation (i.e. the morphology is controlled by the location of the seeps) is still unclear. The exact cause of the high backscatter values in the seep areas (i.e. higher degree of cementation, presence of free-gas bubbles, slightly coarser sediment due to blow-out of the finer fraction by the gas escape) is at present still unclear and awaits further ground-truthing.

Polikarpov, G.G., Egorov, V.N., Nezhdanov, A.I., Gulin S.B., Kulev Yu. D. & M.B. Gulin, 1989. Methane gas seeps in the Black Sea: A new object of molismology. In: Molismology of the Black Sea (G.G. Polikarpov, ed.), Kiev, Nauka. 10-20.