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Gas-charged Sediments, Methane Seeps and carbonate-precipitating Microbial Mats on the NW Black Sea Shelf - preliminary Results of Research Project METROL from a Cruise using the manned Submersible JAGO

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The research cruise of the project METROL (methane turnover in ocean margin sediments: microbiological and geochemical control) to the northwestern Black Sea with RV Poseidon and the German research submersible JAGO aimed at investigating the processes of methane turnover in gas-charged sediments and at methane seeps in three shelf areas: (1) The Danube canyon representing the proximal end of the paleo-Danube delta system on the outer north western Black Sea shelf; (2) the paleo-Dniepr area, a complex canyon system southwest of the Crimea Peninsula that stretches from the shelf into the deep Black Sea Basin; (3) a seep area on the shelf between paleo-Danube and paleo-Dniepr.

All three areas were known to harbour gas seeps, while only the paleo-Dniepr area had been subjected to submersible dives before, which had discovered a field of methane seeps with spectacular carbonate chimneys and microbial mats. We used the manned submersible JAGO (operation range 400 m water depth) to explore gas seeps below and also above the chemocline in all three working areas, and to sample microbial mats, carbonates, sediments, and gas from the seeps. The second major task of the cruise was to sample gravity cores on the shelf and down the slope towards the deep basin in order to analyse pore-water diluted geochemical parameters and microbial processes responsible for methane turnover in the sediment. Diving locations and sediment sampling sites were selected according to our high-resolution bathymetric map-

ping and gas flare imaging.

Preliminary results revealed the following general picture: Most gas seeps are inconspicuous and frequently consist of a small single gas outlet releasing only 1-2 bubbles per second, although the echograms usually show marked flare signals which suggest vigorous bubble streams. Observations on the gas flux at such seeps revealed in-situ volumes of less than 1.5 ml s^{-1}. Carbonate chimney structures with associated microbial mats were found in all three working areas and thus seem to be a common feature on the north-western Black Sea shelf. However, the density and average sizes of the chimneys in the earlier reported seep field remains unique. Onboard measurements of methane in the gravity cores revealed that CH_4 is usually reaching far into the sulfate zone.