



Mineral authigenesis in sediments of pockmark sites of the Northern Congo Fan

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During RV Meteor cruise M56 in November and December 2002 pockmark structures of the Northern Congo Fan at a water depth of 3100 m were investigated by high-resolution seismic, echosounder and video survey combined with detailed geological and geochemical sampling. These investigations revealed the presence of surface and subsurface gas hydrates as well as characteristic features of fluid/gas seepage such as vesicomid clams, vestimentiferan tubeworms and huge amounts of authigenic carbonates.

In this study we focus on sites where authigenic mineral formation occurred and is still actively occurring in the form of finely disseminated precipitates. Although these mineral precipitates are not macroscopically observable they leave distinct imprints on the pore water and solid phase geochemistry. The most abundant carbonate minerals found are high Mg-calcite and aragonite. The particular mineralogy of the authigenic carbonates formed is shown to be strongly dependent on the geochemical environment of the interstitial water – the latter being a result of fluid/gas migration, gas hydrate formation and decomposition as well as metabolic activity of chemosynthetic seep biota. While Mg-calcite is by far the most abundant carbonate mineral and ubiquitously found in the investigated sediments (in particular close to the zone of anaerobic oxidation of methane), aragonite displays a close association with gas hydrates and sediment intervals inhabited by chemosynthetic macro fauna. A second important mineral group whose formation is induced by the anaerobic oxidation of methane are iron sulfides which were identified in highest concentrations at sites colonized by vesicomid clams.

We (1) discuss the significance of authigenic mineral formation at seep sites for the

biogeochemical cycling of elements and in regulating the flux of highly reactive chemical compounds – such as methane and hydrogen sulfide - across the sediment/water interface, and (2) evaluate the diagnostic value of (even finely disseminated) authigenic precipitates to reconstruct the presence of gas hydrates and to quantify past methane fluxes from fossil sedimentary records.