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The variability of fluid-escape features imaged with deep-towed sidescan sonar: morphologies, backscatter facies and controls

I. Klaucke (1), H. Sahling (2), G. Bohrmann (2), W. Weinrebe (1)

(1) IFM-GEOMAR, Leibniz Institute of Marine Sciences, Kiel, Germany, (2) Research Centre Ocean Margins, Bremen University, Bremen, Germany,
(iklaucke@DELETE_THIS.ifm.geomar.de)

During the past three years a number of areas showing signs of cold-fluid venting have been investigated with DTS-1 deep-towed sidescan sonar operated at IFM-GEOMAR. The DTS-1 uses Chirp signals with 75 and 410 kHz centre frequencies for a maximum range of 750 and 150 metres, respectively. Towing speeds of 2.5 knots allows processing the data with pixel sizes of 1.0 and 0.25 metres, respectively. Most of the collected datasets, however, are made up of 75 kHz data. Areas of investigation include the convergent western margin of North and Central America, the passive margin off West Africa, the Eastern Mediterranean Sea and the Black Sea. Fluid venting in these areas has been observed in the sidescan sonar data either through acoustic anomalies in the water column or through high backscatter anomalies on the seafloor. In most cases, seepage of cold fluids induce the precipitation of authigenic carbonates and these carbonates appear as high backscatter on high-resolution sidescan sonar records. A variety of different morphologies and acoustic facies are associated with these fluid vents including pockmarks, chemoherm structures, mud volcanoes, faults and fractures, 'freckles', gas hydrate-carbonate associations, and carbonate and mud mounds. In most cases only few of these facies are present in a given area. Their presence and distribution appears to be closely linked to the stratigraphy and tectonic regime of the study area. The detailed relationship between the geological setting and the presence of different types of fluid-escape features is not yet well studied, but the amount of gas present in the subsurface, the presence and thickness of mud and/or salt in the subsurface, the presence of compression or extension, and the amount of overburden appear to be some of the key factors. The link between these factors and different types of

fluid-escape features will be shown and discussed.