Accurate Identification and Delineation of Structured Benthic Communities (Cold Seeps) Using Double Coverage Acoustic Backscatter, With Water Column Data and Piston Coring

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ABSTRACT

Multibeam Surveys have been used for many years to identify and target cold water seeps to obtain geochemical samples able to identify the existence of any hydrocarbon systems present. This is a valuable de-risking of the more costly seismic surveys and wildcats to follow in the exploration sequence. Typically these early surveys needed to provide enough opportunities to obtain sufficient samples from below the methane/sulphate interface to represent accurately the hydrocarbon geochemistry using 6m piston cores. The surveys did not identify all seeps and the coring of the best seeps assumed present was hit and miss with multiple cores on preferred sites. A return of say 1 in 6 successful cores that obtained samples in a seep rich area was considered a success. Over the last 10 years there has been significant improvements in multibeam quality, double pinging and 4 times as many transmitters was reflected in far better resolution. The comparisons of penetration between 30kHz and 12kHz deepwater systems, the number of successful and non-successful cores and in particular the drop positioning in regard to the high backscatter seep signature revealed a great deal about seep structure and the positioning of the methane/sulphate interface. The needs have changed. Protection of these unique chemosynthetic systems takes a higher profile and a full survey of all such structures is needed to ensure that offsets to development are hazard free for both the community and the development. Recent surveys of the Gran Fuerte Area of the Colombian Caribbean had such a secondary goal to go beyond the exploration target and had a remit to map all the chemosynthetic communities that met a minimum size and activity criteria. The survey method employed relied on a double (200%) coverage of a targeted area and new processing of the backscatter data recovered. The results were correlated with a large number of seabed cores aimed outside the seep boundaries but close enough to obtain suitable geochemical data. Two drift camera surveys of the seabed covered more than a dozen target seeps plus the identification and correlation with gas plumes in the water column data was used. The environmental map identified over 200 seeps ranging from over 200 hectares to only 0.16 hectares in extent. The elimination of artefacts and the increased signal to noise ratios of the backscatter data allowed accurate plotting of seep boundaries and categorization of seeps into an activity catalogue.