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Thermogenic Gas Hydrates In The Northern Cascadia Margin

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ABSTRACT

Gas hydrates are distributed world wide on continental margins and in polar regions. Most of the known hydrates contain methane gas of bacterial origin, and the occurrence of thermogenic hydrates is comparatively rare. This paper presents new results of investigations of thermogenic gas hydrates that were discovered on the sea floor at a hydrocarbon seep site in Barkley Canyon, about 100 km off shore Vancouver Island. The site was surveyed using a remotely operated submersible to collect hydrate fragments and sediment samples in order to study the flux of carbon at the seep site. Analysis of the gas released from the dissociated hydrate samples indicates the presences of significant quantities of higher (C2-C5) hydrocarbons. Methane $\delta^{13}C$ values were – 43 , similar to values from thermogenic sites in the Gulf of Mexico. Sediment samples were obtained with a novel sea floor probe that extracted pore water and stored it at in situ pressure. Analysis of the pore water indicates similar hydrocarbon composition as for the hydrates, and the methane concentrations were as large as 5 mM. Although there was no gas venting at the sea floor, the sediments contain small quantities of light oil that was released when the sediments were disturbed. Oil streaks were also observed in the hydrate outcrops on the sea floor. The overall distribution of thermogenic and biogenic gas hydrates on the margin will be described, and comparisons will be made between thermogenic sites in the Gulf of Mexico and the site in Barkley Canyon. The relationship of the sea floor seep site and migration paths for fluids and methane will be inferred from limited seismic sections in the region.