Deep-Sea Gas Hydrates at the Northern Cascadia Margin

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ABSTRACT

Gas hydrates are solid ice-like structures in which gas molecules (largely methane) are trapped within cages of water molecules. The stability of natural gas hydrates is mainly affected by temperature and pressure. Gas hydrates represent a large potential energy resource but may also play an important role in global climate change and as geological hazards. On seismic sections, hydrates can be detected primarily by the occurrence of a bottom-simulating reflector (BSR). The BSR is thought to represent the base of the hydrate stability field, marking the transition between hydrate-bearing sediments above and the occurrence of free gas below the interface. Gas hydrates were first observed in seismic data at the Northern Cascadia Margin acquired in 1985 and have been investigated intensively over the last decade by the hydrate research group of the University of Victoria and the Geological Survey of Canada.

Recent research activity is concentrated around an active vent field, first discovered in 1997. As part of a 3-D seismic survey carried out in 1999, this vent field was imaged with high-resolution 3-D single-channel seismic data. The vent field is characterized by several blank zones of reduced seismic reflectivity. This vent field was also the target of a piston corer cruise in July 2000. Gas hydrate was recovered at four sites within an active vent at depths from 3 - 8 m below the seafloor. This was the first recovery of marine gas hydrates in Canadian waters. The remotely operated submersible ROPOS was deployed at the most prominent vent in September 2000. Seafloor carbonates were observed as platy pavement but also as disseminated chunks within the sediments. Typical cold-vent biological communities (e.g. tube worms, clams) are present but not abundant as observed on other similar vent sites. Venting might be strongly episodic with a currently more quiet phase.