Scientists Gain New Insights Into 'Frozen' Methane Beneath Ocean Floor

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An international team of scientists supported by the Integrated Ocean Drilling Program (IODP) has completed a unique research expedition aimed at recovering samples of gas hydrate, an ice-like substance hidden beneath the seafloor off Canada's western coast.

Gas hydrate, a mixture of water and mostly methane, is believed to occur under the world's oceans in great abundance, but it quickly "melts" once removed from the high pressure and cold temperatures of its natural environment, making it very challenging to recover and analyze.

"We're interested in gas hydrate because we believe these deposits have played an important role in ancient global climate change," explains Michael Riedel of Natural Resources Canada's Geological Survey of Canada, IODP Expedition 311's co-chief scientist.

"This expedition is the first to explore a transect of deep drilling research sites across the Cascadia Continental Margin and will yield new data that will help us understand the deep origin of the methane that composes the gas hydrate, how the methane is transported into the sediments where gas hydrate exists, and how methane is eventually released into the ocean, and possibly, into the atmosphere where it could impact climate."

"What we've found will fundamentally change how we investigate the impact of gas hydrate deposits," confirms IODP co-chief scientist Timothy S. Collett of the U.S. Geological Survey, Denver, Colo.

"Expedition 311 has shown that the occurrence of gas hydrate is much more complex than predicted. Instead of finding gas hydrate concentrated in one layer," he explains, "near the base of the zone where it is stable, higher concentrations of gas hydrate were found within coarse-grained sand layers throughout core samples from most of the sites drilled."

Scientists and engineers aboard IODP's U.S.-sponsored research drilling vessel, the JOIDES Resolution, drilled hundreds of meters below the seafloor and successfully retrieved gas hydrate in long sediment cores.

More than 1,200 meters of sediment core samples were recovered from beneath the seafloor during this 37-day expedition. Once core samples are brought onto the ship, marine laboratory specialists work quickly to scan them using various sensors and computers to find the gas hydrate, which is unstable at the surface.

Most previous research on the Cascadia Continental Margin has focused on conducting detailed, remote sensing studies to image gas hydrate in the oceanic sediments. In past research efforts, gas hydrate has been recovered from the Cascadia Margin area using shallow sediment coring systems that allowed only the upper few meters of sediment to be sampled.

Among the discoveries of Expedition 311 was a thick section of gas hydrate lying near the seafloor surface beneath an active vent site, known as the 'bull's-eye vent,' where methane gas naturally seeps from the seafloor.

This vent site is one of many similar sites observed along the Cascadia Margin and scientists are just starting to understand their role in the overall history of the margin. The episodic nature of the venting and the potential link to earthquake activity, as well as the possible impact on gas

release into the ocean and atmosphere, will be researched for many years to come, when future drill site observatories will be linked with the NEPTUNE cable observatory system.

Scientists first became interested in gas hydrate in 1982, when it was discovered during a research leg of the Deep Sea Drilling Project, one of two U.S.-sponsored scientific drilling programs that predate IODP. The samples were retrieved from the Middle American Trench region, off the Pacific coast of Guatemala. Since then, gas hydrate has been the focus of numerous studies.