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Surface Deformation and Distribution of Venting-Related Carbonates along Hydrate Ridge, Oregon Accretionary Prism

Details

Meeting	2000 Fall Meeting
Section	Ocean Sciences
Session	Geosphere-Biosphere Coupling: Cold Seep Related Carbonate & Mound Formation & Ecology III Posters
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Abstract

Hydrate Ridge is a gas hydrate-bearing seaward-vergent thrust-anticline located near the toe of the accretionary prism of the Cascadia subduction zone. As part of the 1999 TECFLUX program, we collected high-resolution (0.5 and 1.0 m pixel) sidescan sonar imagery and 4.5 kHz sub-bottom profiles to determine the surface morphology, shallow subsurface structure, and cold-seep carbonate distribution across the Hydrate Ridge region. Samples taken during ALVIN dives and imagery from tv-camera tows have confirmed that most of the high backscatter patterns interpreted on the sidescan imagery are carbonate accumulations. Interpretation of the sidescan imagery is facilitated by draping it over high-resolution (20 m pixel) bathymetry, collected by MBARI in 1998. Together, these data indicate that the largest accumulations of carbonate are focused near the northern summit of Hydrate Ridge, where the amplitude of tectonic folding is greatest and venting is focused by bending-moment normal faults in the crest of the anticline. Additional smaller carbonate accumulations are located near the crests of smaller subsidiary anticlines. The surface and shallow subsurface structural style of the ridge is best seen at the transition between the northern summit and the saddle, where NE-SW trending lineaments are imaged. These lineaments resemble fractures, which may be propagating toward a growing northern summit. Alternatively, some of these lineaments may be erosional in nature, as upslope debris makes its way from the summit toward the saddle and the basin to the east. If erosional pathways, however, they may be utilizing a pre-existing fracture fabric. Shallow subsurface extension of the ridge at the northern summit may be the result of continued folding from increasing slip along the inferred seaward-vergent thrust fault beneath the ridge. Shallow extension in the saddle region, however, where the surface slope is lower and the anticline is less tightly folded, may result from local conditions that promote low cohesion and low strength along bedding planes, due to trapped fluids or gases in the subsurface.

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