1999 Fall Meeting
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HR: 0830h
AN: **OS21B-04**
TI: Distribution and Morphology of Venting-Related Carbonates near Hydrate Ridge, Oregon Margin, Based on Sidescan Sonar and Multibeam Imagery
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AB: As part of the TECFLUX project we conducted a high-resolution deep-towed sidescan sonar survey of the central Oregon continental slope centered on Hydrate Ridge. We used the SM-30, a modified SeaMARC 1A system, and conducted a 22 x 30 km survey of the slope from the 400 m contour down to the abyssal plain. The relatively low (30 kHz) system frequency allowed penetration of the upper hemipelagic sediments to reveal subsurface reflectivity. The main survey was conducted using a 1km swath width, resulting in a pixel size of $\sim$ 1m. A second survey mapped the upper part of the ridge at 0.5 m resolution. Together, these

data present a remarkable view of fluid venting proxies across a complex structural zone encompassing compressional, gravitational, and strike-slip structural styles. We have merged these data with Simrad EM-300 30 kHz multibeam data collected in 1998 to produce 3D imagery to aid interpretation of morphological and structural characteristics of this gas-hydrate bearing province. We interpret the backscatter patterns in this regional survey to indicate carbonate deposition associated with extensive fluid migration in this accretionary margin. Well-defined semi-circular bright spots in the sonar data are aligned along major structures, and are rare in the intervening basins. In some cases, no surface expression associated with these bright spots was found on the seafloor during ALVIN dives and camera tows, but highly elevated methane concentrations were present relative to nearby sites (Heeschen et al., this volume). We interpret these results as evidence for upward migration of gas-bearing fluids and probable subsurface carbonate deposition. These pockmark-style features do not occur at depths shallower than the upper limit of gas hydrate stability, which at this site occurs between 500 and 600 m water depth. On the slope region shallower than 500m, fluid flow and carbonate deposition are imaged as bright linear features along structural trends, and verified with dive data from mid-1990's DELTA dives. On Hydrate Ridge itself, high reflectivity zones are concentrated along its northern summit in a series of round mounds with 10's of meters of bathymetric expression. On the south summit, these features are less prominent, except for a single large structure. Active fluid venting has been observed associated with these features in both the northern and southern summits during recent Alvin dives to the area. These high reflectivity zones are semi-circular in planform, and annular rings within them suggest episodic growth and/or dissolution events. The backscatter data suggest that secondary venting is localized along slumps and normal faults on the west flank of the ridge. More diffuse flow between the main vent sites is suggested by moderate backscatter that decreases away from the main vents. Larger vent sites are associated with "mud volcano" constructional features along the axis of a breached anticline that piggybacks on the main ridge. These new data provide insight into the complex interplay between tectonic structure, gravity, fluid migration, and

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