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Deep Sea Shell Taphonomy: Interactive benthic experiments in hydrate environments of Barkley Canyon, Ocean Networks Canada.

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In order to quantify and track the rates and processes of modification of biogenic carbonate in gas hydrate environments, and their possible environmental/ecological correlates, ongoing observations of experimentally deployed specimens are being made using a remotely controlled crawler with camera and sensors. The crawler is connected to NEPTUNE Canada, an 800km, 5-node, regional cabled ocean network across the northern Juan de Fuca Plate, northeastern Pacific, part of Ocean Networks Canada. One of 15 study areas is an environment of exposed hydrate mounds along the wall of Barkley Canyon, at ∼865m water depth. This is the home of a benthic crawler developed by Jacobs University of Germany, who is affectionately known as Wally. Wally is equipped with a range of sensors including cameras, methane sensor, current meter, fluorometer, turbidity meter, CTD, and a sediment microprofiler with probes for oxygen, methane, sulphide, pH, temperature, and conductivity. In conjunction with this sensor suite, a series of experiments have been designed to assess the cycling of biogenic carbon and carbonate in this complex environment. The biota range from microbes, to molluscs, to large fish, and therefore the carbon inputs include both a range of organic carbon compounds as well as the complex materials that are "biogenic carbonate". Controlled experimental specimens were deployed of biogenic carbonate (Mytilus edulis fresh shells) and cellulose (pieces of untreated pine lumber) that had been previously well characterized (photographed, weighed, and numbered, matching valves and lumber kept as controls). Deployment at the sediment/water interface was in such a way to maximize natural burial exhumation cycles but to minimize specimen interaction. 10 replicate specimens of each material were deployed in two treatments: 1) adjacent to a natural life and death assemblage of chemosynthetic bivalves and exposed hydrate on a hydrate mound and 2) on the muddy seafloor at a distance from the mound. On retrieval, the specimens are being further studied for net material loss, surface alteration, microbial recruitment, endo- and epibionts, and microstructural and chemical modification. Understanding the production and cycling of carbon across the sediment/water interface in this environment will help elucidate the formation and evolution of these hydrate deposits, their distribution through time, and the ecological and taphonomic feedbacks they generate.