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## **Methane Seep, Chemosynthetic Communities, and Carbonate Crusts/"Towers" and Chimneys on the Kuroshima Knoll, Offshore Ryukyu Islands**

A number of methane-seep sites were discovered atop the Kuroshima Knoll at the depth of water of ~650-700m, associated with large chemosynthetic colonies by the submersible dives of Dolphin-3K and Shinkai-2000 during the Cruise NT01-05 April-May, 2001. Methane seepages are observed in narrow area within 10 meters in the eastern part of the Knoll, where E-W trending faults and fractures had been suspected/confirmed from previous dives. Carbonate crusts and irregularly shaped "towers", a few meters high, and chimneys, 5-15cm in diameter and 30-70cm high, are abundant in and around seep sites. Carbonate crusts and "towers" are mostly composed of fragments of clams, mud-clasts, and broken chimneys, while chimneys largely comprise fine crystalline dolomite with clays/silts. Kuroshima Knoll is a flat-topped knoll, but valley-like eroded depressions with a few to 10 meters deep were common in the eastern part, where carbonate "towers" characterizes the micro-morphology. Occurrence and composition of "towers" suggest that they were originally formed within shallow subsurface of sulfate reduction zone, then excavated by strong bottom current of Kuroshio. To the contrary, dolomite chimneys were formed in the water-sediment interface with higher methane flux, causing strong anoxic condition and higher Mg/Ca ratio. Ten days temperature measurements at seep site have revealed ~12 hours warm-cool cycle between 7 and 9°C. This may imply that the seepage is synchronous with and forced by tidal change. The relation between methane seep and gas hydrate has not been confirmed, but planned seismic surveys are expected to identify BSRs in this area.