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Richard B. Coffin<sup>1</sup>, John W. Pohlman<sup>1</sup>, Kenneth S. Grabowski<sup>1</sup>, David L. Knies<sup>1</sup> (1) Naval Research Laboratory, Washington, DC

## **Analysis of Methane Hydrate Formation**

Methane hydrates are abundant in many regions of the world coastal ocean sediment. International research has commenced with a primary goal to obtain the methane in these hydrates as an energy source. Methane in hydrates originates from geothermal and biogenic sources. Characteristically the geothermal methane is associated with other gases ranging from ethane to hexane, while biogenic methane is 99% methane without the presence of heavy gases. As a result there is a difference in the hydrate structure during formation, where biogenic methane forms with structure I and thermogenic gases forms with structure II. Understanding the sources of the gas will provide necessary information for the approach to gas mining, gas purification and hydrate stability. Carbon isotope analysis is being used in hydrates and related carbon pools to show the variation in methane sources at different regions. Data from the Haakon-Mosby Mud Volcano in the Norwegian-Greenland Sea, Texas-Louisiana Shelf in the Gulf of Mexico, and the Cascadia Margin in the Pacific Ocean will be presented. Comparisons of stable and radio carbon isotope analyses from the different regions will be provided for methane in the hydrates, organic matter in sediments, carbonate in the sediments, and phospholipids extracted from the bacterial assemblage.