Sampling of Methane Bubble Plumes and Solid Gas Hydrate on the Cascadia Margin, Pacific Northwest

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The Cascadia Margin along California, Oregon, and Washington is host to hundreds of offshore methane seeps that produce bubble streams that ascend through the water column. In addition to the bubble streams, seismic reflection studies have detected the presence of extensive methane hydrate deposits beneath the seafloor. There are also a few sites along the Cascadia Margin where hydrate deposits are exposed and visible on the seafloor. During an expedition in 2016, our group used an ROV to collect uncontaminated samples of the bubble stream gas at several Cascadia Margin sites using special gas-tight bottles. Although we have successfully obtained samples of the bubble streams, the question remains as to whether the bubble streams are produced by the dissociation of hydrate, or instead represent free gas ascending through the sediment. We have developed a new sampler in which small samples of hydrate can be hermetically sealed into a small gas-tight volume in-situ while incorporating only a small amount of ambient seawater. The hydrate is then allowed to dissociate in the sample volume without exposure to air or other contaminates. During a return expedition to the Cascadia margin in June 2018 we successfully sampled solid methane hydrate at two sites using this new sampler and also collected additional samples of the free gas bubble streams. The paper will compare the results from these hydrate collections with the composition of the free gas.

Keywords: methane, hydrate, Cascadia Margin

