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Gas Hydrate Dissociation in the Ocean DEVIN CONROY, STEFAN LLEWELLYN SMITH, U.C. San Diego — Methane gas is known to exist in extremely large quantities below the sea floor in the sediment of the deep and cold oceanic and in permafrost regions. Due to the large hydrostatic pressure and cool temperatures the gas reacts with the surrounding water to form a crystalline substance known as a gas hydrate. The fate of these reserves is very important to climate on earth because methane is a much more efficient greenhouse gas then carbon dioxide. The dissociation process in general can occur by either a decrease in pressure or an increase in temperature. In this study we concentrate on the latter. Once the hydrate dissociates, water and free gas remain above the phase boundary, occupying a larger volume than the original solid, and are be transported through the sediment. We have modeled this physical mechanism using volume averaged equations in a porous medium with a coupled two-phase flow. The movement of the phase boundary, which is proportional to the rate of heat transfer to this interface, is modeled as a Stefan type melting problem. The resultant governing equations are solved numerically, using a front fixing method to fix the phase boundary, to determine the rate of gas flux through the sediment and the dissociation rate.

Devin Conroy
U.C. San Diego

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