Models of the global distribution of methane in the ocean and its response to climate warming

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I will show the results of two new models of the global ocean methane reservoir. One is based on the etopo-2 bathymetry of the sea floor, and produces detailed maps of the distribution of methane. The other is based on the same column model for methane dynamics as the first, but it is embedded in the CLIMBER model for global climate and carbon cycle from the Potsdam Institute for Climate Impact Research, PIK. In both models we parameterize the escape of methane gas through the sediment column based on the bubble fraction that the hydrate produces upon melting at the base of the stability zone. We find that if we take 10% as the critical bubble volume, the amount of releasable methane is low, a few 10's of Gton C from 3 °C of warming. However, the homogeneity of the column model upon which this analysis is based will tend to underestimate the amount of methane stored in high-concentration deposits, and thus to underestimate the releasable fraction of the methane. If the critical bubble volume is taken to be 2.5%, then a substantial portion of the methane escapes, affecting climate through the buildup of CO2 in the atmosphere as well as potentially by increasing the concentration of methane in the atmosphere through the duration of the melting event.