Geophysical Research Abstracts,
Vol. 10, EGU2008-A-04097, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-04097
EGU General Assembly 2008

Gas Hydrate Stability in the Gulf of Cadiz, Potential and Evolution

V. Magalhães (1,2,3), B. Buffett (1), D. Archer (1), L. Pinheiro (2)

(1) Department of the Geophysical Sciences, The University of Chicago. 5734 S. Ellis Avenue, Chicago IL 60637. USA, (2) Departamento de Geociências and CESAM, Universidade de Aveiro, 3810-193 Aveiro, Portugal, (3) CIMAR/CIIMAR – Centro Interdisciplinar de Investigação Marinha e Ambiental and Dep. Geologia Marinha, INETI, 2721-866 Alfragide, Portugal (vmagalhaes@uchicago.edu)

Gas hydrates have been proven at 3 mud volcanoes in the Gulf of Cadiz and past occurrences have been interpreted from heavier ^{18}O isotopic compositions of methane-derived authigenic carbonates (MDAC) from several fossil seepage sites. The estimated ages of the MDAC indicate formation over discrete episodes that correspond to periods of rapid paleoceanographic changes (such as the onsets of glacial stages terminations).

In this work, the potential gas hydrate system in the Gulf of Cadiz is modeled assuming gas compositions ranging from two end-members: from a pure biogenic origin to a mixture of biogenic and thermogenic gases (80 to 20%). The depths of the Gas Hydrate Stability Zone (GHSZ) were calculated for different paleoceanographic scenarios: present day conditions, with variable intensities of the Mediterranean Outflow (MO), and estimated conditions for the Last Glacial Maximum.

Results indicate a significant reduction (more than 46%, for pure methane gas composition; and by more than 35%, for gas compositions with 20% of heavier hydrocarbons) of the hydrate stability zone during the transition from glacial to interglacial conditions. At several sites the stability zone disappears entirely for both gas compositions. In addition, the temperature increase associated with the beginning of the MO influence can reduce the depth of the GHSZ by more than 23% and 17%, considering respectively pure methane composition or a mixed gas with 20% of heavier

hydrocarbons.

Increases in the seafloor temperature associated with these two processes can efficiently trigger episodes of dissociation of potential gas hydrates that would have significant implications in both slope stability along the margins and intense fluxes of methane rich fluids to shallow sediments or even into the seabottom resulting in cold seep systems recorded by the MDAC.