Geophysical Research Abstracts
Vol. 13, EGU2011-9420-2, 2011
EGU General Assembly 2011

Estimation of advective methane flux in gas hydrate potential area offshore SW Taiwan and its tectonic implications

Pei-Chuan Chuang (1,2), Tsanyao Frank Yang (1), Klaus Wallmann (2), Saulwood Lin (3), Yunshuen Wang (4), and San-Hsiung Chung (4)

(1) Department of Geosciences, National Taiwan University, Taipei, Taiwan (d95224001@ntu.edu.tw), (2) Leibniz-Institut für Meereswissenschaften (IFM-GEOMAR), Kiel, Germany, (3) Institute of Oceanography, National Taiwan University, Taipei, Taiwan , (4) Central Geological Survey, MOEA, Taipei, Taiwan

With the discoveries of Bottom Simulating Reflectors (BSRs), large and dense chemosynthetic communities and rapid sulfate reductions in pore space sediments, gas hydrates may exist in offshore southwestern Taiwan. Methane concentrations in pore space sediments have been measured to investigate if fluids and gases are derived from dissociation of gas hydrates. Very high methane concentrations and very shallow depths of sulfate methane interface (SMI) imply the high methane flux underneath the seafloor. Linear sulfate gradients, low total organic carbon (TOC) have been combined to describe the process of anaerobic methane oxidation (AMO) and calculate the diffusive methane flux in Chuang et al. (2010). However, the appearance of concave (or non-linear) profiles of sulfate in some cores might indicate advective fluid flows. Hence, the methane flux may be much greater under advective conditions. In this study, numerical transport-reaction models were applied to calculate the methane flux including diffusion and advection of dissolved sulfate and methane and the anaerobic methane oxidation of methane. According to the modeled results of three giant piston cores (MD05-2911, MD05-2912 and MD05-2913) collected during the r/v Marion Dufresne cruise in 2005, gas bubbling or bioirrigation may occur in these site. Values of the methane flux ranging from 1.91 to 5.17 mmol m-2yr-1 and upward fluid flow velocities around 0.05-0.13 cm yr-1 are related to different geologic structures in the active continental margin. Site MD05-2912 is located on the Tainan Ridge where anticlines and blind thrusts are the dominate structures. Site MD052911 is on the Yung-An Ridge characterized by emergent and imbricate thrusts.