Geophysical Research Abstracts
Vol. 14, EGU2012-7187-2, 2012
EGU General Assembly 2012

Two Dimensional Fluid Flow Models Offshore Southwestern Taiwan

L.W. Chen, S.K. Wu, W.C. Chi, C.S. Liu, C.T. Shyu, and Y.S Wang
Province Of Taiwan (mmammamma@gmail.com)

Fluid migration rates are important parameters for understanding the structural characteristics and evolution of the crustal tectonics and hydrocarbon exploration. However, they are difficult to measure on the seafloor. Dense distribution of bottom-simulating reflectors (BSRs) as the index of fluid existence to shed light on our study of the fluid migration. In this study, We acquired 2D fluid flow patterns in two potential gas hydrate prospect sites offshore southwestern Taiwan, and respectively modeled across Yung-An and Formosa ridge in N-S and E-W direction southwestern Taiwan. Temperature field in the shallow crust is used as a tracer to examine the fluid flow patterns. We use thermal information directly measured by thermal probes and topography data to develop the theoretical 2D temperature field using a thermal conduction model, which was derived from a finite element method.

The discrepancy between the observed temperature data and the conductive model is attributed to advection heat transfer due to fluid migration. For Yung-An Ridge, we found the BSR-based temperatures are about 2oC higher than the conduction model in the following zones: (1) near a fault zone, (2) on the eastern flank where there are strong seismic reflectors in a pseudo 3D seismic dataset, (3) a seismic chimney zone. We interpret that there is possible active dewatering inside the accretionary prism to allow fluid to migrate upward here. For Formosa Ridge in the passive margin, the BSR-based temperatures are about 2oC colder than the theoretical model, especially on the flanks. We interpret that cold seawater is moving into the ridge from the flanks, cooling the ridge, and then some of the fluid is expelled at the ridge top. The shallow temperature fields are strongly affected by 2D or even 3D bathymetry effects. But we can still gain much information regarding fluid flow patterns through modeling. In the near future, we will extend such study into 3D.

Keywords: fluid migration, geothermal gradient, finite-element, bottom-simulating reflectors