Geophysical Research Abstracts
Vol. 16, EGU2014-1172, 2014
EGU General Assembly 2014

GAS HYDRATE AND PORE PRESSURE

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Many efforts have been devoted to quantify excess pore pressures related to gas hydrate dissociation in marine sediments below the BSR using several approaches. Dissociation of gas hydrates in proximity of the BSR, in response to a change in the physical environment (i.e. temperature and/or pressure regime), can liberate excess gas incrising the local pore fluid pressure in the sediment, so decreasing the effective normal stress. So, gas hydrate dissociation may lead to excess pore pressure resulting in sediment deformation or failure, such as submarine landslides, sediment slumping, pockmarks and mud volcanoes, soft-sediment deformation and giant hummocks. Moreover, excess pore pressure may be the result of gas hydrate dissociation due to continuous sedimentation, tectonic uplift, sea level fall, heating or inhibitor injection. In order to detect the presence of the overpressure below the BSR, we propose two approachs. The fist approach models the BSR depth versus pore pressure; in fact, if the free gas below the BSR is in overpressure condition, the base of the gas hydrate stability is deeper with respect to the hydrostatic case. This effect causes a discrepancy between seismic and theoretical BSR depths. The second approach models the velocities versus gas hydrate and free gas concentrations and pore pressure, considering the approximation of the Biot theory in case of low frequency, i.e. seismic frequency. Knowing the P and S seismic velocity from seismic data analysis, it is possibile to jointly estimate the gas hydrate and free gas concentrations and the pore pressure regime. Alternatively, if the S-wave velocity is not availbale (due to lack of OBS/OBC data), an AVO analysis can be performed in order to extract information about Poisson ratio. Our modeling suggests that the areas characterized by shallow waters (i.e. areas in which human infrastructures, such as pipelines, are present) are significantly affected by the presence of overpressure condition. Moreover, the knoweledge of seismic velocities can be considered an powerful tool to detect the overpressure in case that the pore pressure is equal to the hydrostatic pressure plus the 50% of the difference between the lithostatic and the hydrostatic pressure. In conclusions, an accurate analysis of the BSR nature and the pore pressure are required to improve the reliability of the gas-phase estimation for different target, such as gas hydrate and free gas exploitations and environmental studies.