THE INFLUENCE OF TECTONIC AND SEDIMENTARY PROCESSES ON BSR DEPTH AND GAS HYDRATE STABILITY AT THE MAKRAN ACCRETIONARY SYSTEM, OFFSHORE PAKISTAN

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ABSTRACT
The depth of Bottom Simulating Reflectors below seafloor, being mainly the function of pressure and temperature, is a useful tool to investigate local variations of the physical subsurface conditions. We present examples of anomalous BSR topography from the Makran accretionary prism in order to investigate the role of tectonic and sedimentary processes upon gas hydrate stability. Along the Sixth Ridge, the apparent decoupling between an east-west variation of tectonic-sedimentary interplay and the BSR depth indicates that the BSR adapts dynamically to both uplift and sediment deposition. Near the deformation front, emerging thrust faulting as well as the development of the frontal fold influence gas hydrate stability. Key factors here are uplift, stretching of shallow strata, and excess heat flow caused by fluid advection. In contrast, the temporal evolution of the lower boundary of gas hydrate stability zone at a slump depends on the propagation rate of pressure and temperature signals. Investigating the interplay of controlling mechanisms at individual anomalies brings us a step closer to understanding the behavior and distribution of gas hydrate and gas in this unique system.

Keywords: BSR, tectonic uplift, slumping, Makran

INTRODUCTION
In regions where gas hydrate is present in the subsurface, Bottom Simulating Reflectors (BSRs) in seismic data are interpreted as the base of gas hydrate stability zone [1]. Since gas hydrate stability is primarily a function of temperature and pressure [2], BSR topography can be used to infer changes in the physical subsurface conditions. In active geological settings, high deformation and sedimentation rates affect these properties significantly. Thus the depth of BSR below seafloor (bsf) provides means to investigate the extent and local importance of various tectonic and sedimentary processes. BSRs are observed widespread in the Makran Accretionary System. In addition to subduction and accretion, and related compression / uplift [3], this area is characterized by a very high sedimentation rate [4-5].

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