Fault Controlled Focused Fluid Flow in the Vicinity of NGHP-01-10 site, Krishna-Godavari Basin, Bay of Bengal

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Drilling/coring activities onboard JOIDES Resolution for hydrate resource estimation has recovered 128 m massive hydrates at the NGHP-01-10 site, Krishna Godavari basin, Bay of Bengal, India[1]. Geological and geochemical analysis of long cores acquired onboard Marion Dufresne in the later experiment show the evidence of paleo-cold seep in the vicinity of NGHP-01-10 site[2]. In this presentation, we speculate about geological factors that might control the observed gas hydrate accumulation and cold seep in the vicinity of NGHP-01-10 site. In our opinion, large scale fault system near NGHP-01-10 play an important role in perturbing the background geo-thermal gradient due to focused fluid flow. The fluid flow through the fault system in turn controls the growth and accumulation of gas hydrate and formation of cold seep. We conclude that massive hydrates accumulation in the vicinity of NGHP-01-10 site is localized in the fault zones and may show significant lateral variations. Future plans of hydrate exploitation in KG offshore basin will require careful considerations.

Datasets used in this study comprise multi-channel seismic, high-resolution sparker, bathymetry, and sub-bottom profiler around NGHP-01-10 site. Fault pattern in the vicinity of NGHP-10-01 is jointly interpreted through imaging of all datasets. Velocity model from multi-channel seismic shows increase in velocity near the faults suggesting increased concentration of hydrates. The velocity model also shows a drop in interval velocity below the gas hydrate stability zone suggesting presence of free gas. Heat flow and geo-thermal gradient (GTG) are calculated using depth and temperature of the seafloor and the BSR interpreted on seismic depth sections. Uncertainties estimates in GTG are constrained by logging/coring data from NGHP-01-10. We observe an increase in GTG by 15-20 % at the top of the mound close to fault system. This increase in GTG is attributed to advection of warm fluids through the fault system.

References

[1] Collett, T. S., et al., Results of the Indian National Gas Hydrate Program Expedition 01 initial reports, *Director General of Hydrocarbons, Ministry of Petroleum and Natural Gas, New Delhi* (2008).

[2] Mazumdar, A., et al., Evidence of paleo–cold seep activity from the Bay of Bengal, offshore India. *Geochemistry Geophysics Geosystems* ***10(6)***, 15 pp. (2009).