

Thermodynamic state of gas hydrate in the Krishna-Godavari Basin inferred from well log analysis

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ABSTRACT

We examined the in-situ hydrate saturations and salinities of gas hydrate-bearing sediments at National Gas Hydrates Project (NGHP) Site 01-10A in the Krishna-Godavari Basin, offshore India, to determine the thermodynamic state of the hydrate system. We determined hydrate saturations using logging-while-drilling (LWD) data in an iterative application of Archie's Law. The in-situ salinities were calculated from core-derived salinities by assuming that salts remained in the pore space, that the hydrate dissociated completely, and that pore volume remained constant with hydrate formation and dissociation. The in-situ salinity was compared to that required for three-phase equilibrium. We interpret two regions between 45 – 90 and 123 – 160 meters below seafloor (mbsf) where the system is at three-phase equilibrium at Site 01-10A.

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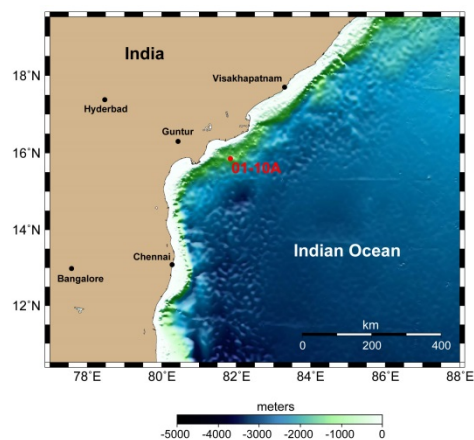


Fig. 1: NGHP Site 01-10A is located approximately 60km off the eastern coast of India in about 1050m of water (IOC et al., 2003).

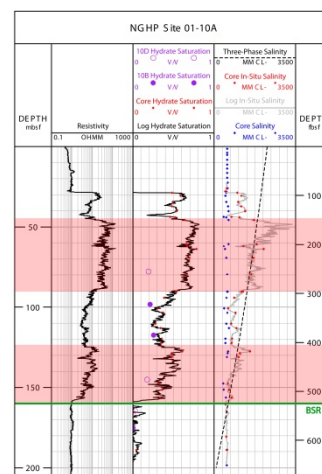


Fig. 2: Results from NGHP Site 01-10A. Track 1: LWD resistivity; Track 2: Resistivity (black line) and salinity (red dots) interpolated, Archie-derived hydrate saturation and the hydrate saturation calculated from pressure cores recovered from Site-01-10B and 01-10D (NGHP Expedition 01 Scientists, 2007); Track 3: Core-derived salinity (NGHP Expedition 01 Scientists, 2007), resistivity (grey line) and salinity (red dots) interpolated in-situ salinities, and the salinity required for three-phase equilibrium (dashed line). Red boxes show qualitatively interpreted three-phase equilibrium zones.

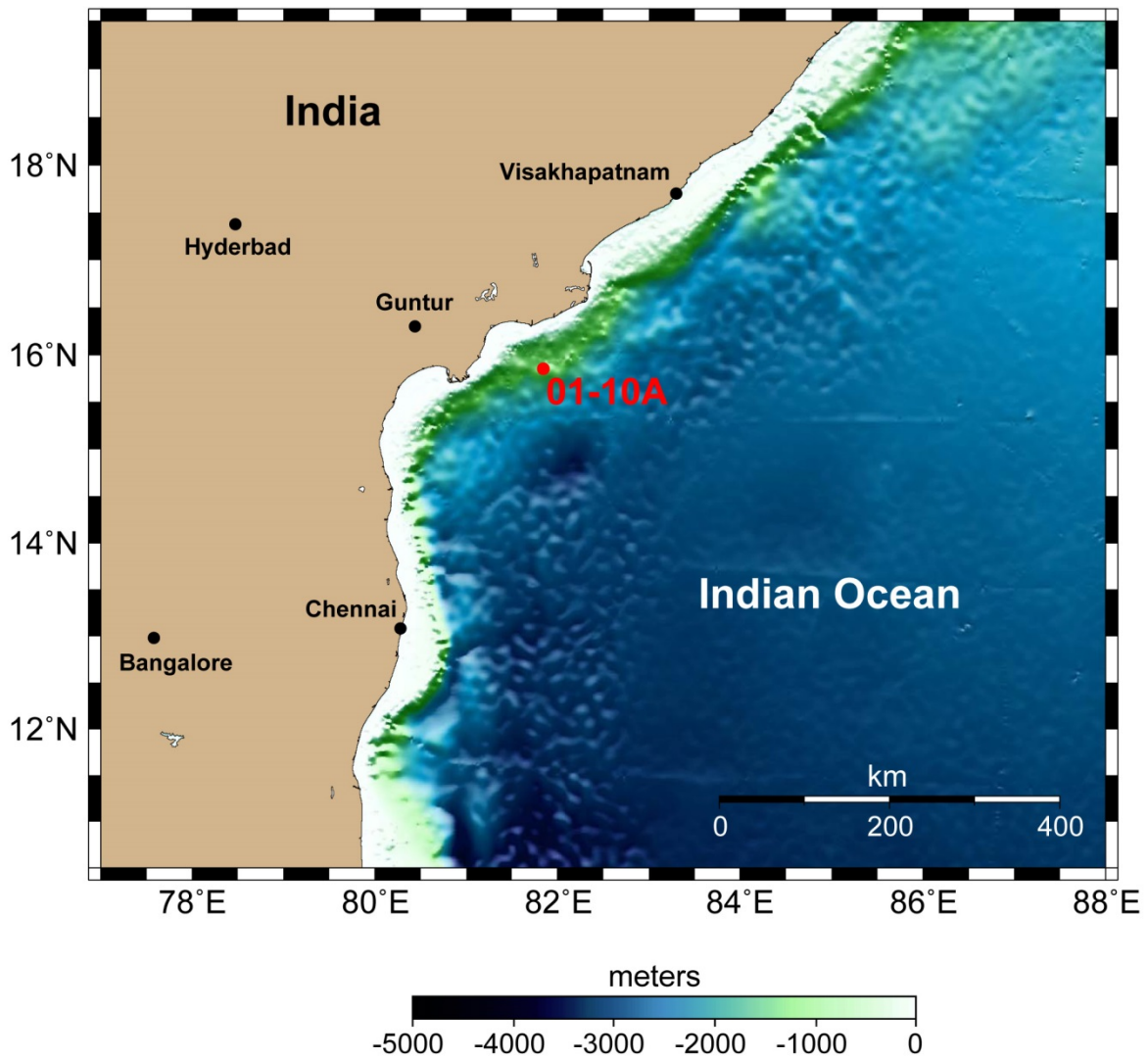


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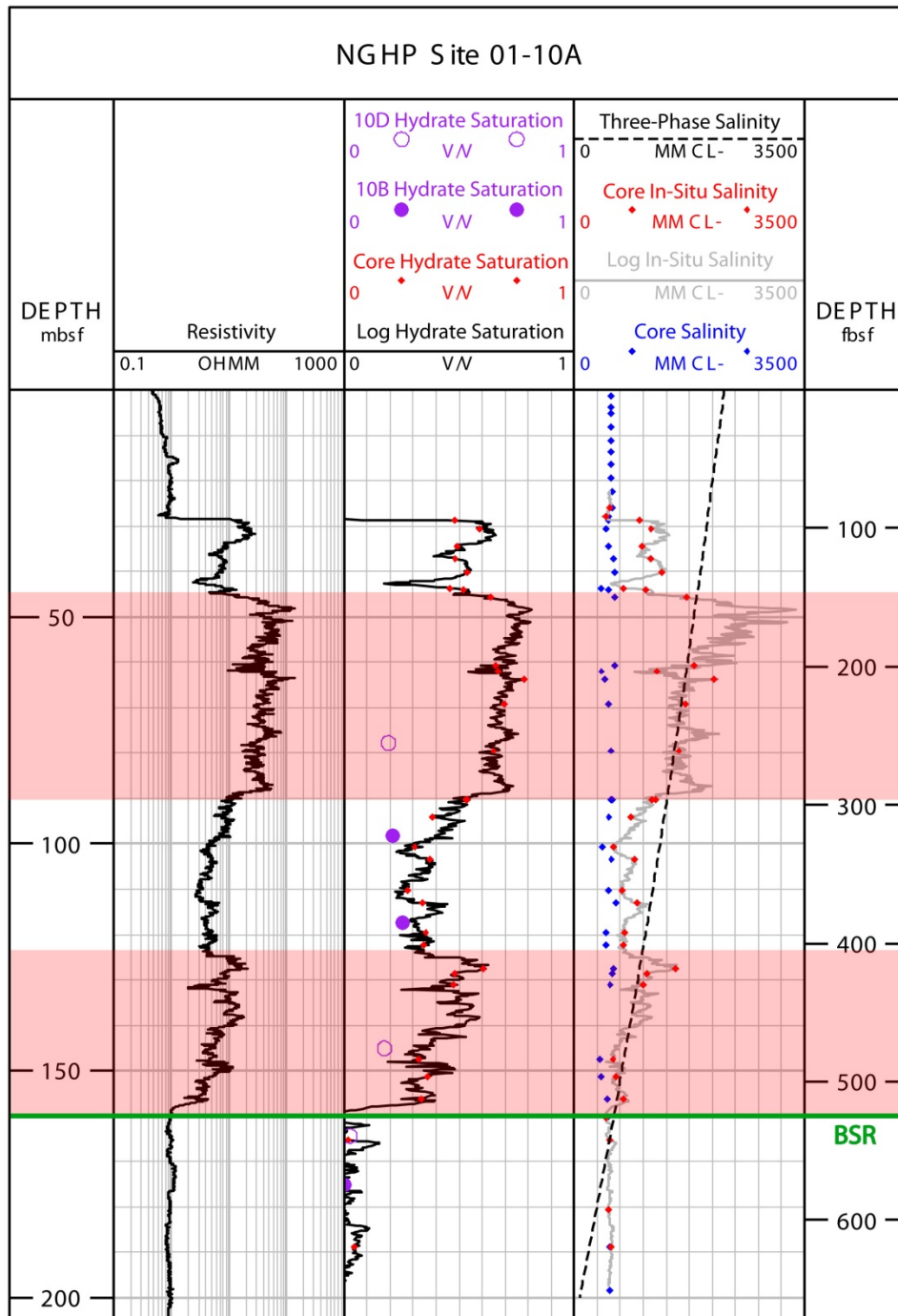


Figure 2: Results from NGHP Site 01-10A. Track 1: LWD resistivity; Track 2: Resistivity (black line) and salinity (red dots) interpolated, Archie-derived hydrate saturation and the hydrate saturation calculated from pressure cores recovered from Site-01-10B and 01-10D (NGHP Expedition 01 Scientists, 2007); Track 3: Core-derived salinity (NGHP Expedition 01 Scientists, 2007), resistivity (grey line) and salinity (red dots) interpolated in-situ salinities, and the salinity required for three-phase equilibrium (dashed line). Red boxes show qualitatively interpreted three-phase equilibrium zones.

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