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Fine-scale Velocity Structure across a BSR in the Western Continental Margin of India using Full-waveform Inversion of MCS Data

K. SAIN[1] and N.K. THAKUR[1]

[1]*National Geophysical Research Institute, Uppal Road, Hyderabad-500 007, India*

A bottom simulating reflector (BSR) is visible ~400 m below the seafloor at 1900 m on a seismic section in the western continental margin of India (WCMI). The BSR is identified based on high amplitude and reverse polarity event with regard to seafloor reflection. As the bedding planes are parallel to the seafloor, the crosscutting phenomenon of BSR is not observed in WCMI. We derive the large-scale velocity structure across the BSR by performing AVO modeling of easily identifiable reflected phases of multi-channel seismic
(MCS) data at few CDP gathers. Starting from this large-scale velocity structure, we derive the fine-scale velocity variation across the BSR by exploiting the full information contained in the recorded wave field using full waveform inversion. The main result of the study is the delineation of 25-40m thin hydrated sediments in which P-wave velocity suddenly increases from a value of 1.88 to 2.25 km/s and then drops to a value of 1.84 km/s. The low velocity zone below the BSR representing the 'free-gas' zone is very thin (~10 m). However, the AVO attributes do not show any signature of gas lying below the BSR. The possible mechanism for the formation of BSR is mainly due to high concentration of gas-hydrates above the BSR. Results of the AVO modeling, waveform inversion and attribute analysis will be presented in the seminar.

Keywords: BSR; gas-hydrates; AVO modeling; WCMI; waveform inversion.