AOGS 2006

Tomographic Velocity Analysis: A Case Study for the Occurrence of Gas Hydrates Along the Western Offshore of India

P. DEWANGAN[1], T. RAMPRASAD[1], M. V. RAMANA[1]

[1]*National Institute of Oceanography, Dona Paula, Goa, India*

Vast reserves are envisaged in deep oceanic environment, where the thick water column exerts enough pressure to stabilize the gas hydrate. Hydrate is usually identified on the seismic data using the bottom simulating reflector (BSR), which marks the bottom of the hydrate stability zone. The excess gas captured beneath the base of gas hydrate stability manifests itself as free gas. The presence of free gas decreases the seismic velocity and can be identified in the interval velocity model. Building an accurate interval velocity model is also important for estimating the hydrate and gas saturation. Velocity models derived using tomography have substantially better resolution of velocity anomalies compared to other techniques. The velocity models, in turn, result in better depth imaging, particularly in areas where seismic propagation was distorted by lateral velocity variations caused by faults, over pressured zones and rugged seabed topography. Tomographic velocity analysis also enhances the value of the velocity model as a depth imaging product; a tomographic velocity model is ideal for subsequent use in seismic inversion, pore pressure prediction studies and for accurate pre-stack depth migration. The raw multi channel seismic data from western offshore was processed to estimate the initial velocity model using the conventional semblance analysis. Seismic reflection traveltime inversion was carried out to refine the velocity structure with depth. The drop in seismic velocities at specific locations indicates the presence of free gas usually associated with the hydrates. The velocity model was used in pre-stack depth migration to obtain an accurate image of the subsurface. The resultant depth section shows better fault definition, as well as greatly improved reflector continuity. The preliminary interpretation of the fault patterns suggests that the hydrates and the free gas might be of thermogenic origin.