# VELOCITY REVERSAL AS A DIRECT HYDROCARBON INDICATOR IN THE ANOMALOUS HIGH TEMPERATURED AND OVER PRESSURED DF1-1 GAS FIELD BELOW 2100 M IN THE YINGGEHAI BASIN, SOUTH CHINA SEA

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In the DF1-1 Gas Field in the Yinggehai Basin, South China Sea, the velocity-depth plot and velocity spectra show significant variations from the classic linear trend, exhibiting a universal reversal phenomenon. Velocity parameters derived from velocity spectral analyses of the seismic data and sonic logs indicate that the "Interval Velocity" universally reverses below 2100 m, corresponding to the starting depth of overpressure in the field. There is a distinct difference between the gas-bearing sandstones and the surrounding rocks in the shallow strata with depths <2100 m, however, such a difference becomes less apparent beyond 2100 m in the middle-deep strata.

In the shallow strata of the DF1-1 Gas Field, the gas-bearing sandstones can be effectively recognized prior to exploration drilling using the DHI (Direct Hydrocarbon Indicator) techniques. However, these DHI models developed for the shallow strata were found to be ineffective for the middle-deep strata for direct exploration target recognition due to the velocity reversal.

To effectively identify DHIs in the middle to deep depth strata under velocity inversion, we used an integrative approach to detect the "integrated hydrocarbon-indicators" and tested the applicability of "Differential Interformation Velocity Analysis (DIVA)" as a DHI in the DF1-1 Gas Field. The results indicate that the "DIVA" technique can be effectively used as a DHI in both the shallow and the middle-deep strata in the study area with the shallow strata characterized by Type I DIVA anomaly and the middle-deep strata characterized by the Type II DIVA anomaly.

**Technical Area: PETROLEUM**