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The Relationship between Pressure Gradient and Hydrocarbon Migration and Accumulation in Bonan Sub-sag,Bohai Bay Basin, China

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Bonan sub-sag has regained a prominent position in Bohai bay basin oil and gas production. Overpressure is also widespread in it. According to study, overpressure has a strong influence on the migration and accumulation of hydrocarbons sourced from Es3 and Es4 formation(Paleogene). Using geological data collected from 78 wells to precise predict the pressure. Regarded as one of the driving force, the changing rates of overpressure (pressure gradient) can affect the oil migration. In the source zone and near-source zone, oil and gas migrate and accumulate rapidly and efficiently. While in the far-source zone, scarcely affected by the overpressure, oil and gas migrate slowly. Combing the hydrocarbon distribution in the study area, there exist following three relationships between pressure gradient and hydrocarbon distribution: (1)In the source-zone (overpressure-driving zone), as the physical properties of the reservoir become better, the pressure gradient increases, it is more favorable to expelling oil and gas, which leading lower oil column and less oil distribution. (2)In the near-source zone (overpressure & buoyancy driving zone), the better properties of reservoir, the lower pressure gradient exist, which is better for hydrocarbon accumulation. Exploration also proved that the hydrocarbon spread widely and oil column in the reservoir here is high. (3)In the far-source zone (buoyancy driving zone), there exist poor correlation between pressure gradient and oil gas distribution. Oil and gas accumulation is greatly influenced by the structure and reservoir. Hydrocarbon converged in the high point of structures and enriched in the high porosity reservoirs. So the hydrocarbon distributes in limitation area. These phenomena were result from the difference hydrocarbon migration pattern affected by different pressure gradient. These difference can be reflected by the changing ratio of physical parameters of the fluid and geochemical parameters, such as viscosity and density of crude oil, light/heavy normal paraffin hydrocarbon, nitrogenous compounds and biomarkers etc. The changing ratio of these parameters in the overpressure-driving zone is faster than those in overpressure & buoyancy driving zone. And in buoyancy these parameters change slowly.