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Impact of Polygon Fault on the Accumulation Process of Gas Hydrates

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Polygon fault is a type of non-tectonic origin of extensional faults, characterized by small separation, short extension length and small spacing. Polygonal faults are layer-bound, and have polygonal features on a plane, mainly developed in mudstone, shale and other fine grain sediments in deep water environments. Polygonal fault has been proposed since 1994. Till now, the existence of polygonal faults has been discovered in nearly 60 deep water basins all over the world, including East China Sea, South China Sea, the Pearl River and other sea basins.

Some scholars believe that polygonal faults are good hydrocarbon migration pathways, such as the research in Congo Basin (Gay A et al., 2006) and the Norwegian coast Hustoft S et al. 2007). According to the research in Congo Basin, the gas stored in the composite channel sandstone migrated upwards along the polygonal faults, and formed gas hydrates under appropriate conditions of temperature and pressure, which inhibited further migration of hydrocarbons (Gay A et al., 2006). Based on the research, polygon fault can not only provide conduits for fluid migration, but also for the invasion of sand. The invasion of sand is not only favorable for hydrocarbon migration, but also provides space for hydrocarbon reservoirs. Polygon fault is important for reservoir physical properties, hydrocarbon migration and accumulation in Huaguang depression of southeast Hainan basin (Wu et al., 2009). Polygon fault provides access of hydrocarbon migration and solves the problem that the conditions of source rock, reservoir and seal match well in area but lacks migration pathway of gas after the split of thermal subsidence. However, polygonal fault may also damage Meishan reservoir, causing secondary migration and accumulation of oil and gas, and favors the accumulation of gas in deep valley sandstone above Huangliu formation. Therefore, polygonal faults may be migration pathway of secondary accumulation of oil and gas in the study area (Wu et al., 2009).

However, some scholars have different views about the role of polygonal faults as an accumulation channel of gas hydrates. In the study of polygonal faults in Pearl River Mouth Basin, Sun Qiliang found that polygon faults

developed above the reservoir directly, with the reservoir preserved well and there is no evidence of fluid migration above it, indicating that polygon fault is not the pathway of fluid migration in the region (Sun et al., 2012). Some other scholars believe that only in the process of formation and active contraction, polygonal fault can act as a hydrocarbon migration pathway, otherwise the strata where polygon faults developed will be a good seal, where the polygonal fault can't channel hydrocarbon flow, and has no effect on gas hydrate accumulation.

Based on the results of previous research, we realize that polygonal fault plays an important role in reservoir properties, migration and accumulation of oil and gas. Besides, to better understand the role of polygon fault as migration conduit, a few factor needs to be considered: (1) understand the gas source of gas hydrate reservoir; (2) analysis the spatial relationship among gas hydrate accumulation area, distribution of polygon faults and gas source; (3) define the match relationship between generation of polygon fault and the time of source rock maturity.

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