

SUBSIDENCE ANALYSIS AND BASIN INFILL MODEL OF PALEOZOIC SUCCESSION, IRAQ

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ABSTRACT

The Paleozoic succession of Iraq is a true exploration target. The quantitative subsidence analysis is performed to the Paleozoic basins by applied 1D backstripping technique. Ten deep exploration wells are chosen for this study, these are Akkas-1, Akkas-2, Akkas-3, Khleisia-1, Jabal Kand-1, West Kifil-1, Mityaha-1, Atshan-1, Diwan-1 and Key Hole-1. A recognizable three rapid subsidence are observed in Akkas-1 and Khleisia-1 wells; but with significant differences. The first rapid subsidence corresponds to the Late Ordovician Khabour Formation. It was followed by slow subsidence rates (sagging) till the Early Silurian. During the Early Silurian, the subsidence rate in Khleisia-1 is larger than in Akkas-1. This phase could be related to active fault movement along Khleisia block. The Mid Paleozoic Unconformity is older in Khleisia-1. Another significant difference are observed from Upper Devonian onward, which suggests a complex tectonic history and/or faulting activity at different stages of basin development.

The tectonic subsidence curves of West Kifil-1 and Jabal Kand-1 wells represent mostly the Late Permian period. A significant hiatus from Kungurian to Guadaloupian is recognized in West Kifil-1, whereas in Jabal Kand-1, the hiatus is older as it is observed from Carboniferous (Hercynian) to Guadaloupian. So, the entire AP5 megasequence is absent in this location, and may also be absent in most of northern Iraq.

The basin infilled models revealed that the Paleozoic basins in Iraq have been evaluated through three rifting phases: Upper Ordovician-Lower Silurian phase, Upper Devonian-Lower Carboniferous phase and Upper Carboniferous-Upper Permian phase. The first two phases are interrupted by inversion phases, which in turn terminated the development of their rifting processes. It is revealed that, the general geodynamic framework of Paleozoic basin in Iraq is its setting as intraplate basins, which exhibit extensional driving mechanisms. These basins are "superimposed failed rift basins" that had undergone multiphase history of subsidence and uplift. Some of these subsidence phases are typically of synrift and postrift stage of rift basin evolution. Nevertheless, it is clearly that most of these rift events had not successfully developed from intraplate basin to passive margin setting till the Late Permian. The prolonged subsidence of lower Paleozoic basins has great importance of hydrocarbon generations and accumulations; whereas the inversion of these rift basins might have a major importance on occurrence of hydrocarbons. This result confirms that the Paleozoic basins require a different philosophy of exploration than that used to follow in the Mesozoic and Cenozoic basins of Iraq.

Keywords: Paleozoic basins, basin infill model, subsidence, rift basins, hydrocarbon exploration, Akkas field, Iraq.