



Formation mechanisms of two different typical volcanic hydrocarbon reservoirs within a volcanostratigraphic framework: the case of the Kebai fault zone in the Junggar Basin, China

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Volcanic reservoirs, which may contain unconventional oil and gas, have attracted attention from petroleum geologists in recent years. The Carboniferous volcanic reservoirs in Kebai fault zone(KBFZ) are prolific and the earliest discovered in China. The most hydrocarbons of Carboniferous strata in KBFZ come from weathered volcanic rocks beneath the regional Carboniferous and Permian unconformity surfaces. But commercial oil is found recently in the deeper Carboniferous volcanic rock which is far beneath from the weathering crust. In this paper, the formation mechanisms of another type volcanic reservoirs, which is different from the weathered, has been detailed studied and contrasted with the weathered. The Carboniferous strata consist of one volcanic cycle and two volcanic-sedimentary cycles. From the first cycle at the bottom to the third cycle on the top, the geotectonic environment transforms from the island arc to the collision zone and the main types of volcanic rocks change from the subalkali series(basalt, basaltic andesite, andesite, and related pyroclastic rock) to the alkali series(trachy-basalt, basaltic trachy-andesite, trachy-andesite, and related pyroclastic rock). The weathering volcanic reservoirs are about 500 m beneath the unconformity, and the spaces are primarily freshwater dissolved pores and weathering-induced cracks. the deeper reservoir spaces are dominant by organic acid dissolved pores and tectonic-induced cracks. The cracks in these two type of reservoirs are the significant factor in connecting the pores. The degree and type of diagenetic processes, which includes compaction, filling of pores and fractures, cementation, and grain dissolution, controls reservoir quality and is the key of the differences of the two typical reservoirs.