

Tectonic evolution and its control of structural and sedimentary patterns of multi-cycle superposed Sichuan Basin, China

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The Sichuan Basin is a large superposed basin that developed on a metamorphosed basement of the Upper Yangtze Craton that was consolidated in the Jinningian (c. 820 Ma). It comprises four structural stratigraphic sequences, each of which corresponds to an evolutionary cycle related to the ocean basin opening and closing. The Sichuan Basin exhibited a sedimentary framework in a NE-SW direction in the Nanhuan Period-Eopaleozoic because of geodynamic plate evolution at the southeastern margin of the Yangtze Craton, then in a NW-SE direction in the Neopaleozoic-Triassic because of plate evolution at the northern margin. The transition from a marine Craton basin to a continental lake basin in the Neopaleozoic-Middle Triassic may be related to the subduction and extinction of the Mianlue palaeo-ocean basin in the north. The current landform may have been shaped in the Lower Shaximiao (J2s1) period in the Middle Jurassic, when the Micangshan and Dabashan Foreland Basins formed in northern Sichuan. The Western Sichuan Foreland Basin formed in the Late Jurassic Penglaizhen (J3p) period and Early Cretaceous, when the Sichuan Basin was finalized. Fission track tests and thermal history simulations suggest basin-mountain coupling in different periods since the Middle Jurassic gave rise to reverse thermal evolutions, rapid packing actions and temperature increases at the margins of and inside the Basin. It also led to different thermal histories of marine and continental sourced rocks deposited in the same period at different structural locations. Since the Late Cretaceous, the Sichuan Basin has been uplifted and exposed to denudation. Consequently, the Cenozoic formations have been lost in most parts of the Basin. These processes have a profound influence on hydrocarbon accumulation.