

EGU21-6969, updated on 20 Apr 2021

<https://doi.org/10.5194/egusphere-egu21-6969>

EGU General Assembly 2021

© Author(s) 2021. This work is distributed under the Creative Commons Attribution 4.0 License.



New data from ICDP borehole SK2 and its constraint on the beginning of the Lower Cretaceous Shahezi Formation in the Songliao Basin, NE China

haibo liu¹, Pujun Wang¹, Youfeng Gao², Yongkang Yin¹, and Honghao Li¹

¹College of Earth Sciences, Jilin University, Changchun, China (liuhaibo918@126.com)

²Research Center of Palaeontology and Stratigraphy, Jilin University, Changchun, China (gaoyoufeng@jlu.edu.cn)

The Songliao Basin is one of the largest non-marine petroliferous basins in the globally and contains nearly complete Cretaceous terrestrial sedimentary records. The Shahezi Formation is a thick terrestrial clastic sedimentary succession deposited during the rift period of the Songliao Basin. Accordingly, it is significant for research on initial basin history restoration and global continental-marine stratigraphic correlation, to certificate the deposition time of the Shahezi Formation. This formation is always met when wells are drilled in fault basins of the Songliao Basin, and its outcrops are discontinuously distributed along the southeastern margin of the basin. Limited by the discontinuous cores and outcrops, previous studies on the deposition time of the Shahezi Formation were lack of direct evidence.

Borehole SK2 of ICDP was located in the thickest part of the Shahezi Formation in the northern Songliao Basin. It drilled into and traversed the Shahezi Formation from 3,335.99 m to 5,960.00 m, cored all the strata of this 2,624.01 m interval, and obtained 2,503.86 m of core with a coring rate of 95.79%. This core, which can be regarded as a continuous high-resolution terrestrial geological record, provides the basic material to study greenhouse climate events in the Cretaceous and interpret oil and gas generation processes in the basin.

Based on centimeter-scale core observation, the Shahezi Formation is mainly composed of variegated conglomerate, gray sandstone, and black mudstone. It is a sedimentary succession of fan-delta facies and lake facies.

One sedimentary tuff layer with a thickness of almost 1 m was found at a depth of 5,943.19 m, close to the bottom of the Shahezi Formation in SK2. The weighted mean age of 117.9 ± 1.6 Ma (MSWD = 0.15, N=15) provides a reference for the beginning of the deposition of the Shahezi Formation. One rhyolitic crystal tuff layer approximately 6 mm thick was found at a depth of 5,958.62 m at the bottom of the formation. The weighted mean age of 118.2 ± 1.5 Ma (MSWD = 0.18, N=19) is interpreted as the eruption age of the tuff sample. These weighted mean ages provide the best estimate of the beginning of deposition of the Shahezi Formation. Taking other studies into account, the deposition rate of the Shahezi Formation without compaction correction was calculated as about 460 m/Ma. This rate is much faster than the deposition rate of other

periods in the Songliao Basin. The Shahezi Formation was deposited approximately from 118 to 111 Ma, from the middle Aptian to early Albian.

The study of the high-resolution stratigraphic sequence and deposition time of the Shahezi Formation is a key to know the process of hydrocarbon generation in the basin. It provides a foundation for the correlation between terrestrial sedimentation in the Songliao Basin and global continental-marine stratigraphy. Also, it should have positive significance for other studies, such as CNS, OAE1a, OAE1b, ORB1, Cretaceous paleogeography and paleoclimate, change in the drifting direction of the subducting Pacific Plate, and other contemporaneous global geological events.