

## Continental Scientific Drilling of Cretaceous Songliao Basin

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The “Continental Scientific Drilling Project of Cretaceous Songliao Basin (SK): Continuous High-resolution Terrestrial Archives and Greenhouse Climate Change” is the third ICDP project in China Mainland, and the first to obtain a complete, continuous, terrestrial sedimentary record of the whole Cretaceous in the world. This project has four basic scientific objectives: (1) to precisely define terrestrial stratigraphic boundaries (e.g. Jurassic-Cretaceous boundary, Cretaceous-Paleogene boundary) and make marine-terrestrial correlation of stratigraphy; (2) to study biotic response to terrestrial environmental change and the deep biosphere; (3) to understand terrestrial response to oceanic anoxic events and formation of massive terrestrial hydrocarbon source rocks; (4) to decipher the geodynamics of deep earth during the Cretaceous Normal Superchron.

The SK project consists of two phases. Phase one, the SK-1 project, includes drilling and coring of early Paleogene to Late Cretaceous strata in two boreholes (north and south holes) that can be correlated through a marker bed. Drilling depths of 1811.18m and 1915.00m were achieved, rock cores of 2485.89 m in total length were recovered and the recovery ratio reached 96.46%. Phase two, the SK-2 project, includes drilling and coring of Early Cretaceous strata and early Mesozoic to Paleozoic basement of the Songliao Basin started in 2014. This phase also consists of two boreholes, the east hole and the west hole. In May of 2018, the SK-2 east hole completed drilling with a depth of 7018.00m, a coring footage of 4279.73m, a total core length of 4134.81m, and a recovery ratio of 96.61%. Drilling and coring on SK-2 west hole is still in preparation. Overall, the SK project consists of two phases, four boreholes, and is expected to obtain more than 10,000m long cores covering the whole Cretaceous period.

After ten years' scientific research on SK cores, multidisciplinary research progress has been achieved based upon massive geological datasets. Chronological frameworks have been precisely established for SK-1 cores and SK-2 east hole core. Terrestrial climatic changes in Late Cretaceous at tectonic, orbital and millennial to annual time scales have been proved by multiple paleoclimatic proxies. Sea water incursion events were identified when the paleo-Songliao lake expanded to maximum lake level and area. Organic-rich deposits formed during rising lake levels and sea water incursion, which promoted bottom water anoxia as the most favorable condition for organic carbon burial.