Intercalibration of astrochronologic and radioisotopic time scales for Late Cretaceous continental records in Songliao Basin, Northeastern China

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Songliao Basin (SB) in northeastern China is one of the largest and long-lived Cretaceous continental basins in the world. Two overlapping scientific drillcores (SK-1n and SK-1s) recently obtained from the basin depocenter (total length of 2485.89 m) together provide a unique opportunity for investigating continental climate/environmental changes in the Cretaceous greenhouse world (WANG et al., 2013). Establishing a high-resolution chronostratigraphic framework for these drillcores is the essential first step for studying the terrestrial paleoclimate signals and their correlation with marine records. Multidisciplinary chronostratigraphic studies on the two cores have greatly improved the time framework in SB (WAN et al., 2013; WU et al., 2013). Recently, WANG et al. (2016) reported four high-precision U-Pb TIMS zircon ages of interbedded bentonites in SK-1s drill-core, which show consistent estimated durations for Qingshankou Formation, but a 0.6 myr discrepancy for Nenjiang Formation. Here we use thorium (Th) logging data to reanalyze the cyclostratigraphy of SK-1s. The results indicate that Quantou, Qingshankou, Yaojia and Nenjiang formations record significant Milankovitch cycles. We tune 405 kyr cycles to the orbital eccentricity solution La2011 using U-Pb ID-TIMS age of 91.886±0.033 Ma in the lower Qingshankou Formation as an anchor point. This revised astronomical time scale (ATS) is consistent with the other three U-Pb ID-TIMS ages within the errors, and provides new constraints on geological events and their counterparts in marine records, as follows: 1. The SK-Is borehole spans 10.16 Myr from 92.63 Ma–82.47 Ma (Early Turonian to Early Campanian). 2. The age of the polarity boundary of C33r/C34n (985.95 m) is estimated as 82.884 Ma. 3. Filtered 2.4 Myr long orbital eccentricity cycles and 1.2 Myr obliquity modulation cycles are consistent with those of La2011. 4. The new ATS links the continental records in SB and marine sediments in Western Interior basin, USA at the astronomical level (SAGEMAN et al., 2014).

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