Geophysical Research Abstracts
Vol. 21, EGU2019-6216, 2019
EGU General Assembly 2019

Calibration of sedimentary sequences using combined methods: Examples from the Triassic Period

Roland Mundil (1), Cornelia Rasmussen (2,5), Paul E. Olsen (3), Dennis V. Kent (3,4), Randall B. Irmis (5,6), Christopher Lepre (3,4), Dominique M. Giesler (7), George E. Gehrels (7), John W. Geissman (8), Brenhin Keller (1,9), and William G. Parker (10)

(1) Berkeley Geochronology Center, Berkeley, United States, (2) University of Texas, Austin, United States, (3) Lamont–Doherty Earth Observatory, Columbia University, Palisades, United States, (4) Rutgers University, Piscataway, United States, (5) University of Utah, Salt Lake City, United States, (6) Natural History Museum of Utah, University of Utah, Salt Lake City, United States, (7) University of Arizona, Tucson, United States, (8) University of Texas at Dallas, Richardson, United States, (9) University of California, Berkeley, United States, (10) Petrified Forest National Park, Petrified Forest, United States

The chronostratigraphic calibration of sedimentary sequences is, in most cases, done directly by using either radioisotopic or astronomical clocks, or indirectly by correlating calibrated successions by means of bio-, magneto-, and/or chemostratigraphy. Age-equivalent sedimentary sections where a combination of these methods can be mutually tested and calibrated are rare but do exist. One such example are the Late Triassic fluvial deposits of the Colorado Plateau and the contemporaneous lacustrine strata of the Newark Basin.
We present a suite of U-Pb zircon ages from core CPCP-PFNP13-1A of the Colorado Plateau Coring Project (CPCP) through Late Triassic non-marine deposits of Petrified Forest National Park that span a time interval from ca. 222 to 210 Ma (Norian). The zircon populations from individual layers are complex as they are redeposited, but juvenile volcanic zircon crystals, the ages of which closely approximate the depositional age, are in most cases ubiquitous. In order to extract the fraction containing abundant juvenile zircon, U-Pb LA-ICPMS analyses where employed on 80-300 crystals per sample and the youngest crystals were subsequently extracted and subjected to high-resolution U-Pb CA-TIMS analyses. The U-Pb ages in combination with the unambiguous superposition in the drill core result in a robust and exportable age model. Complementary rock magnetic analyses throughout the core reveal a U-Pb age-calibrated magnetic reversal pattern that can be correlated with the astronomically-calibrated Late Triassic sequence of the Newark Basin, allowing a calibration of the predominantly long eccentricity cycles recorded in the latter. Our results suggest that the periodicity of the long eccentricity cycle in Late Triassic times is very close to the calculated periodicity in the Cenozoic (Kent et al., 2018). Attempts to universally use this periodicity throughout Earth's history, however, should be cautioned until further studies of this kind have been completed. This caution particularly applies to sedimentary sequences that are solely calibrated by cyclostratigraphy. Similarly, reliance on one calibration method alone can be equally fragile making a combination of techniques desirable where it is applicable. Focused field or coring experiments in areas with exportable complimentary properties to the areas with robust cyclostratigraphy, or vice versa, can circumvent the limitations of the geological peculiarities of any one area, as we have done here with the CPCP.