EGU2020-158, updated on 25 Oct 2020
https://doi.org/10.5194/egusphere-egu2020-158
EGU General Assembly 2020


# Astronomically paced climate changes during the demise of the penultimate icehouse

**Qiang Fang**[1,2] and Huaichun Wu[1,2]
[1]School of Ocean Sciences, China University of Geosciences, Beijing, China (fangqiang-geo@hotmail.com)
[2]State Key Laboratory of Biogeology and Environmental Geology, China University of Geosciences, Beijing, China

Late Paleozoic deglaciation is the only deep-time analogue of an icehouse-to-greenhouse transition in a vegetated world, but the detailed processes of this climatic upheaval are still under debate due to the absence of higher precision and accuracy in global correlations. The astronomical calibration of sedimentary cycles (3–4 m) in a carbonate succession from Naqing in South China to the 405 kyr eccentricity cycle reveals short eccentricity (135 kyr and 96.1 kyr), main obliquity (31.6 kyr), and precession (21.5 kyr and 19.3 kyr) for the early Cisuralian (Early Permian). 405-kyr-eccentricity-forced teleconnections are established between Paleo-Tethyan deep-marine carbonate cyclicity and U-Pb zircon ages-calibrated cyclothems from Euramerica in the Pangean paleotropics, providing a refined chronostratigraphy for the Asselian and Sakmarian stages on global scale. Geological record indicates a $(s_4 - s_3) - (g_4 - g_3)$ resonance likely transited into $(s_4 - s_3) - 2(g_4 - g_3)$ resonance at ~296.8 Ma, which confirms the chaotic dynamical behaviour of the Solar System during the Cisuralian. The synchronized proxies from marine records (magnetic susceptibility, gamma ray, carbon and oxygen isotope) and terrestrial climate indicators (paleosols, evaporates and tillites) across continents and latitudes demonstrate that long-term glacial, glacioeustatic, and climatic events were in pace with eccentricity and obliquity modulation cycles superimposed on secular global warming, reinforcing solid linkage between climate changes at low and high latitudes regardless of the ice sheet volume. Quasi-periodic alignments of the maxima (minima) of eccentricity and obliquity amplitude decelerated (accelerated) the trajectory of the $CO_2$-forced deglaciation. Intermittent nondeposition of the Cisuralian cyclothems on the North American Midcontinent correspond to the enhanced none-astronomical-related noise in the sedimentary record from South China, both of which were likely attributed to weaker or less apparent influence of astronomical forcing on the climate changes without an ice-sheet amplifier. Our study provides a better temporal resolution and understanding of the late Paleozoic deglaciation.