
Cyclostratigraphic study of the Middle-Late Ordovician Pagoda Formation on the Upper Yangtze Platform, China and the implications on palaeoclimate

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Abstract

High resolution measurement of magnetism susceptibility (MS) in the Late Ordovician Pagoda Formation were performed in the northern, eastern, southern and central Upper Yangtze Platform, China. The MS variation and wavelengths of significant cycles correspond to long eccentricity, short eccentricity, obliquity and precession cycles. The continuous and well exposed sections of the Upper Ordovician on the Upper Yangtze Platform were surveyed and sampled for $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ isotope and conodont fossils. The geochem-stratigraphic-cyclostratigraphic work in the Pagoda Formation has resulted in the recognition of a positive $\delta^{13}\text{C}$ excursion, the Pagoda Positive $\delta^{13}\text{C}$ Excursion (PPCE). The PPCE is a distinctive positive excursion occurring in the Middle-Late Katian, consists of three minor excursions ranging from 1.5‰ to 3‰, which has been identified in all the study sections on the Upper Yangtze Platform. The PPCE interval ranges through the conodont *Hamarodus brevirameus* and *Protopandeordus insculptus* conodont zones in ascending order, which indicates that the PPCE develops in the Middle-Late Katian of the Late Ordovician, and is different from the Guttenberg $\delta^{13}\text{C}$ Excursion (GICE) in the Baltoscandia and America extended from the Late Sandbian to the Early Katian. The strong signal of the astronomical forcing illustrates that the trigger of the PPCE was determined to be the combination of a sea-level transgression and long highstand in the Katian, which led to enhanced marine productivity and light-carbon burial on the flooded shelves causing an extended $\delta^{13}\text{C}$ positive excursion. The MS signal in the limestones during the PPCE indicates that the orbital forcing, obliquity and precession impact the transgression and climate cooling. It reveals that the transgression occurs earlier in the southeastern Upper Yangtze Platform than the northwestern Upper Yangtze Platform.

Keywords: Cyclostratigraphy, Ordovician, palaeoclimate, sea, level, Katian, cooling event

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