

High-precision geochronology of the upper Ediacaran in South China: implications for the stratigraphic correlation

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The well developed upper Ediacaran sedimentary successions in South China are the key to decipher the chemo-oceanographic and biological evolutions on the eve of the Cambrian explosion. However, the Ediacaran stratigraphy in South China is complicated because of facies variation and scarcity of high precision ages, thus hampering development of a regional and global integrated stratigraphic model for life evolution and environmental changes during this critical interval. Here we present several zircon U-Pb dates from the upper Ediacaran in South China, which will shed new light on the stratigraphic correlation.

The upper Ediacaran in South China consists of the shallow-water facies Dengying Formation and its deep-water facies equivalents (e.g., part of Liuchapo Formation). SIMS zircon U-Pb dating results suggest that the ash beds at the basal and middle parts of the Jiucheng Member (middle Dengying Formation) were deposited at 553.6 ± 2.7 Ma (2 SE) and 546.3 ± 2.7 Ma, respectively. An ash bed from the lower Liuchapo Formation was dated at 543.3 ± 2.5 Ma by SIMS, which was further refined to 545.76 ± 0.66 Ma (total uncertainty) by CA-ID-TIMS U-Pb dating method. These new zircon U-Pb dates suggest the following: (1) The terminal timing of the DOUNCE/Shuram $\delta^{13}\text{C}$ negative excursion, i.e. the age for the Doushantuo/Dengying boundary, is older than 553.6 ± 2.7 Ma; (2) The middle Dengying fossil assemblage is temporally overlapping with the Nama Assemblage; (3) The lower and the middle-upper parts of the Liuchapo Formation can be correlated with the lower Dengying Formation and the upper Dengying - lower Zhujiaqing formations, respectively; (4) The correlative horizon of the Ediacaran-Cambrian boundary in the deep water facies in South China is likely located near the base of a widespread negative $\delta^{13}\text{C}_{\text{org}}$ excursion at the upper Liuchapo Formation.