New U-Pb age from the Shuijingtuo Formation (Yangtze Gorges area) and its implications for the Cambrian timescale

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Abstract

The Terreneuvian Series of the early Cambrian records the first major diversification phase of the canonical Cambrian explosion. However, a paucity of precise radio-isotopic ages for key stratigraphic horizons has resulted in a poor temporal calibration of fossil lowest occurrences (LO) and corresponding rates of evolution throughout the Terreneuvian. Here we present integrated SIMS and CA-ID-TIMS U-Pb analyses on zircons from the basal Shuijingtuo Formation in the Yangtze Gorges area, South China. The dating results provide a depositional age of 526.43 ± 0.54 Ma for the basal Shuijingtuo Formation, and compiled detrital zircon U-Pb dates from the Ediacaran-Cambrian transitional strata in the Yangtze Gorges area indicate their local provenances. The new high-precision date provides a minimum age constraint on the ZHUCE (Zhujiqing positive carbon isotope excursion) and LOs of Watsonella crosbyi and Aldanella attleborensis in South China, and allows correlation of ZHUCE with either 5.5p or 5p/I’ in Siberia and Morocco. We construct two models of the Ediacaran-Cambrian transitional timescale based on the two alternative correlations of the ZHUCE. The first model correlates the ZHUCE with 5.5p and yields significantly diachronous LOs of W. crosbyi and A. attleborensis between the Siberian Platform and South China. In contrast, the second and our preferred model equates ZHUCE with 5p/I’ and implies relatively synchronous LOs of W. crosbyi and A. attleborensis between the Siberian Platform and South China. In the preferred model, the couplet of ZHUCE/5p/I’ and LOs of W. crosbyi and A. attleborensis serves as a reliable combination to bracket the base of Cambrian Stage 2.

Keywords: Cambrian, Geochronology, Yanjiahe, Shuijingtuo, ZHUCE, South China

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