



## High precision time calibration of the Permian-Triassic boundary mass extinction event in a deep marine context

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To construct a revised and high resolution calibrated time scale for the Permian-Triassic boundary (PTB) we use (1) high-precision U-Pb zircon age determinations of a unique succession of volcanic ash layers interbedded with deep water fossiliferous sediments in the Nanpanjiang Basin (South China) combined with (2) accurate quantitative biochronology based on ammonoids, conodonts, radiolarians, and foraminifera and (3) tracers of marine bioproductivity (carbon isotopes) across the PTB. The unprecedented precision of the single grain chemical abrasion isotope-dilution thermal ionization mass spectrometry (CA-ID-TIMS) dating technique at sub-per mil level (radio-isotopic calibration of the PTB at the <100 ka level) now allows calibrating magmatic and biological timescales at resolution adequate for both groups of processes. Using these alignments allows (1) positioning the PTB in different depositional setting and (2) solving the age contradictions generated by the misleading use of the first occurrence (FO) of the conodont *Hindeodus parvus*, whose diachronous first occurrences are arbitrarily used for placing the base of the Triassic. This new age framework provides the basis for a combined calibration of chemostratigraphic records with high-resolution biochronozones of the Late Permian and Early Triassic. Here, we present new single grain U-Pb zircon data of volcanic ash layers from two deep marine sections (Dongpan and Penglaitan) revealing stratigraphic consistent dates over several volcanic ash layers bracketing the PTB. These analyses define weighted mean  $^{206}\text{Pb}/^{238}\text{U}$  ages of  $251.956 \pm 0.033$  Ma (Dongpan) and  $252.062 \pm 0.043$  Ma (Penglaitan) for the last Permian ash bed. By calibration with detailed litho- and biostratigraphy new U-Pb ages of  $251.953 \pm 0.038$  Ma (Dongpan) and  $251.907 \pm 0.033$  Ma (Penglaitan) are established for the onset of the Triassic.