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New high precision U-Pb calibration of the late Early-Triassic (Smithian-Spathian Boundary, South China)

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Following the Permian-Triassic mass extinction (PTME), the Early Triassic is characterized by large short-lived perturbations of the global carbon cycle associated with radiation and extinction pulses of the biota. More stable conditions resumed in the Middle Triassic (Anisian). The exact ages and duration of these short-lived but intense radiation-extinction events as well as carbon cycle perturbations are poorly constrained and a robust intercalibration of U-Pb dates, biochronozones and carbon isotope fluctuations is still lacking. An accurate and precise time frame is essential in order to quantify the dynamics of the underlying mechanistic processes and to assess the validity of the various explanatory scenarios.

The most drastic Early Triassic extinction occurred at the Smithian-Spathian boundary (SSB) and is associated with a globally recognized sharp positive excursion of the marine d13C signal. Based on the most recently published ages for the Permian-Triassic boundary (251.938 $\pm$ 0.029 Ma, Baresel et al., 2016) and for the Early-Middle Triassic boundary (247.05 $\pm$ 0.16 Ma, Ovtcharova et al., 2015), we know the Early Triassic lasted 4.9 myr. However, neither the position of the SSB nor the durations of the major biotic and abiotic events around the SSB are constrained by radiometric dates.

Here, we will present new high precision, chemical abrasion, isotope dilution, thermal ionization mass spectrometry (CA-ID-TIMS) U-Pb ages from single zircon crystals, sampled from closely spaced volcanic ash layers that bracket the SSB in the Nanpanjiang Basin (Guizhou province, South China). These ash layers are found in a mixed carbonate–siliciclastic, conodont-rich sedimentary succession (Luolou Formation) that is well calibrated biochronologically. We obtained best estimates of the ages of the SSB and associated events by applying Bayesian age modelling.

References:

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