Combining high-precision geochronology with accessory mineral chemistry: Zircon and apatite from volcanic ashes at the Permian-Triassic boundary

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High-precision chemical abrasion isotope dilution thermal ionization mass spectrometry (CA-ID-TIMS) U-Pb dating of single-zircon crystals is preferably applied to tephra beds intercalated in sedimentary sequences. By assuming that the zircon crystallization age closely approximate that of the volcanic eruption and ash deposition, U-Pb zircon geochronology is the preferred approach for dating events and boundaries (such as the Permian-Triassic boundary mass extinction) in the sedimentary record. As tephra from large volcanic eruptions is often transported over long distances, it additionally provide an invaluable tool for stratigraphic correlation across distant geologic sections. Therefore, the combination of high-precision zircon geochronology with apatite chemistry of the same tephra bed provides a robust fingerprint of one particular volcanic eruption.

We will present new high-precision U-Pb zircon dates for a series of volcanic ash beds in deep- and shallow-marine Permian-Triassic sections in the Nanpanjiang Basin, South China. In addition, apatite crystals out of the same ash beds were analysed focusing on their halogen (F, Cl) and trace-element (e.g. Fe, Mg, REE) chemistry. On the basis of these data, including litho- and biostratigraphic correlations, we can precisely and accurately constrain the Permian-Triassic boundary in an equatorial marine setting, and correlate tephra beds over different sections and facies in the Nanpanjiang Basin independently from litho-, bio- or chemostratigraphic criteria.