High-resolution records of past and modern Pb exposure: Laser-ablation ICPMS profiles from tooth enamel

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We present compositional and isotopic profiles of past and modern tooth enamel aimed at reconstructing *in-vivo* Pb exposure at high spatial and time resolution. Focus is on dental enamel because of its sequential mineralization preserving time-series information, and due to its resistance to *post-mortem* diagenetic alteration. Examples include medieval Pb–Ag miners from SW Germany (Black Forest), the port of ancient Rome (Isola Sacra) for an assessment of the 'Pb poisoning hypothesis', and a modern Pb–Zn smelter village in NE NSW. (Sub-)ppb levels of U, LREEs, Y in soil-buried enamel resembling modern enamel are utilized as indicators for the preservation of pristine *in-vivo* concentrations. This facilitates the identification of *in-vivo inter-tooth* and particularly *intra-tooth* Pb concentration variations, which range from below 0.1 up to 150 ppm, and exceed three orders of magnitude even for the same individual. Of particular interest is the identification of sharp Pb peaks recorded in enamel, whose existence may prove more potentially damaging to health than lower average Pb concentrations. Their identification may also improve existing blood-Pb and tooth-Pb calibrations for modern Pb exposure reconstruction. By analyzing several teeth of an individual together with detailed tooth histology (e.g. relative to the neo-natal line), detailed life time trajectories can be established together with—as will be shown—isotopic proxies of mobility (Sr, O).

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The Permian-Triassic boundary in Australia: New radio-isotopic ages

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Studying potential causes of the most severe biotic crisis in the Phanerozoic, the Permian-Triassic (P-T) mass extinction, requires knowledge about the timing of events in both marine as well as terrestrial sedimentary archives. Recent radio-isotopic age results from both U/Pb and $^{40}Ar/^{39}Ar$ dating of volcanic ash falls place the age of the Permian-Triassic boundary in marine strata (as defined by the FAD of the conodont *Hindeodus parvus*) and the age of the mass extinction indistinguishably at 252.5 ± 0.2 Ma (based on the U/Pb system) (Mundil et al., 2004; Renne et al., 2004). In addition, new $^{40}Ar/^{39}Ar$ age data confirm the U/Pb ages, with the $^{40}Ar/^{39}Ar$ ages being systematically younger by ca. 1% than U/Pb ages, but yielding identical intervals between dated ashes. This bias is most likely due to systematic errors in the current calibration of the $^{40}Ar/^{39}Ar$ system (Min et al., 2000). It has been notoriously difficult to precisely correlate marine and terrestrial sedimentary records due to a lack of reliable radio-isotopic ages as well as bio- and magnetostratigraphic constraints.

New U/Pb age data on single zircons from a volcaniclastic layer conformably underlying the Rewan Fm. (Bowen Basin, Queensland, E Australia) yield a preliminary mean $^{206}Pb/^{238}U$ age of 252.2 ± 0.4 Ma. The tuff shows evidence of soft sediment deformation by the quartzose sands of the Rewan Fm., suggesting that the units are contemporaneous. The tuff yielded few palynomorphs, but an assemblage 3.8 m above the contact within the Rewan Fm. belongs to the *Lunatisporites pellucidus* Zone and lacks *Aratrisporites* spp.. Traditionally the Rewan Fm. is regarded as a Triassic unit, as it post-dates the Glossopteris coal-bearing strata. Our new age, in combination with our detailed age results from marine strata in S China, correlates this part of the succession with the P-T boundary. This result facilitates improved understanding of the timing of the biotic crisis, but additional radio-isotopic ages (using different isotopic systems), in combination with improved bio-, chemo- and magnetostratigraphy, from terrestrial, paralic and marine sections are essential to link extinction patterns to specific causal events which may have affected the Earth's hydrosphere and atmosphere on global scale during the P-T transition.

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