# Precise U-Pb geochronology for high resolution correlation of geological, environmental and biological events in Earth's history

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To study the history of the geological past of our planet we need to employ techniques that deliver absolute time markers in the stratigraphic record. These allow for correlation between sedimentary records on different continents, and between different environmental and ecological environments. Furthermore, it can add absolute time to the calibration of biochronology, by temporal linking of different subspecies or endemic fossil species where well-defined index species are lacking.

The "golden spike" of geochronology is the U-Pb dating technique, applied to the mineral zircon ($ZrSiO_4$) that resides in volcanic ash beds interlayered with the sediments we want to study. The technique of chemical abrasion, isotope dilution, thermal ionization mass spectrometry (CA-ID-TIMS) has been developed since 2005 to an unprecedented precision and accuracy of 0.05% for $^{206}Pb/^{238}U$ dates (Schaltegger et al., 2015). A large part of this development is due to the joint effort of the international EARTHTIME consortium (Bowring et al., 2005).

The established precision can now be used to target a series of scientific questions that were impossible to tackle before because of the lack of temporal resolution: (i) precise dating of geological boundaries; (ii) dating of major biotic and environmental turnovers ("mass extinctions"), and their precise correlation with volcanic events of large igneous provinces; (iii) contribute to improved biochronological schemes by adding absolute time; (iv) study the timescales of environmental change through age calibration of stable isotope and chemical time series, and link them to volcanic events, erosional feedback and orbital forcing.

The talk will highlight some prominent applications and will demonstrate that working at the 0.05% precision level of time resolution in the geological past requires a tight control on all parameters of the U-Pb dating technique.

References: Bowring et al. (2005) Geochim. Cosmochim. Acta 69, A316; Schaltegger et al. (2015) Chem. Geol. 402, 89-110

**Mots-Clés :** U-Pb dating, high-precision geochronology, zircon, ash beds, mass extinctions

Merci de ne rien inscrire dans cette zone et ne pas modifier les marges des pieds de page et entêtes.