How does the link between LIP's and environmental crises hold up under the lens of precise geochronology?

U. SCHALTEGGER[1*], P. WIDMANN[1], L. LENA[1], N. D. GREBER[1], J.H.F.L. DAVIES[1,2], C. ANTOINE[1], F. JOURDAN[3]

[1] Dept. of Earth Sciences, University of Geneva, Switzerland, *urs.schaltegger@unige.ch

[2] Earth and Atmospheric Sciences, University of Quebec in Montreal, Canada

[3] School of Earth and Planetary Sciences, Curtin University, Perth, Australia

A temporal link between Large Igneous Provinces and mass extinctions in Earth's history is generally accepted. Here we explore two examples to determine whether this link is still valid at a temporal resolution of 1E4 to 1E5 years using high-precision U-Pb geochronology.

(1) Recurrent biotic/environmental crises occur in the early Triassic, peaking during the late Smithian positive carbon isotope excursion (CIE), with global cooling and extinction of nekton *c.* 2 my after termination of the Siberian LIP volcanism [1]. Our time-resolved model allows reconstruction of potential drivers of climate change: we imply that the CIE is terminated by a sea-level lowstand and regression at the end of the Smithian, due to enhanced weathering and CO_2 drawdown triggering global cooling, and not directly related to gas emisions of volcanic activity.

(2) The Karoo and Ferrar magmatic provinces occur synchronously with repetitive biotic and environmental crises of moderate magnitude in the Lower Jurassic (Pliensbachian-Toarcian [2]). A revised timescale suggests (i) a Late Pliensbachian CIE and Hg/TOC anomaly now dated at 186.7 Ma and tentatively related to an unknown early Karoo phase, and (ii) biotic events at the Pliensbachian/Toarcian boundary and in the lower Toarcian *falciferum* subchronozone possibly correspond to precise U-Pb dates of Karoo sill intrusions [3] and Ferrar magmatism [4]. New U-Pb ages at ca. 180 and 176 Ma from the NE part of the Karoo province corroborate the $^{40}Ar/^{39}Ar$ dating.

Precise U-Pb geochronology of marine sections and LIP volcanism has the potential to distinguish between volcanic forcing of biotic/environmental change and non-volcanic, biotic/abiotic feedback reflected by the disturbance of the C cycle.

[1] Burgess & Bowring (2015) Sci. Adv. 5;1:e1500470; [2] Dera *et al.* (2010) J. Geol. Soc., London, **167**, 21-33; [3] Corfu *et al.* (2016) Earth Planet. Sci. Lett. **434**, 349-352; [4] Burgess *et al.* (2015) Earth Planet. Sci. Lett. 415, 90-99.