



## **What do we know about pre-Toarcian events and how is it connected to the Karoo LIP emplacement?**

Luis Lena (1), David Taylor (2), Jean Guex (3), Annachiara Bartolini (4), Thierry Adatte (3), David Van Acken (5), Jorge Spangenberg (3), Elias Samankassou (1), Torsten Vennemann (3), and Urs Schaltegger (1)

(1) University of Geneva, Department of Earth Sciences, Geneva, Switzerland (lena.luis@gmail.com), (2) Department of Earth Sciences, University of Oregon, Portland, OR, USA, (3) Department of Earth Sciences, University of Lausanne, Lausanne, Switzerland, (4) Department of Origins and Evolution, CR2P, Museum National d'Histoire Naturelle, Paris, France, (5) School of Earth Science, University College Dublin, Dublin, Ireland

The Early Jurassic (Pliensbachian-Toarcian) was a period of important biotic and environmental crises took place. During this period, a series of second-order extinctions have been recognized in the Pliensbachian and a global ocean anoxic event in the Early Toarcian. One of the most prominent features in the Early Jurassic is the rapid transition from the cool-glacial climate in the Late Pliensbachian to the enhanced global greenhouse effect in the Early Toarcian. The causal relationship between the Early Toarcian-OAE and the Karoo has been well established over the years. However, much less is known regarding the events that precede the Toarcian-OAE, i.e. in the Late Pliensbachian (Margaritatus-Spinatum Zones). Since the events of the Early Toarcian have been well linked to volcanism, this has led many authors to hypothesize that the events of the Late Pliensbachian might also be driven by volcanic activity due to the temporal proximity between the two events. Recently, palaeomagnetic data and  $^{40}\text{Ar}/^{39}\text{Ar}$  allows a temporal link between the Latest Pliensbachian (Upper Spinatum Zone) to Early Toarcian and the Karoo LIP. However, from a high-precision U-Pb geochronological perspective, the temporal link between the events of the Late Pleinsbachian and Pliensbachian Toarcian boundary presents certain complications. Here we present high-precision U-Pb geochronological data on interbedded ash beds in the Late Pliensbachian of the Nicely Fm, eastern Oregon, USA. Given the available ages of currently known occurrences of the Karoo and our new high-precision ages of the Late Pliensbachian in western USA, there is an offset of  $\sim 800$  ka between the youngest know occurrences of the Karoo and the high-precision ages in the Latest Pliensbachian (Uppermost Carlottense Zone/Hawskense subzone) therefore precluding an immediate causal connections between the Late Pliensbachian and the Karoo. We also present Hg/TOC ratios and  $\delta^{13}\text{C}_{\text{org}}$  throughout the Kunae and Carlottense Zone (Margaritatus/Spinatum Zone) that could reveal a more complex relation between volcanism and the environmental pre-Toarcian events, because it would require that the Karoo volcanism could have been operating much earlier than what is currently known.