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Geochemical and palynological records for the end-Triassic Mass-Extinction Event in the NE Paris Basin (Luxemburg)

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The End-Triassic mass-extinction event is one of the "big five" mass extinctions in Earth's history. Large scale flood basalt volcanism associated with the break-up of Pangaea, which resulted in the opening of the central Atlantic Ocean, is considered as the leading cause. In addition, an asteroid impact in Rochechouart (France; 201 $\pm$ 2 Ma) may have had a local influence on ecosystems and sedimentary settings. The Luxembourg Embayment, in the NE Paris Basin, offers a rare chance to study both effects in a range of settings from deltaic to lagoonal.
A multidisciplinary study (sedimentology, geochemistry, palynology) has been carried out on a number of outcrops and cores that span from the Norian to lower Hettangian. Combined geochemical and palynological records from the Boust core drilled in the NE Paris Basin, provide evidence for paleoenvironmental changes associated with the end-Triassic mass-extinction event. The Triassic-Jurassic stratigraphy of the Boust core is well constrained by palynomorphs showing the disappaerance of typical Triassic pollen taxa (e.g. Ricciisporites tuberculates) and the occurrence of the marker species Polypodiisporites polymicroforatus within the uppermost Rhaetian, prior to the Hettangian dominance of Classopollis pollen. The organic carbon stable isotope record (δ13Corg) spanning the Norian to Hettangian, shows a series of prominent negative excursions within the middle Rhaetian, followed by a trend towards more positive values (approx -24 per mille) within the uppermost Rhaetian Argiles de Levallois Member. The lowermost Hettangian is characterized by a major negative excursion, reaching – 30 per mille that occurs in organic-rich sediments. This so-called "main negative excursion" is well-known from other locations, for example from Mariental in Northern Germany and from St Audrie's Bay in England, and Stenlille in Denmark. Based on redox-sensitive trace element records (V, Cr, Ni, Co, Th, U) the lowermost Hettangian in most of the sections shows clear signs of strong anoxia. Sedimentological observations reveal several horizons with soft sediment deformation (seismites). These are attributed to strong earthquake during the initial breakup of Pangea. The lowermost horizon at the base of the Argiles de Levallois Member exceeds the seismites in thickness and shows an erosional base and a chaotic sedimentation structure. Its sedimentological characteristics as well as its stratigraphic age makes it a possible candidate for a tsunami deposit triggered by the Rochechouart impact. As such, drill cores from Luxembourg and sourrounding areas (Eifel, W-Germany; NE-Lorraine, France) preserve a unique archive with great potential for unraveling the causes and consequences of the end-Triassic mass-extinction event.