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A global review of Late Triassic dinoflagellates - when, why and where did they evolve?

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Dinoflagellates are one of the primary producers in today's oceans, and have formed a major part of the phytoplankton during long periods since the Middle/Late Triassic when they first evolved. In the fossil record, the dinoflagellate cysts represent valuable tools in biostratigraphy as well as in paleoecology and paleoclimatology and understanding their distribution in time and space is therefore valuable.

During the Late Triassic, the landmasses were relatively symmetrically situated around the equator, forming Pangea. Most of the Upper Triassic successions are dominantly terrestrial, deposited in various continental, clastic depositional systems caused by continental rifting. However, along its margins, marine deposition occurred. During the Late Triassic, rifting increased; eventually leading to ocean spreading and the Pangea breakup (see e.g. Ziegler et al. 1983, 2003, Golonka 2004, 2007, Golonka et al. 2018). Successively, marine deposition took place in some of the rifts, and the areal extent of marine borderlands increased.

Surrounding the Upper Triassic continents, the first cyst-forming dinoflagellates evolved, developed and spread in these relatively shallow, marine environments. With the exception of the Australian record of Sahulidinium ottii from the late Middle Triassic, cyst-forming dinoflagellates seem to have evolved relatively synchronously around Pangea from the late Carnian, gradually taking up new niches, first along the existing coastlines and later, during the Rhaetian, within the evolving rifts systems which eventually lead to break-up. According to Mac Rae et al. (1996), about 24 species of dinoflagellate cysts had developed globally by the Norian.

The overall scarcity of data on Triassic dinoflagellate cysts, makes it challenging to gain a global overview of their first distribution in time and space. This talk therefore attempts to give a global review of their first occurrences: where, when and why.