

# **PALAEOZOIC CLIMATES**

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**Abstracts**

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## SEA LEVEL CHANGES AND BRACHIOPODS AND CORAL EXTINCTIONS DURING THE LATE FRASNIAN IN THE NAMUR-DINANT BASIN (BELGIUM)

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On the shallow part of the ramp situated in the north of the Namur-Dinant Basin, the upper Frasnian Aisemont Formation rests in disconformity upon the middle Frasnian Lustin Formation, and records a transgressive-regressive cycle corresponding to a third-order sequence. The maximum of relative sea-level (maximum flooding surface) is marked by the development in the middle of the formation of argillaceous deposits comprising an unit with dysaerobic-anaerobic facies, which is correlated with the Lower Kellwasser Event (LKW; lower part of the Upper *rhenana* Zone). The overlying Lambermont Shale Formation corresponds to the transgressive system tract of a following third-order sequence which crosses the Upper Kellwasser Event (UKW) and the Frasnian/Famennian boundary, and extends into the lower Famennian shales. Southwards, these formations passes laterally to more distal ones in which sequence system tracts and boundary can be followed.

Frasnian brachiopod decline occurred in three steps within the interval spanning the Lower *rhenana* Zone to the *linguiformis* Zone. Most brachiopod orders suffered severely and the major losses occurred at the top of the Upper *rhenana* Zone. These extinction episodes were linked principally to diachronous regional facies changes related to transgressions. For example, atrypids and pentamerids became extinct within the Upper *rhenana* Zone in the shallow parts of the basin, whereas they had already disappeared at the top of the Lower *rhenana* Zone in its distal part, just before the deposition of the dark shales of the Matagne Formation indicative of hypoxic bottom conditions. These orders vanished in the *linguiformis* Zone in other areas of the world.

The initial decline of the rugose corals within the Namur-Dinant Basin is recognized in the Lower *rhenana* Zone, and corresponds to the extinction of the colonial disphyllids and to their replacement mainly by members of the phillipsastreids. This coral turnover is correlated with the beginning of the rise in sea-level triggering the transgressive system tract of the “Aisemont sequence” and following the fall in sea-level which marks the top of the Philippeville and Lustin formations. But it was not due to the LKW *sensu stricto*, which happened later (in the middle part of the Aisemont Formation) and induced strictly no extinction in corals and brachiopods, those found in the lower part of the formation being still present in the upper part. Rugose corals disappeared progressively, along with the tabulates, in the Upper *rhenana* Zone, before the UKW.

Post-extinction brachiopod recovery was rapid in the basal Famennian but, despite their great abundance, their diversity was quite low. However, it is only close to the base of the Strunian Substage that the rugose coral recovery actually started. Tabulates never really recovered.

As considered by some authors, the ecological crisis probably resulted of a cooling. The fall and then a rapid rise of the sea-level at the middle–upper Frasnian transition could correspond to a ice cap freezing-melting cycle.

However the LKW (and the UKW?) was not triggered by a short-term cooling event, but corresponds to the maximum flooding surface of a upper Frasnian third-order sequence (“Aisemont sequence”), ie. a rise of the sea-level, and had no direct influence on the distribution of corals and brachiopods. The UKW had influence only on brachiopods.