

# Carnian black shale events triggered by Cimmerian-Eurasian Collision?

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## Geography



Dating of the sections has to be based on conodonts as megafossils are completely missing. A detailed Lower Carnian conodont zonation has been proposed by Krystyn in Gallet et al. (1994). This zonation, however, is based on species (i.e. *E. carnica*) which are missing in the Salzkammergut sections. The limestones below and within the Reingraben Shales have delivered a depauperate faunule of *G. polygnathiformis* and *Gl. tethydis* allowing a general assignment of middle to late Lower Carnian (aonoides to austriacum ammonite zone resp. tethydis conodont zone). Stratigraphically important is the disappearance of *Gl. tethydis* on top of the shales. This proves the exclusive Lower Carnian age of the Reingraben terrigenous interval in the Hallstatt facies of Berchtesgaden and most probably elsewhere.

At the Polzberg section, 0,75 m or 11 beds around the lithological boundary between the Reifling and Göstling Limestones were sampled and checked after their conodont content. Only two layers, the uppermost one of the Reifling Limestones and bed 9 of the Göstling Limestones (0,35 m above base) yielded conodonts. *G. polygnathiformis* and *Gl. tethydis* occur in the uppermost Reifling beds, both of limited biostratigraphic use as mentioned above. The Göstling sample contained *Epigondolella carnica*, a stratigraphically important species characterising a short-term horizon of a few 100 ka within the upper Lower Carnian. The onset of the Göstling Limestones can thus be dated exactly in the topmost aonoides ammonite zone and according to data from other sections is an isochronous event within the Reifling basin (Krystyn, unpublished data).

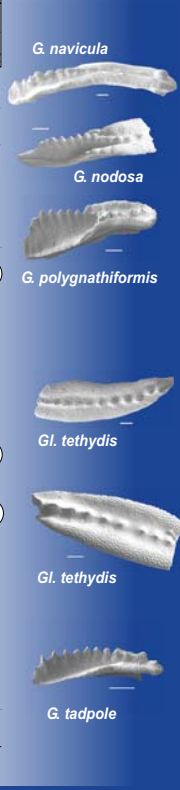
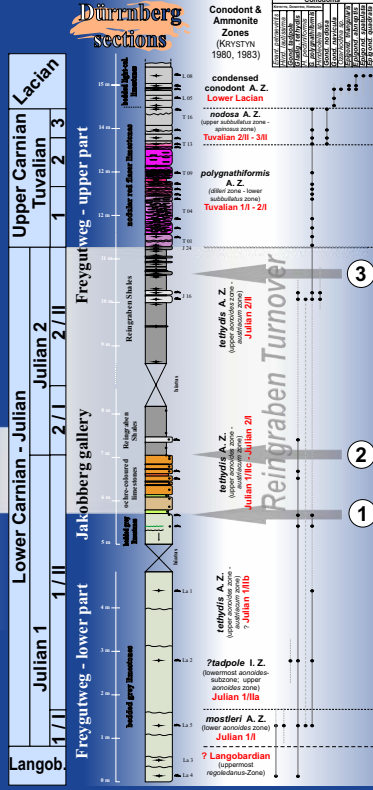


Known as the "Reingraben Turnover" (Schlager and Schöllinger 1974), the sudden anoxic event followed by strong terrigenous influx is noted on top of Carnian shelves, intraplatform basins and in the Hallstatt basin. The Freygutweg section and Jakobberg gallery near Bad Dürrberg / Salzkammergut and the Polzberg section near Lenz / Lower Austria allowed for an investigation of continuous sections including the Carnian Turnover.

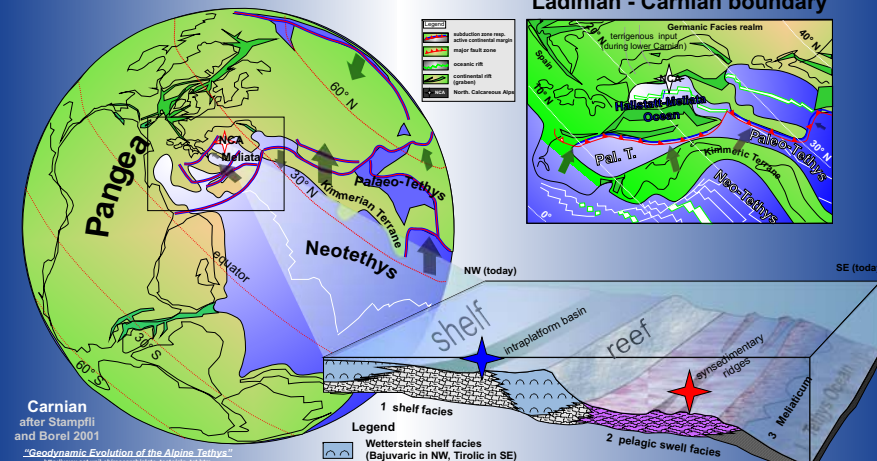
The identified abrupt lithological changes within these three sections might be explained by changes of oceanic and climatic circulations forced by coincident Cimmerian orogenic.

## Biostratigraphy

## Dürrberg sections

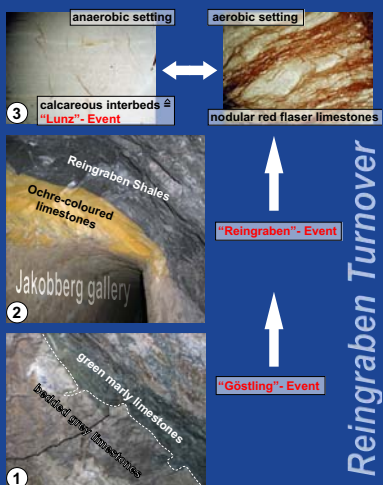


## Paleogeography



Carnian after Stampfli and Borel 2001  
"Geodynamic Evolution of the Alpine Tethys"  
[http://www.sciencelibrary.com/earth\\_history/earth\\_history.htm](http://www.sciencelibrary.com/earth_history/earth_history.htm)

## Lithology



## Discussion

At least three lithological turnovers are notable in the Hallstatt basinal succession: (1) the ochre-coloured limestones on top of the lower thick bedded grey limestones with reefal detritus, (2) the very distinct insertion of black Reingraben Shales and siltstones and (3) the sudden change between black shales and nodular red flaser limestones. The events point to a major reorganisation in the Western Tethyan deep water circulation.

Because of the synchrony of Wetterstein shelves, Reifling Limestones and basinal thick bedded grey limestones, we presume the contemporaneity of the Göstling Limestones and the ochre-coloured limestones in the Hallstatt basin ("Göstling Event"). According to the conodont data, this turnover was settled around the boundary between aonoides and austriacum ammonite zone. The subsequent black shale event, namely the insertion of Reingraben Shales ("Reingraben Event") should be settled in the lower austriacum ammonite zones representing the late Lower Carnian. The paralic "Lunz Event" in the eastern and western NCA might be traceable in the silty calcareous interbeds at the top of the Reingraben Shales (upper austriacum ammonite zone, Julian 2/3; see also Tollmann 1976).

What are the regional and superimposed mechanisms controlling the abrupt changing in lithology and (micro)palaeontology? After Reijmer and Everaars (1991), the Upper Triassic basins were profoundly conditioned by the development of adjacent shelves. The boundary (1) might be initiated by a sudden breakdown of the carbonate factory of the adjacent Wetterstein shelf (drowning). Within a starved basin, the rate of sedimentation was rather diminished. At boundary (2), the system collapses under anaerobic setting and stopped circulation. The sharp boundary (3) might be explained with a re-coloured bottom water circulation and anew aerobic setting.

As for the same time span, strong tectonic movements - the Cimmerian-Eurasian collision - are known from the eastern northern Tethys margin, it is assumed that both, the changes in oceanic circulation and terrigenous sediment supply are triggered by this orogeny. As a consequence of the Cimmerian-Eurasian collision, large areas have been elevated along the northern Tethyan margin forcing the monsoonal climate circulation.

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