

# Event stratigraphy accross the Devonian-Carboniferous – New views from the shelf

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The Devonian-Carboniferous Boundary (DCB) is associated with one of the ‘Big Five’ extinction events of the Phanerozoic. It was also a time marked by a rapid but short-lasting change in deposition called Hangenberg event. In pelagic sections, where the Hangenberg event was defined below the DCB, the succession displays, in stratigraphic order, an anoxic black shale unit (Hangenberg Black Shale-HBS) recording the main extinction phase, the Hangenberg Shale showing no anoxia, the Hangenberg Sandstone (HSS), and (4) the Stockum Limestone (SL). The HBS is traditionally interpreted as a transgressive pulse followed by a rapid regression (HSS) often regarded as a sequence boundary. In Belgium, the DCB transition is well exposed in shelf settings and the HBS-SL interval corresponds to c. 25 m of mixed carbonate-siliciclastic deposits. In comparison, in classic pelagic sections, the events are condensed in a c. 4 m-thick succession where they appear superimposed to each other. Events are thus best developed and separated in neritic sections and are moreover fossiliferous. The latest Devonian (‘Strunian’) Comblain-au-Pont Fm recorded a 3rd-order transgression that produced a progressive switch from coastal siliciclastic to proximal mixed deposits with an increase of the carbonate content. Hence the Comblain-au-Pont and lower Hastière fms are regarded as the transgressive system tract. The highstand system tract corresponds to the massive crinoidal rudstones of the middle member of the Hastière Fm. The latter is capped by an erosion surface corresponding to the 3rd-order sequence boundary. The next sequence starts with the upper member of the Hastière Fm, made of thin-bedded crinoidal pack/grainstones. Superimposed to the 3rd-order sequences are well marked orbitally-forced precession cycles of c. 18.6 ka, appearing as regular c. 40 cm-thick couplets of limestone and calcareous shale beds. These couplets are interpreted as climatic cycles deposited during alternations of dry and wet periods. The HBS event is variously developed in thickness and is sometimes not marked on shallow platforms. It is however more likely that the anoxic facies were triggered by a transgressive pulse that did not spread into shallow-water environments where carbonate facies rich in benthic fossils continued to develop. The HSS event, recorded as a sandstone bed in pelagic sections, is variously recorded at the base of the Hastière Fm in S Belgium, either as a sandy siltstone bed in proximal sections, or as a horizon with limestone clasts and reworked fossils in more distal ones. This event was responsible for the final demise of the Late Devonian fauna. The HSS occurs sharply in the stratigraphic record and does not correspond to the long sea-level fall of a 3rd-order sequence boundary, but most probably to a short out-of-sequence event. After this short-lasting regressive phase, normal settings returned with the deposition of the Hastière Fm.

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