

BONVALLET Lucie (2015): Evolution of the Helvetic shelf (Switzerland) during the Barremian-early Aptian: paleoenvironmental, paleogeographic and paleoceanographic controlling factors

Abstract

The Early Cretaceous has experienced the development of large shallow-water carbonate platform in tropical and subtropical regions, favoured by exceptionally warm climatic conditions, optimal trophic conditions and a suitable tectonic and paleogeographic context. This period was also characterized by shorter intervals, in which the widespread deposition of marine sediments enriched in organic matter occurred ("oceanic anoxic episodes": OAE). This study focuses on the Barremian-Aptian interval, during which the Urgonian platform developed throughout the northern Tethyan passive margin. Due to the Alpine orogeny, sediments belonging to this platform - named locally Schrätenkalk Formation, are presently outcropping in the Helvetic Alps.

This study aims to reconstruct the paleogeographic evolution of the Helvetic platform, and to define the environmental and oceanographic factors, which influenced its development.

Several key episodes in the life of this platform have been identified:

- The installation of the platform, covering hemipelagic sediments of the Drusberg Member, near the limit between the early and late Barremian.
- The temporary change of carbonate production type during the basal Aptian, with the deposition of the Rawil Member.
- And finally the definitive interruption of photozoan carbonate platform sedimentation in the study area, during the early Aptian.

The sedimentological, biostratigraphical and chemostratigraphic ($\delta_{13}\text{C}$) data lead to the sequential subdivision of eleven sections and one core, located throughout the different Helvetic nappes of Switzerland. The sequence stratigraphic framework, initially defined for the Urgonian carbonate platform of the Vercors area (SE France), is confirmed in the Helvetic nappes, where the same number of sequences was observed. Many similarities between these two areas are put forward in this work. The sequence stratigraphic framework helped to highlight the installation of a bioclastic body, included in the Schrätenkalk Formation, since the middle Early Barremian (sequence B2). The age of the installation of the rudist-rich limestone, which corresponds to the Urgonian facies *sensu stricto*, is attributed to the late Barremian (maximum flooding surface of the sequence B3). This age coincides with the one determined in other northern Tethyan areas for the installation of the Urgonian platform. The results of this study show a strong tectonic control of the platform architecture, with the presence of syn-sedimentary faults in a perpendicular position to the progradation direction of the platform. The presence of these faults was highlighted by the study of the evolution of the microfacies distribution and by thickness variations in different areas.

Sea level fluctuations also played an important role in the various life phases of the platform. Three major falls in sea level have been identified. A significant emersion of the proximal domain has been observed, involving an important drop of the relative sea level, leading to the exposure of the Drusberg Member hemipelagic series. A second major drop in sea level is identified near the Barremian-Aptian boundary, and a third is registered on the top of the Upper Schrätenkalk Member on the whole platform; it is associated with a karst affecting the underlying limestones to a depth of over 20 meters. This observation sheds new light on the conditions linked to the demise of Urgonian platform, which was strongly influenced by this phase of emersion.