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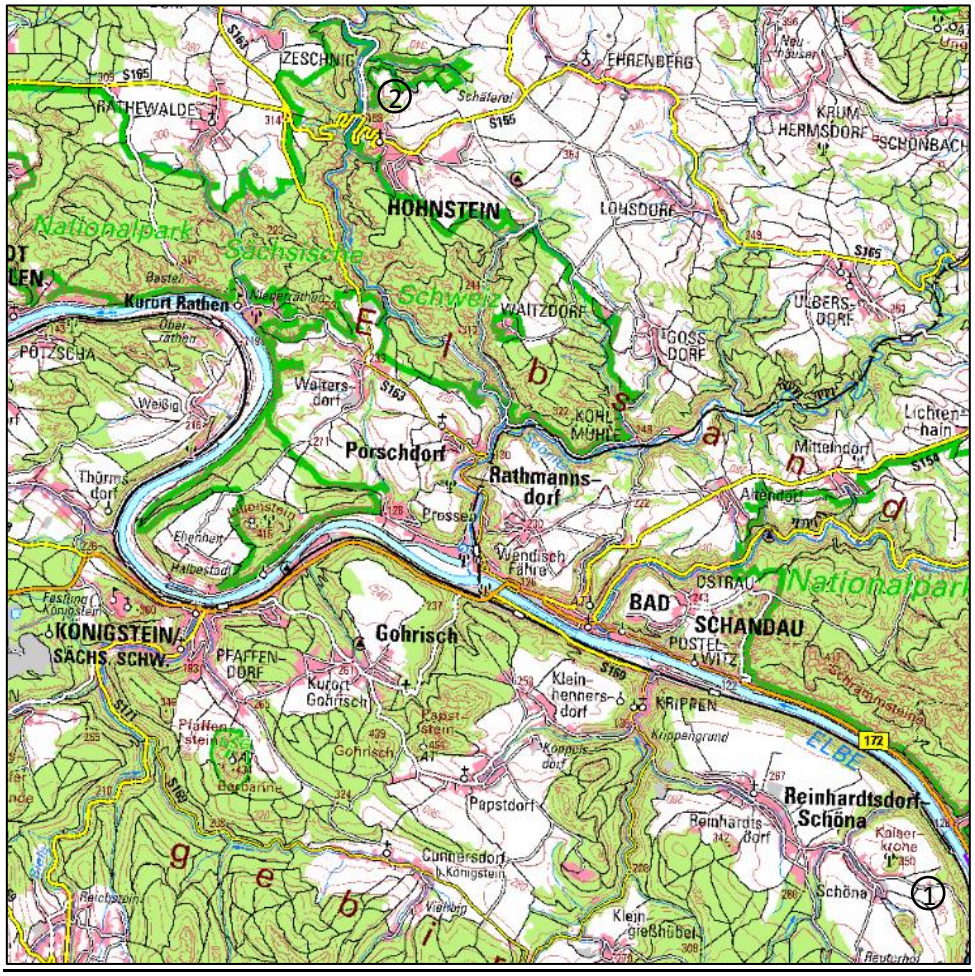
Excursion Materials

Saxonian Cretaceous Basin
Startigraphy of the Elbsandsteingebirge

09.05.2017



Introduction

The palaeogeography, depositional environments and integrated stratigraphy of the Saxonian Cretaceous (Elbtal Group, Cenomanian to Coniacian) are described formation-wise following the current lithostratigraphy, and the succession is placed in a regional context. The Elbtal Group formed in a narrow strait between the Mid-European Island in the southwest and the Lausitz Block in the northeast (Westsudetic or Lusatian Island). During the Late Cretaceous period, the Elbtal Group was situated in an important intermediate position between the temperate Boreal in the north and the Tethyan warm water areas in the south, and it shows a strong relationships in terms of litho- and biofacies to contemporaneous deposits and faunas of the Bohemian Cretaceous Basin. Lithologically, the Elbtal Group consists of marine sandstones, calcareous siltstones (Pläner), marl and marly limestones which are in part very rich in fossils. The overall sequence describes a transgressive–regressive megacycle with maximum flooding in the late Middle Turonian. Although sedimentation allegedly persisted into the later part of the Late Cretaceous, the youngest strata preserved today date into the Middle Coniacian. The rich fauna of the Cenomanian to Coniacian stages form the basis of the present fossil compendium.

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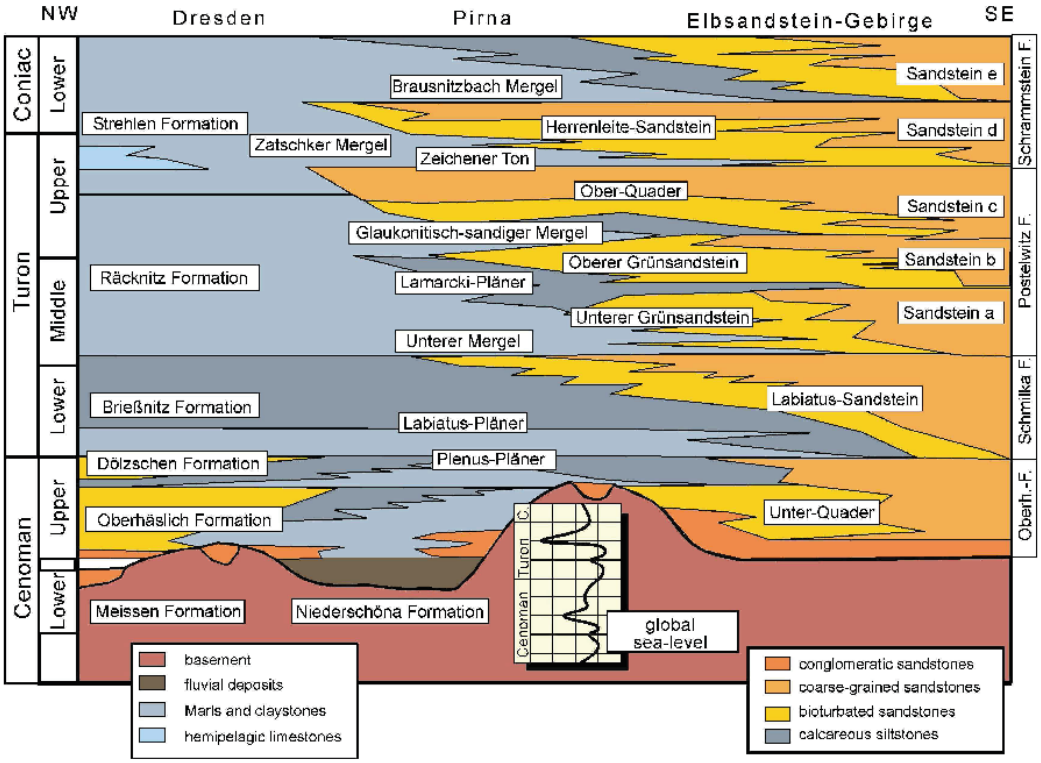
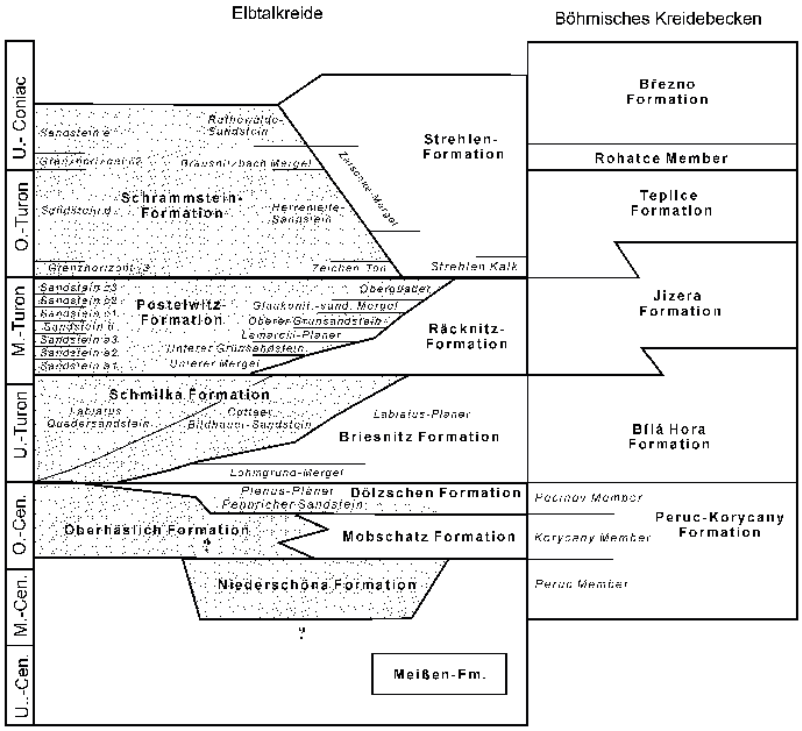
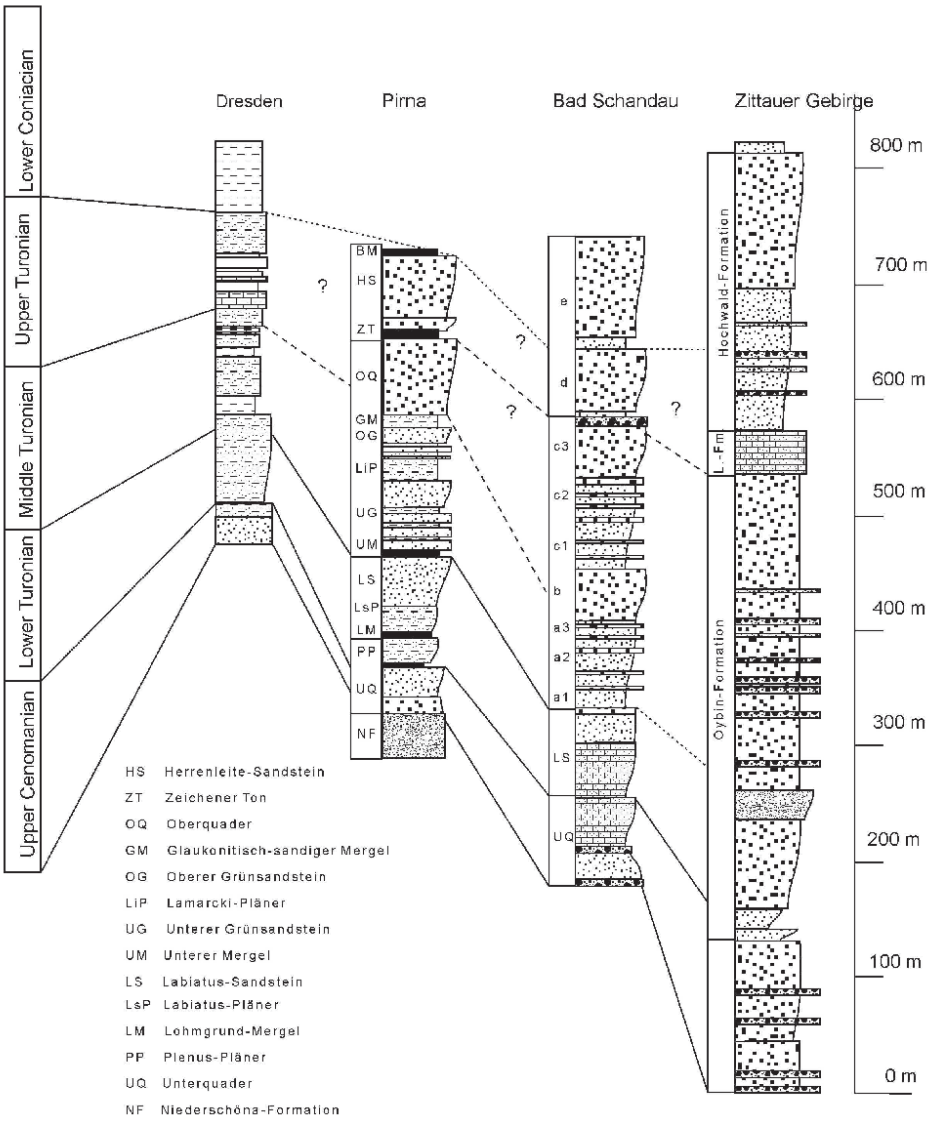


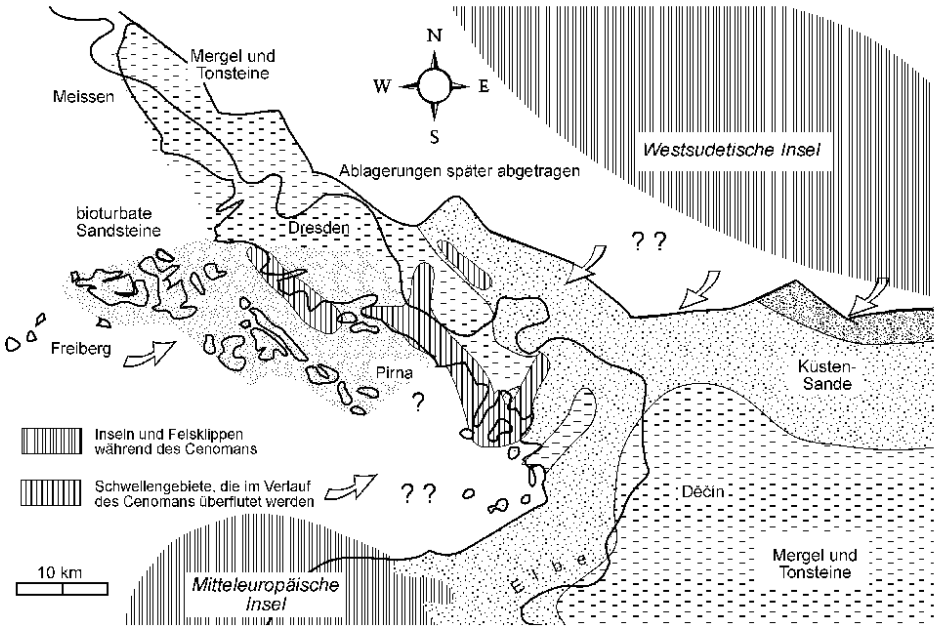
Simplified stratigraphic sketch of the Saxonian Cretaceous Basin from the basinal facies of Dresden to the coastal sandstones of the Elbsandsteingebirge.



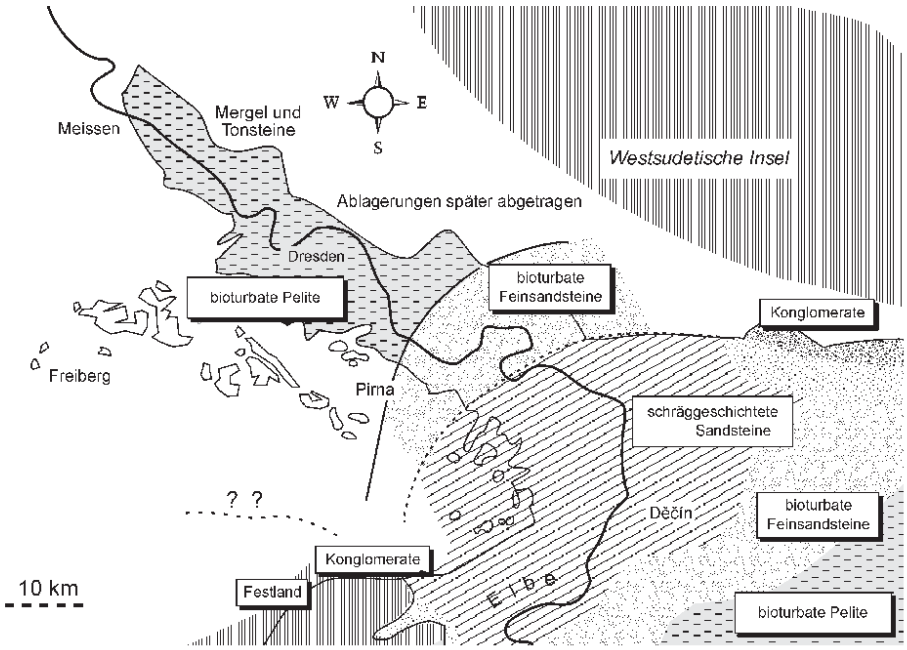
Lithostratigraphy of Cretaceous deposits in Saxony and correlation with the Bohemian Cretaceous.



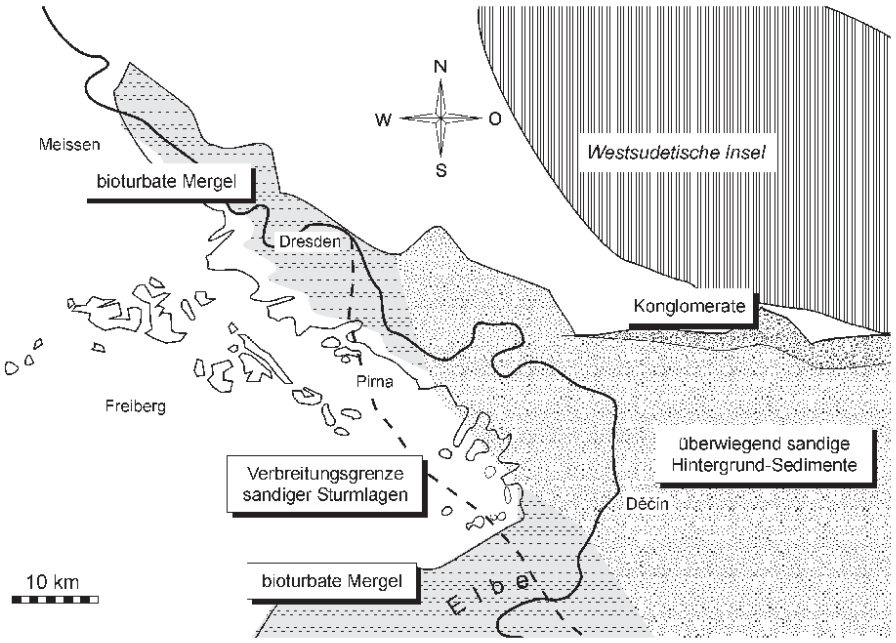
Petrography of the Saxonian Cretaceous from the basin facies (Dresden-Pirna) to the marginal facies (Elbsandsteingebirge, Zittauer Gebirge)



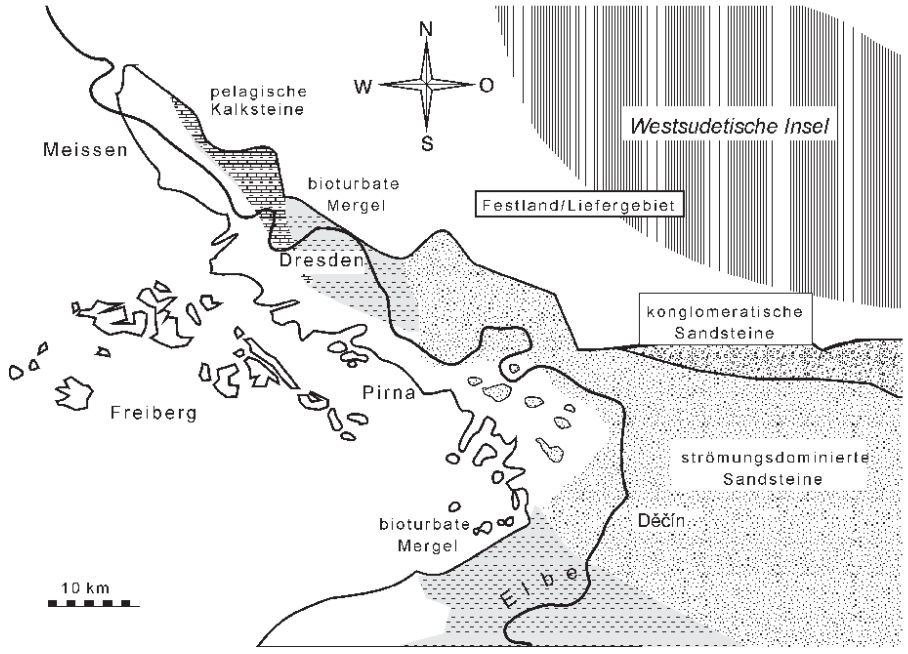
Facies map of the Upper Cenomanian



Facies map of the Lower Turonian/basal Middle Turonian (Labiatus-Sandstein)



Facies map of the higher Middle Turonian/Upper Turonian



Facies map of the higher Upper Turonian/Lower Coniacian

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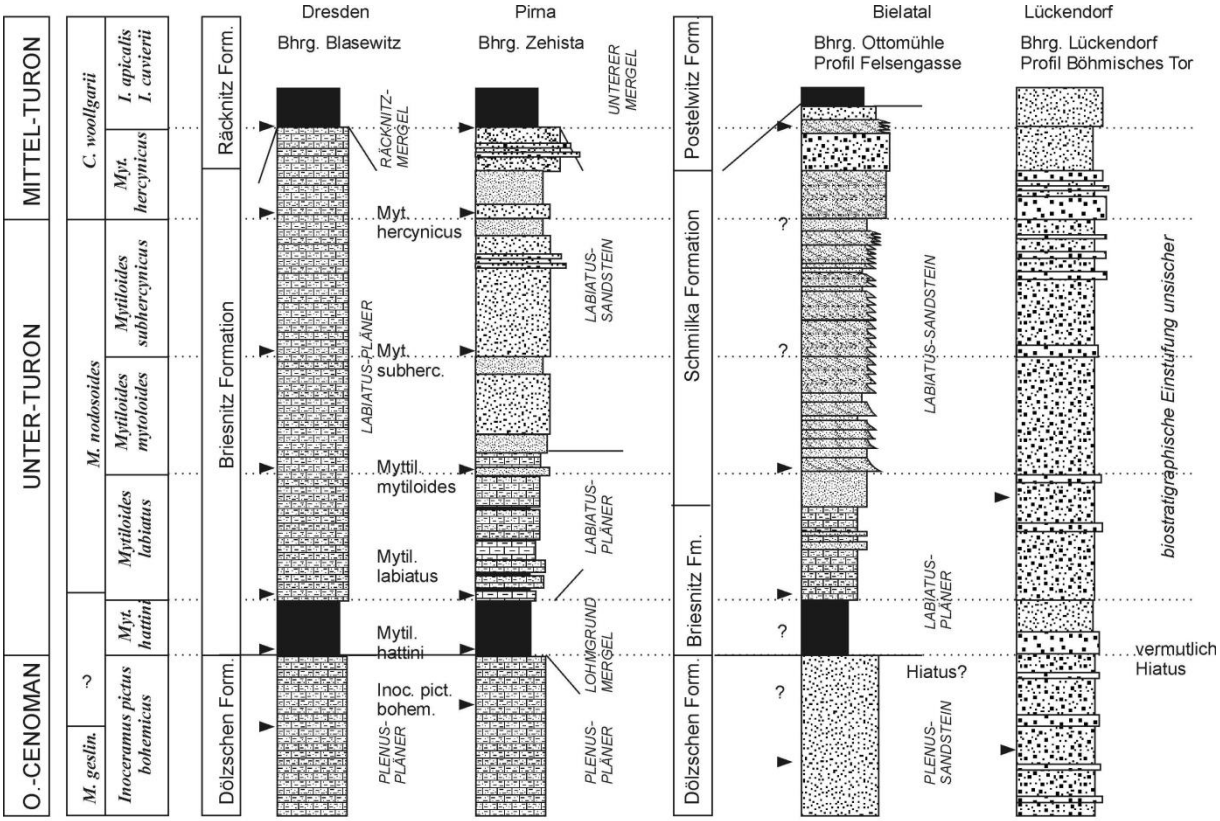
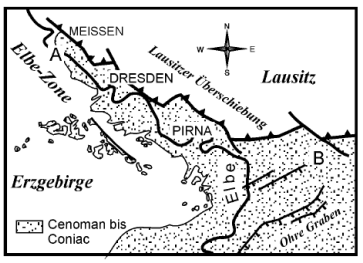
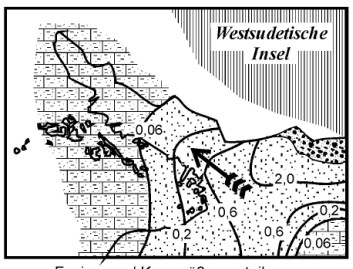


Die vertikale Ausdehnung der Säulenprofile entspricht nicht den Mächtigkeiten, sondern der Ausdehnung biostratigraphischer Zonen.
Der zeitliche Umfang der Biozonen ist unbekannt.

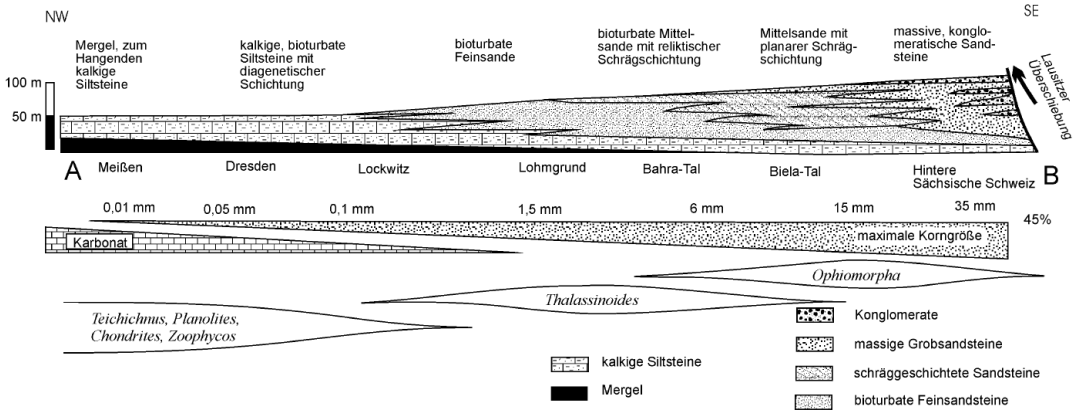
Correlation of the Lower Turonian in Saxony on the base of borehole desriptions.



Übersichtskarte des Sächsischen Kreidebeckens



Fazies- und Korngrößenverteilung (Top Schmilka-Formation)



Facies correlation of the Lower Turonian in Saxony.

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Stop 1

Kaiserkrone point with view of the Schrammstein Massif

***Location*:** The Kaiserkrone is situated NW of Schöna close to the Bahnhofsstraße, that proceeds down to the Elbe valley and left-elbian train stations of Schmilka-Hirschmühle and Schöna.

***Lithostratigraphy*:** Upper Postelwitz Formation (Sandstones c1 – c3) and Schrammstein Formation (Sandstones d and e); at the Kaiserkrone only up to Sandstone d (lower part), at Schrammsteinblick up to Sandstone e.

***Chronostratigraphy*:** Upper Turonian and (at Schrammsteinblick) Lower Coniacian.

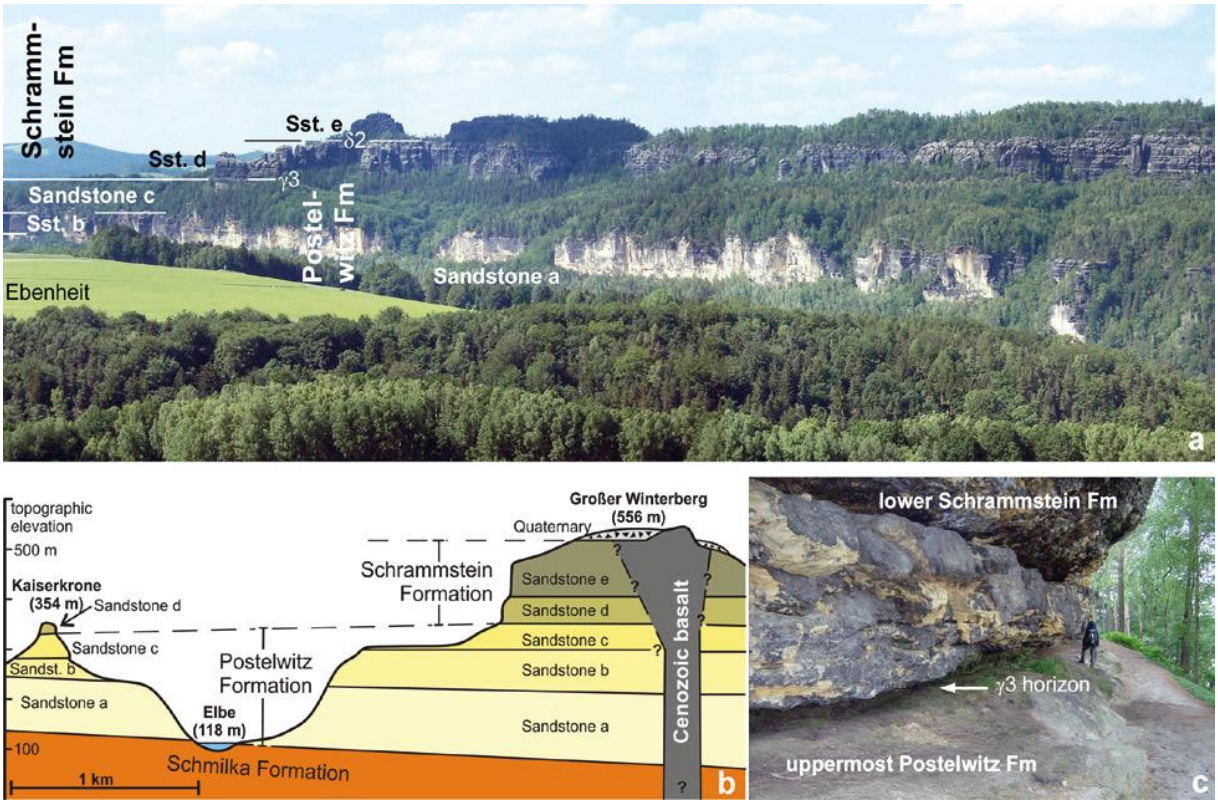

Fig. 1. Geomorphology and lithostratigraphy of the Saxonian Switzerland. **a)** view from the northern peak of the Kaiserkrone towards the Schrammstein Massif with indication of sandstone units, marker beds and formations. **b**) schematic cross-section from the Kaiserkrone to the Großer Winterberg. **c)** γ3 horizon at the Kaiserkrone. Modified after Wilmsen & Niebuhr 2014)

***Description*:** The Kaiserkrone is a typically small scaled table mountain of the Elbsandsteingebirge that is strongly eroded. Its peak subdivides into three single peaks orientated by NNW/SSE striking joint sets, giving the peak a crown-like shape from a distance. The Kaiserkrone has an elevation of 354 m and it is easier to climb than the directly southern Zirkelstein (384 m). Further, the northern peak provides a remarkable view of the Schrammstein-Winterberg area where Lamprecht (1928, 1934) elaborated the classical formation of the rear Saxonian Switzerland and the subdivision into sandstones a to e (Fig. 1a). Besides, the wood covered hillside of the Kaiserkrone consist of the Upper Postelwitz Formation (sandstone c1 – c3), where the top ("crown") comprises thick bedded, coarse-grained sandstones of the sandstone d of the Lower Schrammstein Formation, which also contain portions of fine gravel (Fig. 1b). Note the distinctive marker horizon γ3 that is situated between sandstone c3 of the Upper Postelwitz Formation and the sandstone d of the Lower Schrammstein Formation (Fig. 1c), composed of a fine-grained matrix which is less cemented and forms distinctive gaps or caves due to the erosive propagation (note the granular material "Krümelsand"). Many places exhibit alum weathering with its characteristic "Eating wounds", which are recognizable by the fresh, yellowish color of the sandstones. At the level of the γ3 horizon, a circular path leads around the three

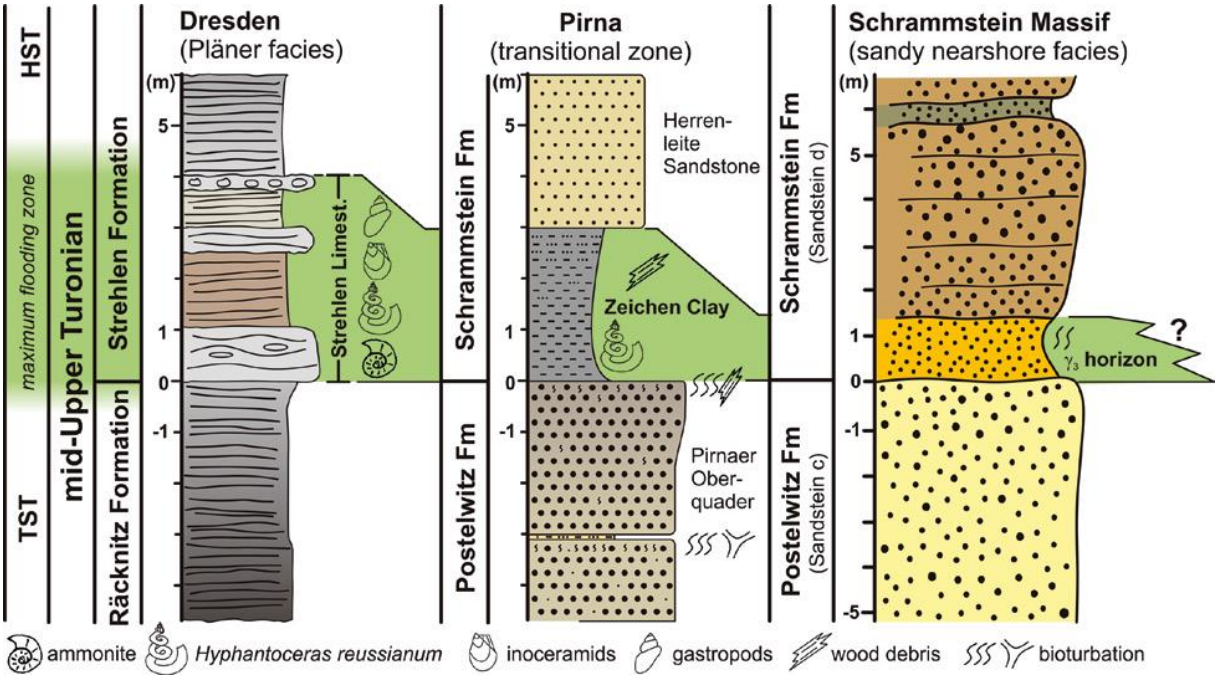

Fig. 2. Distal – proximal correlation of the Strehlen Limestone (lower Strehlen Formation, mid-Upper Turonian) with the Zeichen Clay (facies transition zone) and the γ3 horizon (Saxonian Switzerland) at the base of the Schrammstein Formation as a result of a maximum flooding zone; TST = transgressive systems tract, HST = highstand systems tract. Strehlen section after Tröger & Wolf (1960).

peaks of the Kaiserkrone. From the northern summit, the Postelwitz formation can be recognized very nicely at the remaining "Postelwitz quarries" in the geological profile at the slope of the Elbe river (especially sandstone a1 – a3, that were excavated as „Postaer Sandstein"; Fig. 1a). The Schrammstein Massif is formed by approximately 50 - 60 m high, perpendicular rock walls of the sandstone d of the Lower Schrammstein Formation above the γ3 horizon. About 20 m below the peaks occurs another gap (δ2 horizon), which delineates the sandstone e of the Schrammstein Formation (Fig. 1a), more often visible through the overgrown parts. The δ2 horizon comprises an approximately 4 m thick interval of thin-bedded, bioturbate fine-grained sandstones. The sandstone e reaches at least a thickness of 80 m at the Great Winterberg; while approximately 20 m are remaining at the Schrammsteine that form the top of the summit range. Only a few mountains tops of the Elbsandsteingebirge such as the Lilienstein and the Pfaffenstein have kept remains of the sandstone e.

Interpretation: The stratigraphic boundary between the Postelwitz and the Schrammstein Formation constitutes a significant Upper Turonian marker horizon: the γ3 horizon is representing a major transgressive event (well sorted, fine-grained marine quartz arenites) that correlates with the Strehlen and Weinböhlaer Limestone of the basin profiles of the Dresden area, and in addition with the Hyphantoceras event and the Zeichen Clay in the facies transition area (Seifert 1955, Voigt 1994, Tröger & Wejda 1997, Janetschke & Wilmsen 2014, Fig. 2). The coarse-grained sandstones of the lower Schrammstein Formation mainly consist of quartz (with partly reddish color) but exhibit a poorly textural maturity (poorly sorting and roundness). Regarding the depositional environment, a coastal facies together with short transport of the detritus from the Lusatian Block can be observed. High sedimentation rates and therefore fast burial inhibited any further marine maturation of the coastal sand deposits. That led to the assumption of high subsidence in the area of the Lusatian Thrust and corresponding syn-sedimentary tectonics.
Further, the δ2 horizon shows an additional transgressional event affecting the coarse-grained coastal facies of the Schrammstein Formation. This is presumably an event of the Lowermost Coniacian, in particular when taking into account the correlation of the δ2 horizon with the Zatschke Marl.

The presence of inocerams of the Cremnoceramus-Waltersdorfensis and Cremnoceramus-deformis groups of the Lower Coniacian in the Zatzschke Marl near Pirna-Zatzschke is assured. However, sandstones c, d and e of the Schrammstein-Winterberg area only contain minor amounts of biostratigraphically useful fossils. All the important index fossils of the Upper Postelwitz Formation and the Schrammstein Formation, with the Lower Coniacian index-inoceram Cremnoceramus inconstans from the borehole Rathewalde (Tröger 2008), derived from the transition area of the sandy to the marly lithofacies between Pirna - Wehlen - Rosenthal - Bielatal (vgl. Tröger & Voigt in Niebuhr et al. 2007, Tröger & Niebuhr 2014).

Stop 2
Hockstein lookout point near Hohnstein

***Location*:** The Hockstein lookout is a cliff situated on the western slope of the Polenz valley. From the parking lot below the “Hocksteinschänke”, a signposted hiking trail heading southeast to the Polenz valley. Across the Devil´s Bridge you can reach the Hockstein lookout point on top of a bluff.
Lithostratigraphy: Schrammstein Formation
***Chronostratigraphy*:** Upper Turonian to Lower Coniacian
***Description*:** The Hockstein consists of an articulated platform, whose almost vertical walls reign 100 m above the Polenz valley (Fig. 3). On the other side of the valley dominates the castle of Hohnstein surrounded by the village of Hohnstein to the NE. From there, the Mühlbergstraße runs down in narrow bends to the Polenz valley and climbs up as Wartenbergstrasse to the Hocksteinschänke. In 1958, the Lusatian Thrust was exhibited during road works on the western side of the valley (Rast 1959). The Lusatian granodiorite was encountered in shallow NE-dipping tectonic contact with strongly jointed and silicified Turonian sandstones. Moreover, RAST (1959: 114) described a 20 to 30 cm thick zone of a "gray, silty, smeary substance" as product of "strongest pressing and grinding of the granite". In addition to this presumed mylonite, slickensides are also very frequent in the sandstones of the immediate surrounding, indicating the enormous stresses in a reverse fault. Unfortunately, the outcrop conditions and the accessibility of the profil at the Wartenbergstraße are now severely restricted. Repeatedly, the sandstones of the Postelwitz and Schrammstein Formations near the Lusatian Thrust, are comprising intercalated matrix-rich breccias and conglomerates with gravel-sized components. Hence, indicating an increased topography in the vicinity and the availability of coarse clasts. The components are Jurassic limestones, limonite concretions, quartz, red siltstones and limonitic sandstone (Häntzschel 1928, Seifert 1937, Voigt 2009). Further, those elements pinch out to the W and therefore indicating an origin from the Lusatian block. Geomorphologically, the lithological change at the Lusatian Thrust is impressively demonstrated by the shape of the Polenz valley. In the northern part, the "Granitic Polenz valley" shows gentle slopes and an extended, meadow covered valley floor. Downstream to the south, the character changes rapidly to a canyon with steeply dipping walls. In the process, this narrow "Sandstone Polenz valley" carved out the sandstones d and e of the Schrammstein Formation (Upper Turonian to Lower Coniacian).
Interpretation: Voigt (2009) mentioned, that the Lusatian Thrust as north-east limiting structural element of the Saxonian Cretaceous Basin has been active since the late Cenomanian. Debris flow deposits in the sandstone rocks of the Postelwitz and Schrammstein Formations show, however, that the elevation and erosion of the Lusatian Block and the flexural subsistence of the edged trough is supposed to be intensified in the mid-Turoniam stage. Most of the layers from the overburden of the Lusatian were eroded (Voigt 2009, Hofmann et al. 2013). Also, the absence of layers which are younger than Coniacian age imply only speculative statements over the further course of the basin evolution. But it is assumed that recent 1000 m thick cover of the Cretaceous was substantially larger (Voigt 2009), further expecting a similar chronological sequence for the Lusatian Thrust as like the “Harznordrand Fault” with an apex in the Santonian and Campanian (see T. Voigt Et al., 2006).

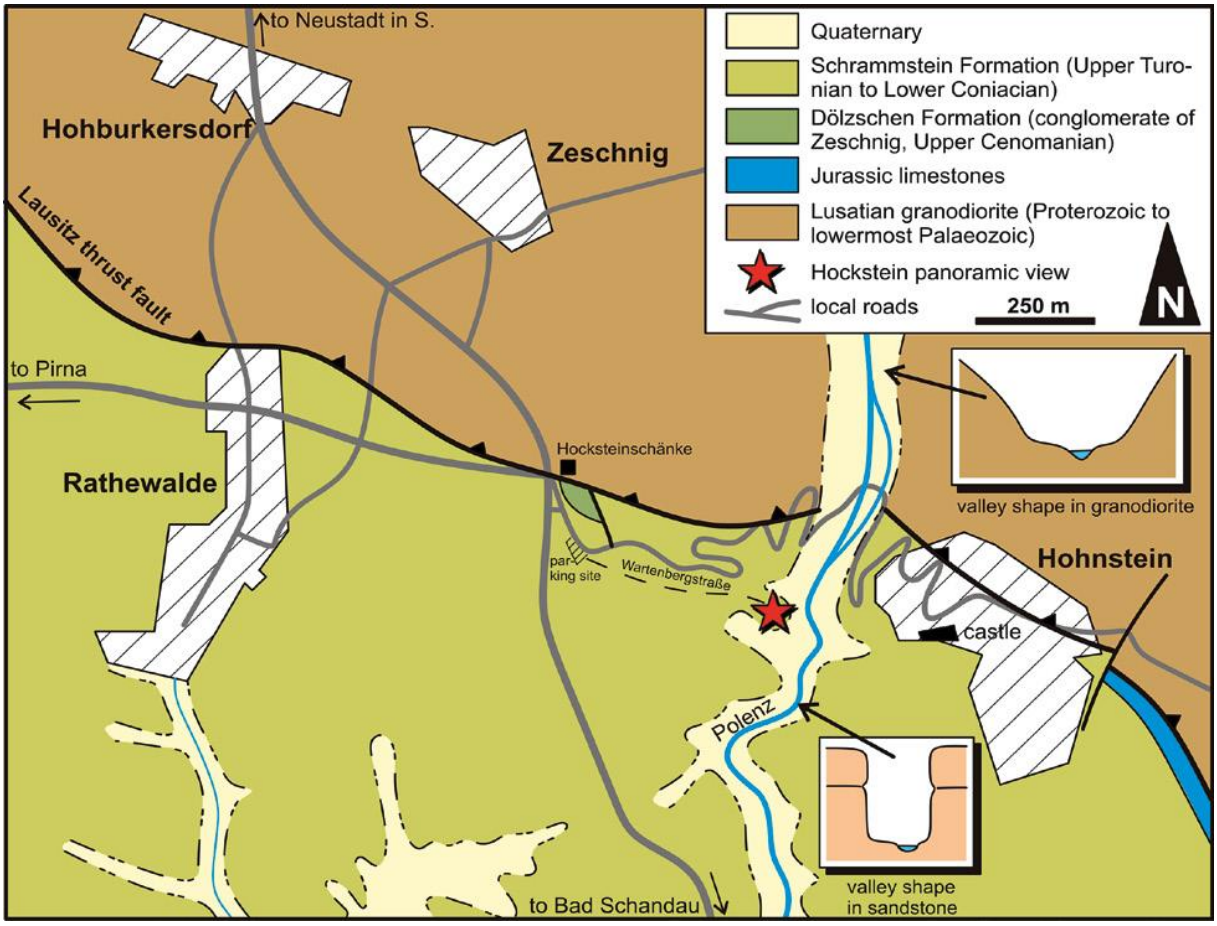

Fig. 3. Simplified geological map of the Hohnstein area (after Rast 1959) with position of the Hocksteinaussicht.

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