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Facies analysis in a poorly exposed siliciclastic area: the Upper Cretaceous basal Gosau Conglomerate at Gaisberg, Austria

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Facies analysis in a poorly exposed sedimentary successions hampers on outcrops, and exposed lithologies are strongly biased towards erosion-resistant lithologies, weak lithologies are often simply not mapped. Here, an example is shown, where a combination of surface exposures, digital terrain models (DTM) backed up by a well-documented abandoned coal gallery allows facies analysis of an Upper Cretaceous, virtually pure conglomerate-dominated succession. This section shows terrestrial to deltaic-lacustrine facies, among which marls dominate ca. one third of the surface area. High-resolution DTMs also allow the recognition of a high frequency, climate-controlled cyclicity of the clastic succession, and the geometry of beds allows facies interpretation. The Upper Cretaceous section was deposited above an angular unconformity after the Early Alpine orogeny. Based on the new DTM-derived data, several informal lithostratigraphic units can the distinguished from base to top: (1) In the south, the basal coarse-grained reddish conglomerate lithofacies with reddish coated clasts represents the infilling of a valley. (2) On its northern lateral extension, the basal grayish conglomerate lithofacies is exposed with lens-shaped conglomerate ridges indicating ca. east-to-west sedimentary transport. This lithofacies represents a lateral equivalent to or is younger than the basal coarse red conglomerate lithofacies in the south. (3) In the south, the basal coarse red conglomerate lithofacies is followed by the reddish conglomerate-sandstone lithofacies with its alternation of conglomerate with reddish silt- and sandstones, and yellowish siltstones indicating a flat valley floor. (4) In the eastern part, above the basal grayish conglomerate lithofacies, a regular four layer-conglomerate ridge unit is exposed with a as remarkable long lateral continuity interpreted to represent a lake shore facies. (5) Above, grayish siltstone and marl are following, defined here as the grayish marl lithofacies, for which the formal term Felberbach Marl Fm. is here introduced. It covers a wide area and is obviously more than 100 m thick and potentially contains, near the base, reddish marls, too, which grade laterally into the reddish conglomerate-sandstone lithofacies (3). (6) The grayish conglomerate unit overlying the grayish marl unit is here formally defined as Aigen Conglomerate Fm. and include also separate, decametric thick marl members.

DTM-based lithofacies units (1) to (4) corresponds to the classical Kreuzgraben Fm., and (5) and (6) likely correlate with the Streiteck Fm. as defined by Wagreich & Faupl (1994, Palaeogeography, Palaeoclimatology, Palaeoecology 110, 235–254).

Four groups of clasts can be identified in these six lithofacies units, all are typical for the Northern Calcareous Alps. (1) Various types of cherts, (2) a large variety of Upper Triassic and Jurassic limestones and rare dolomites, (3) rare greenish to grayish Lower Cretaceous sandstones, and (4) a small group of intraformational clasts, interpreted as clasts of likely Late Cretaceous age. Together, they constrain erosion down to Upper Triassic levels, and strong enrichment of erosion-resistant cherts. Interesting is also the low amount of dolomite clasts due to chemical weathering. No exotic clasts were found. This implies short valleys and no connection to the Austroalpine basement exposed in Central Alps.

In summary, the application of high-resolution DTMs is an easy tool for mapping of clastic succession in the case that few outcrops support the lithological and facies interpretations.

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