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Aeolian and fluvial Sedimentation in Lower Buntsandstein (Calvörde Formation), Eastern Thuringia

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Abstract

The basal Calvörde Formation („Untere Sandsteinfolge“ of the Lower Buntsandstein) at the southeastern margin of the Thuringian syncline is exposed in several sand pits in the valleys of the rivers Saale and Orla. The poorly-cemented sandstones are composed of units with giant cross-beds and well-sorted, laminated sands. This sandstone-succession is interrupted by thin clay and silt layers with mud cracks and some fluvial channels. The sedimentary structures observed in the poorly-cemented sandstone units are very typical for aeolian deposits. Especially up to three meters thick cross-beds with sigmoidal foresets which are interpreted as the basal units of large transverse dunes and horizontally-laminated pin-stripe sands, attributed to migrating wind ripples, occur exclusively in aeolian sediments. The orientation of cross-beds allows the reconstruction of wind directions during deposition. Like the drainage direction of fluvial channels, the wind directions are directed to the north. They agree with wind directions determined in the southern Eifel and in Northern Hesse and prove the dominance of a monsoon-triggered wind system against SE-NW directed trade winds. The occurrence of fluvial channel sands and interdune deposits points to a semi-arid climate. The environment was probably characterized by a dune belt which was episodically cut by northwest-directed small rivers. The Calvörde formation in the surroundings of Gera and in the centre of the Thuringian syncline shows no evidence for significant aeolian deposition. Instead, sediments are predominately of lacustrine origin.