



Reconstruction of bedform geometry of the Devonian siliciclastic deposits by use of in situ measurements and terrestrial laser scanning: Veczemji cliffs, Latvia

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The Veczemji outcrop is situated at eastern coast of the Riga Gulf, between the Rankuļi and Kutkāji capes. Erosional coast, up to 500 m long and 4-5 m high, exposes the sandstone of the Middle Devonian Givetian Burtnieki Formation. Notches, caves and columns have formed in the sandstone in result of wave action.

Previous studies suggest that the Givetian siliciclastic deposits in the Main Devonian Field were formed in an epeiric basin (Kurshs 1992). Later deltaic origin for these deposits and strong influence of tidal processes has been suggested (Tovmasjana et al. 2011; Kreišmane 2014). It is not still clear, what was the role of fluvial and tidal processes in accumulation of the Givetian siliciclastic deposits in the epeiric Baltic Devonian palaeobasin, and this object providing large exposed surfaces with various orientations give good option for planned measurements. This study focuses on detailed analysis of orientation of main bedding surfaces and cross-beds in the sandstone succession. The aim is understanding of bedform architecture and changes in time under the influence of fluvial and tidal processes in the Middle Devonian. Innovative methodology including traditional measurements of bed surfaces and cross beds by the geological compass combined with terrestrial laser scanning has been applied. In result 3D model with combined results was developed. Model includes reconstructions of palaeocurrent directions, derived from in situ measurements, as well as from interpretation of laser-scanned point cloud data.

The studied deposits are represented mainly by trough cross-stratified sandstone, trough cross-stratified sandstone with mud/mica drapes, as well as current ripple laminated sandstone, compound cross-stratified sandstone and large scale cross-stratified sandstone facies. This succession is composed of mainly fine-grained sandstone, where mud or mica laminae systematically drape most of individual cross strata. Architecturally, this succession is composed of large-scale sandbodies with significant, low angle master bedding surfaces and superimposed smaller scale bedforms. Palaeocurrent directions derived from very slightly inclined master bedding surfaces are approximately perpendicular to the palaeocurrent measurements derived from the superimposed bedforms - smaller scale cross-stratification and cross lamination, e.g. master surfaces are inclined to 7-246 degrees (mostly to S-SW) and the superimposed bedforms towards to 2-338 degrees (E and SE directions are dominant).

References:

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