

Meandering alluvial systems in the Lower Devonian, La Roche-en-Ardenne area (Saint-Hubert Formation)

Frédéric BOULVAIN*

(*) Pétrologie sédimentaire, Université de Liège, B20, Sart Tilman, B-4000 Liège.

The study focuses on the base and top of the Lochkovian Saint-Hubert Formation near La Roche-en-Ardenne, utilizing quarries and boreholes. The primary aim is to understand the nature of rivers in the Ardenne region during the Lower Devonian.

The predominant lithologies in the studied sections are medium- and fine-grained overbank deposits (60%), representing levees and lowlands of the alluvial plain. Carbonate nodules and rhizomorphs are present, but no persistent crusts were observed. Coarser deposits (40%) correspond to fluvial channels, with quartz-dominated sandstones indicating relatively high sediment maturity. The main sedimentary structures observed include planar and trough lamination. Lateral accretion forms associated with point bar development are primarily restricted to the smallest channels. Main channel bodies, reaching up to 6 meters in thickness, often lack lateral accretion sets, indicating relatively low-sinuosity river deposits.

Microfacies analysis reveals seven types, quartzites being less abundant than mudshale and quartzwackes, depicting a landscape characterized by low slope, large alluvial plains, and meandering smaller distributaries. Pedogenetic glaebules are usually associated with roots and may be reworked and incorporated into sandstones (channels, crevasse splay) or mudshales during erosion episodes of the alluvial floodplain.

The vegetation consisted of small, short plants adapted to a climate with alternating wet and dry seasons. The architecture of deposits in the Saint-Hubert Formation is influenced by the response of fluvial systems to marine base-level changes. The ideal short-scale deposition cycle involves channel sands grading into fine sands, mudshale with bioturbation and pedogenesis, and topped by siltstones with channelized crevasse splays. On a larger scale, there is evidence of long-term accommodation increase, leading to thickening upward cycles and a higher proportion of alluvial plain deposits. This trend aligns with the onset of a future marine transgression depositing marine facies in the Mirwart Formation. Overall, the study provides valuable insights into the Devonian alluvial systems, including sediment characteristics, depositional environments, and landscape evolution.