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Volcaniclastic and sedimentary deposits in Late Oligocene/Early Miocene Smrekovec Volcanic Complex, northern Slovenia

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Late Oligocene/Early Miocene volcanic activity in northern Slovenia is related to post-collisional accommodation of continental Apulian and oceanic European plates (von Blanckenburg and Davis, 1996). It occurred in one of small south-western marginal depressions of the Pannonian basin system, locally termed the Smrekovec Basin (Hanfland et al., 2004). Contemporaneous clastic sedimentation is evidenced by several hundred metres thick succession composed mainly of mudstone, siltstone and sand.
Smrekovec Volcanic Complex (SVC) is an eroded and tectonically uplifted remain of a larger submarine strato-volcano edifice, built of lavas, shallow or subsurface intrusive bodies, and pyroclastic, hyaloclastic, syn-eruptively resedimented volcaniclastic and reworked volcaniclastic-sedimentary deposits (Kralj, 1996). The development of lithofacies of syn-eruptively resedimented deposits is controlled by the proximity to the ancient volcano summit and the volcano sloping. Moreover, close to the rising volcano edifice, distinct shallow-water environments with siliciclastic sedimentation developed.
Syn-eruptively resedimented deposits are the most widespread and are related to volcaniclastic debris flows and volcaniclastic tubidity flows. Volcaniclastic debris flow deposits are subdivided into lithofacies Bx – polymict volcaniclastic breccia, and Bt - volcaniclastic tuff-breccia. Bx occurs as tabular, up to some ten metres thick bodies with abundant up to 5 dm large angular lava clasts and angular or rounded clasts of fine-grained tuff, and tuffaceous matrix.
Bt forms basal, massive layers in fining-upward sequences. The main constituent is tuffaceous matrix; up to 1.5 dm large clasts of lavas and tuffs are subordinate. In a distance up to 2 km from the former volcano summit (proximal area), Bt predominates in the sequence lithofacies composition ($\sim$75 %), and attains a thickness of up to 4 m. At a distance of 2-4 km (distal area), a maximum Bt thickness rarely exceeds 5 dm, an average is 2 dm. Bt is overlain by the lithofacies of horizontally stratified coarse grained tuffs - Tv(h). The thickness ranges from 0.1-5 m.The main constituent are angular volcanic rock fragments of diverse composition, texture and stage of alteration. Thick layers may comprise up to 50 graded units, each 1-20 cm thick, which are united in mostly normally graded subsets and sets. Uppermost parts of the sequences are occupied by horizontally and vaguely laminated fine-grained tuffs, and massive fine grained tuffs, denoted as lithofacies F(h), F(v) and F(m), respectively. F(h) and F(v) attain a thickness of 1-5 dm, and F(m) a few mm to 25 cm.
At a distance of about 2 km from the former volcano summit, volcaniclastic turbidity ash flow deposits alternate with reworked turbidite ash deposits and siliciclastic marine sediments. Lithofacies of massive (tuffaceous) sandstone – Sv(m), through-cross stratified tuffaceous sandstone – Sv(t) and massive mudstone – M were recognised. They contain detritial constituents (quartz, metamorphic minerals, illite), some layers are rich in organic matter and fossil remains. The succession indicates changing of depositional environment - from high-energy and influenced by wave action to restricted, low-enegy, lagoonal environment with intensive activity of biosphere.

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