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Sedimentation and simulation in the Pleistocene Mitterndorf basin (Vienna Basin, Austria)

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The Mitterndorf basin ("Mitterndorfer Senke") comprises a Pleistocene to recent depocentre of the larger Neogene Vienna Basin, situated at the junction of the Eastern Alps and the Western Carpathians. The Mitterndorf basin (MB) is an active pull apart, about 50 km long and a maximum of 10 km wide on top of Alpine thrust sheets. It formed along prominent sinistral strike-slip faults (e.g. the Leitha fault system, Hinsch et al., 2005). 1.5 to 2 km sinistral displacement during the Pleistocene was quantified by a model for thin-skinned extensional strike-slip duplexes (Decker et al., 2005). The MB comprises one of Europe's largest shallow groundwater reservoirs, including the 3^{rd} Vienna waterline Moosbrunn. The vulnerability of this shallow groundwater reservoir is extremely high. The sedimentology of the basin is currently under investigation in FWF Project XXX. The Mitterndorf basin is filled with up to 150 m of (glacio-)fluvial gravels of mainly Late to Middle Pleistocene ages. Two red paleosoil horizons of the MB have been related to interglacial intervals (Riss-Würm interglacial, post-Mindel interglacial). This results in an estimated maximum time span of about 400.000 years for the sedimentation of the gravels and intervening soils of the MB (Decker et al., 2005).

The software package WinGeol/SedTec (FABER & WAGREICH, 2005) simulates erosion and deposition in dependency on topography, fault movements, lithological properties and sea level. Sediment transport such as mass and suspension flows are induced by elevation or concentration differences between neighbouring cells. Grain size reduction during sediment transport is included into the model. The spatial distribution of different rock types in the source area is used to model sediment composition. Rock types are characterized by their resistance to erosion and grain size reduc-

tion during sediment transport. Input data for simulation include elevation, lithology, fault data and tabular data from various data sets such as sea level curves and control points. Faults are defined by their geometry, geographic position, time interval of activity, and a displacement vector.

Simulation of the Mitterndorf basin with WinGeol/SedTec incorporates a strongly simplified digital elevation model including the nearly flat Vienna Basin, a low relief eastern and southeastern mountainous metamorphic basement source area, and a western higher relief carbonate mountainous source area (Northern Calcareous Alps). The Mitterndorf basin was modeled by a simplified rhombic fault bounded subsidence area. The simulation concentrated mainly on the southern part of the basin, as sediment transport paths and sedimentation patterns were simpler in that area. Sediment input was mainly controlled by lateral paleovalleys, resulting in a fan-like sedimentation pattern of the Neunkirchen fan and the Wöllersdorf fan

Simulation results indicate a complex interplay of erosion and sedimentation of different lithologies according to the chosen parameters for bedrock erodability and grain size reduction. The two fans have been successfully modeled by coarse channel sediment building fans from point sources where channel-like paleovalleys enter the basin. The internal sediment architecture of the fans displays some variations due to different lithologies and irregularities as a consequence of the coarse cell size (500 m), the large time steps (40.000 years) and the simple geometry used for this simulation. However, a clear cyclic trend in carbonate clast sedimentation from the Northern Calcareous Alps can be recognized, indicating low sedimentation rates and low carbonate clast input during interglacial periods versus high carbonate clast input during glacial times.

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