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Delineation of a shallow subsurface aquiclude relief with aero electromagnetic data

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Within a governmental groundwater remediation project in Austria, a new (overworked) characterization of a large catchment area (600 km2) with aeroelectromagnetics (AEM) was carried out.

This catchment area is a large and important zone of subsurface water resources for currently and future municipal and rural water supply. Conflicts in future land use between e.g. agricultura, excavigation of mass materials, city and regional planning, ect. are preassigned and have impacts concerning the quality and quantity of available groundwater.

The geology of the investigation area is a typical post-glacial region, characterized by aggradational deposition areas. The thickness of the wide-spread terrace gravels ranges from 10m to 40m, being the preferred ground water aquifer. The subsurface of the investigation area is built up by a Neogen basement, the so called Molasse and is acting as an aquiclude relative to the overlying quaternary sediments.

Aeroelectromagnetic data from a former aerogeophysical survey were reinterpreted with a new processing and interpretation approach for the determination of this geological 3 layer case. This aeroelectromagnetic inversion integrates results from borehole data, ground geoelectric surveys and from geological mapping as a priori input information. The inversion result for a measured AEM data value is determined by a combination of geostatistically weighted additional information and likelihood weighted theoretical models.

The primary aim of the study was the delineation of the aquiclude relief. The ground water circulation within the different terrace gravels is substantially affected by this Neogen relief. Depressions and prequaternary (tertiary) riverbeds within the Molasse often show other trends of water flow than the surficial, recent vales. The knowledge of the hydrogeological framework is essential for identification and definition of water protection and catchment areas as a decision base for national land use regulations.

The result is a topographic model of the aquiclude with a depth resolution of $\pm$5m.