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GIS-based modeling of a complex hydrogeological setting in the younger Pleistocene of NE-Germany

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The water balance of the young pleistocene landscape in northeastern Germany is exposed to strong threats by changing climate conditions. During the last two decades the landscape with its many lakes has been impacted by increasing periodic fluctuations of the climate. In addition, anthropogenic influence has been causing significant changes in the landscape in order to improve agriculture and forestry but with negative impact on the groundwater hydrology.
For a sustainable ecological and economical water management it is therefore paramount to build precise groundwater data models allowing a complex spatial and multi-temporal data processing. Such models could potentially be used as sources of consistent data providing improved data sets for numerical groundwater modeling and quantitative assessments to avoid unrecoverable damage (e.g. intrusion of highly mineralised groundwater intrusion.
Such assessments are cost intensive if data source are heterogeneous and not well-integrated. To allow an hydrogeologically elaborated examination of data, an effective geodata management is needed to homogenize and combine available digital and thematic map information.
This work reports on a project conducted for the catchments of two streams, Quillow and Strom, located in the Uckermark, a region in northeastern Germany. The database comprises current geodatasets consisting of hydrological and hydrogeological content and old thematic maps of Quaternary geology. Available geodata, measurements and digitized map series data of this region from environmental agencies of the states Mecklenburg Western Pomerania and Brandenburg were included and homogenized considering publications and technical reports. As a result, a newly developed spatial data basis has been compiled as geodatabase using vector feature classes, raster data, TINs and relationship classes. The resulting three-dimensional image of aquifers and aquitards of the Quaternary deposits exhibit potential interfaces between different aquifers and surface hydrology.
The storage formats allows to include new information of this region in an intuitive way, thereby expanding the database and increase information density without losing control over data integrity and consistency by maintaining referential integrity.
This enhanced, GIS based geodatabase is of future interest for more detailed exploration campaigns and as data basis for numerical modeling in order to provide a reliable basis for an integrated, sustainable groundwater management in this region.