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Regional hydrological models are important tools in water resources management, but prediction uncertainties are often high due to non-uniqueness of the hydrostratigraphical model. This model is often based on borehole lithology only. However, a much better resolution can be obtained from large geophysical datasets covering the entire domain. Using boreholes to link between hydrostratigraphical classes and resistivity is efficient and emphasizes the need for an all-inclusive data interpretation procedure that can be integrated in groundwater model calibration.

We present an automatic method for parameterization of a 3D model of the subsurface, integrating lithological information from boreholes with resistivity models. The objective is to create a direct input to regional groundwater models for sedimentary areas, where the sand/clay distribution governs the groundwater flow. The resistivity input is all-inclusive in the sense that we include data from a variety of instruments (DC and EM, ground-based and airborne), with a varying spatial density and varying ages and quality. The coupling between hydrological and geophysical parameters is managed using a translator function with spatially variable parameters, which is calibrated against observed lithological data. In other words, the translator function interprets the geophysical resistivities into a 3D clay fraction model and the 3D clay fraction model is then turned into a zonation for the hydrological model by a K-means clustering.

We present the methodology by show-casing a study from Denmark were a regional groundwater model is constructed by including lithological information from 3100 boreholes over an 710 sqkm area. The geophysical models spans more than 30 years of data collection and includes approx. 225,000 DC models, and 35,000 EM models, airborne as well as groundbased. The final model was calibrated giving parameters that were comparable with existing models based on thorough and time-consuming manual model construction.