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Advantages and limitations of three-dimensional geological modelling for cultural heritage management

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Developments in collection and digitisation of geoarchaeological data now allow geoscientists to develop meaningful 3D spatial models of the subsurface. Geological models of the subsurface have been constructed for regional (urban) areas to predict ground conditions and reduce risk and uncertainty in urban planning on a regional scale. Risk assessment at the smaller scale of archaeological sites, for example for in-situ preservation, not only requires delimitation of cultural deposits with respect to natural geological formations, but also systematic collection, interpretation and visualisation of intra-formational geoarchaeological information. The Norwegian Standard for archaeological monitoring of cultural deposits (2009) provides the framework for systematic data collection, interpretation and monitoring over time. It enables an objective evaluation of variations between e.g. preservation state and environmental preservation conditions, a.o. based on soil moisture content, groundwater level and quality variations, and temperature variations within cultural deposits. The standard allows comparison of conditions both within and between archaeological sites. The inclusion of this monitoring data within a geological model of the site results in an integrated geoarchaeological model that can be used for both ground prediction and risk assessment with respect to for example in-situ preservation. However, archaeological sites and their surroundings, particularly in urban areas, are often characterised by large heterogeneities and a complex mixture of natural and anthropogenic deposits. At a certain level of complexity and spatial scale, modelling efforts will go beyond the advantages that can be gained. This presentation examines the advantages and the limitations of three-dimensional geological modelling at small scale urban archaeological sites for cultural heritage management.