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A lithostratigraphic geo-archaeological 3D model of the subsurface of a medieval mound in the city center of Vlaardingen (The Netherlands).

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GSI3D modeling for archaeology
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In the medieval mound in the city centre of Vlaardingen, in the Netherlands , archaeological material is remarkably well preserved. It is remarkable because this elevated location has a high degree of humidity, which must remain intact to sustain the favourable conditions of the archaeology. For that reason, the centre of the city was cored when and where possible, and subsequently its archaeology and lithostratigraphy was modelled in 3D.
In this presentation we demonstrate the difficulties and methodological restraints in 3D modelling to come to a workable method and future prospects.
The municipality of Vlaardingen lies north of the Nieuwe Maas in the province of Zuid Holland close to the coast. It is one of the oldest Dutch urban areas known in Holland. The project makes use of coring (n=72), cone penetration test (n=127), C-dating, archaeological and paleogeographic data in order to create interpretative profiles containing both archaeological and lithostratigraphic layers in the mound and its broader context.
With the available university's licence of ArcGIS 3D modeling is possible (ArcScene), but it is not an efficient subsurface software, while most ideal 3D software for such project (such as i.e. Petrol, GoCAD, Rockworks) are beyond archaeological budgetary limits. The most ideal software in our context was GSI3D (a software provided by the British Geological survey). Though it strictly is not a 3D model software (there are no 3D interpolation algorithms), it has the advantage that the user can interfere directly in the interpolation by using the profiles as a framework and by defining the extent of each layer.
The following methodology is applied:
• Based on depth information of coring and cone penetration charts, all possible profiles are created. The lines between layers defined in the profiles are then all used for the interpolation. This defines the vertical variation of the layer.
• The facies distribution can also be digitalized and used as limits wherein the interpolation takes place. This defines the horizontal variation of the layers.
• Finally, all the data are used to make a 3D volume that extends over the entire investigation area.
By applying GSI3D, the model relies on both the modeler expert knowledge of the area and the data. A model based on data alone would be more objective, but reliability of these data would require an immense number of corings, which are not possible due to budgetary and even more architectural limits . Moreover, GSI3D has the additional advantage that one can use spatial algorithms that understand which layer is older/younger. Take away message is that 3D modeling cannot be done without expert knowledge from the modeler both in the pre- and post-calculation of the model.