

## FAST GEOLOGICAL MODELING From EM data to Voxel Model

### GeoScene3D - fast modeling of a large EM datasets into lithologic voxel models

Would you like to be able to build a detailed voxel model based on EM data within only a few hours of work? – then keep on reading.

Airborne geophysics (AEM), often generates very large amounts of highly detailed data, densely distributed along thousands of kilometers of flight lines. These data typically need to be interpreted into a geological or hydrostratigraphic context, e.g., in the field of mining or groundwater mapping.

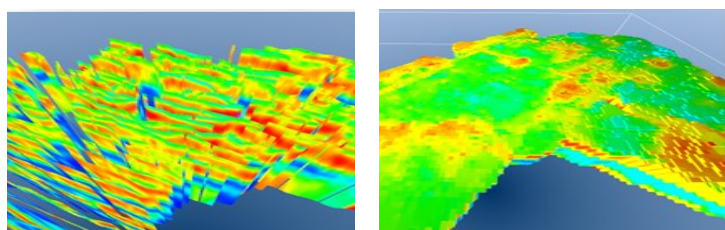
### Resistivity to lithologic voxel model

GeoScene3D offers a fast, simple and intuitive workflow:

1. Interpolate EM data into a resistivity grid
2. Define an empty voxel grid
3. Define resistivity classes to be used as e.g. lithologic classes (figure to the right).
4. Select and apply information from the resistivity grid into the voxel grid—finish!

After step 4, users can apply even more details to the voxel model on a local basis, based on borehole information, seismics or other data. Step 1 to 4 takes 1-3 hours.

Optionally, use surfaces and/or regional boundaries as boundary conditions.



Soundings (2D)

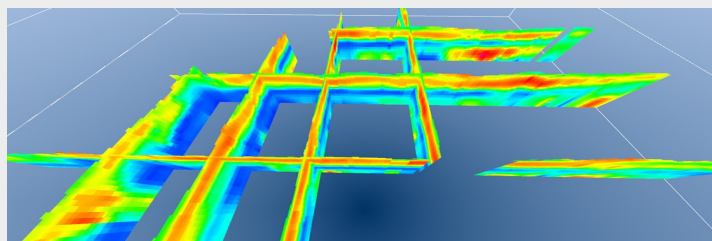


Resistivity grid (3D)

### Info box

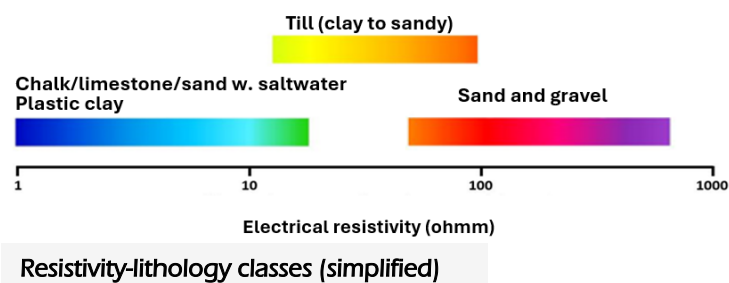
Handling resistivity data in GeoScene3D as 3D grids allows the users to create vertical and horizontal slices in the grid, including the option to show the horizontal slices as depth or elevation in the map window. Volume calculations can be made as well. The 3D grid is created by using the 3D interpolator, facilitated by the Interpolation Wizard.

The 3D grid and the soundings can be used side by side.



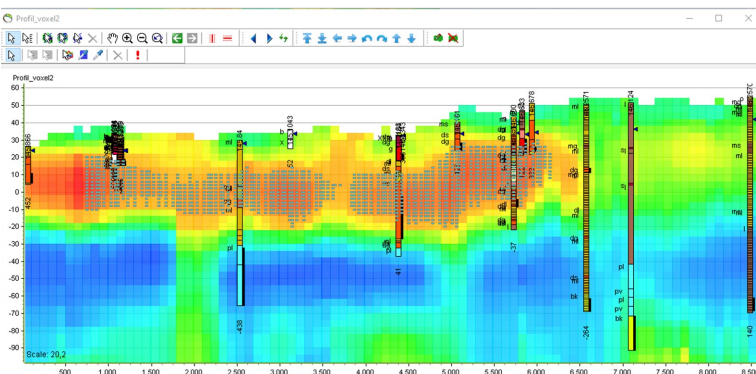
For further improvement of the voxel grid, voxel modeling can be combined with surfaces generated using e.g. Smart Interpretation (SI), cognitive layered modeling and Multiple Point Statistics (MPS).

The voxel model can be exported as a csv or text file for use in other software.

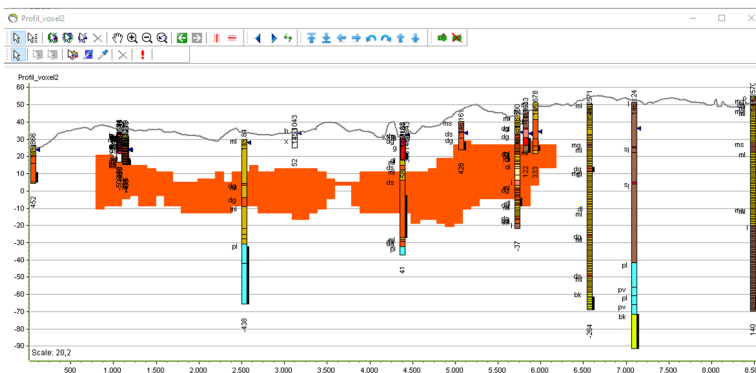


## Building a lithologic voxel model based on resistivity data – outlining the workflow

When building the voxel model, the user defines the translator: E.g., all resistivities between 70 and 200 ohmm are selected and defined as sand. This selection serves as input to the voxel grid, and in this streamlined and efficient process, all voxels in the chosen resistivity interval are in this case assigned a lithology of sand.



Resistivity between 70 and 200 ohmm selected in a 3D resistivity grid (bluish marks on top of the high resistivity areas (red colors))



Voxel-lithology grid: Sand applied based on selection in resistivity grid

Next steps are to define and select resistivity intervals for the other lithology types

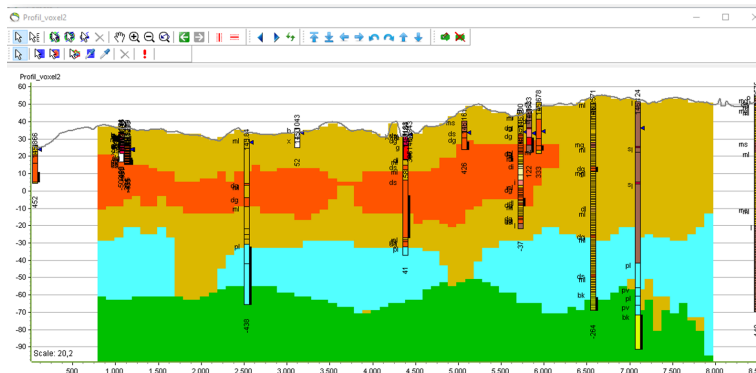
Boundary conditions such as grid surfaces and polygons can be used to limit and exclude selected parts of the voxel grid, e.g., for adding information based on other data such as stratigraphic boundaries. This could also be relevant in areas with saltwater intrusion, where resistivity data might not represent the known lithology.

## Info box: GeoScene3D

GeoScene3D is a geological modelling software that has its essential modelling efforts based on a manual cognitive approach. This comes with a lot of advantages such as an optimized data usage across multiple data formats and enabling geological expert knowledge to be incorporated into a fine and detailed model. But the time spent in the modelling process can be relatively large.

In many cases, the need is for a quick first version of the model. In other cases, a faster approach is simply the way to go, even though it is known that the result will not necessarily be as good and thorough as the manual approach.

Using GeoScene3D's Voxel Builder module, the user has access to different modeling tools structured in a simple user interface: A series of tools are available to select and change voxels on profiles and in the Map Window.



Final voxel model based on resistivity grid from EM data

## Combine Voxel modeling with Smart Interpretation (SI)

Creating a fast geological model using the resistivity grid to voxel model approach can be combined with the SI approach.

With SI, the user can, in a fast and automatic way, generate geologic surfaces based on EM data and borehole information. These generated surfaces can be used as boundaries in the voxel selection.



## WANT TO KNOW MORE?

We are here to help you! Find our useful online tutorials and information about GeoScene3D on our homepage or on YouTube channel: [www.youtube.com/user/GeoScene3D](http://www.youtube.com/user/GeoScene3D)