

ESF projekts

“Starpnozaru zinātnieku grupas un modeļu sistēmas izveide pazemes ūdeņu pētījumiem”

**Baltijas artēziskā baseina
modeļa ģeoloģiskās uzbūves
versija - V0**

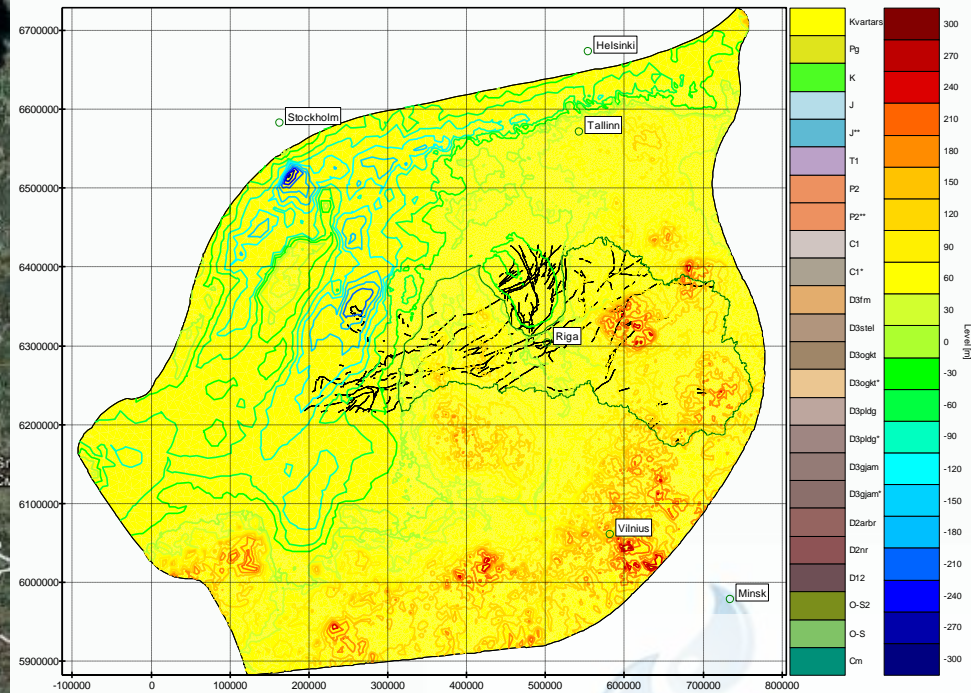
Baltic artesian basin geological structure model
– version 0

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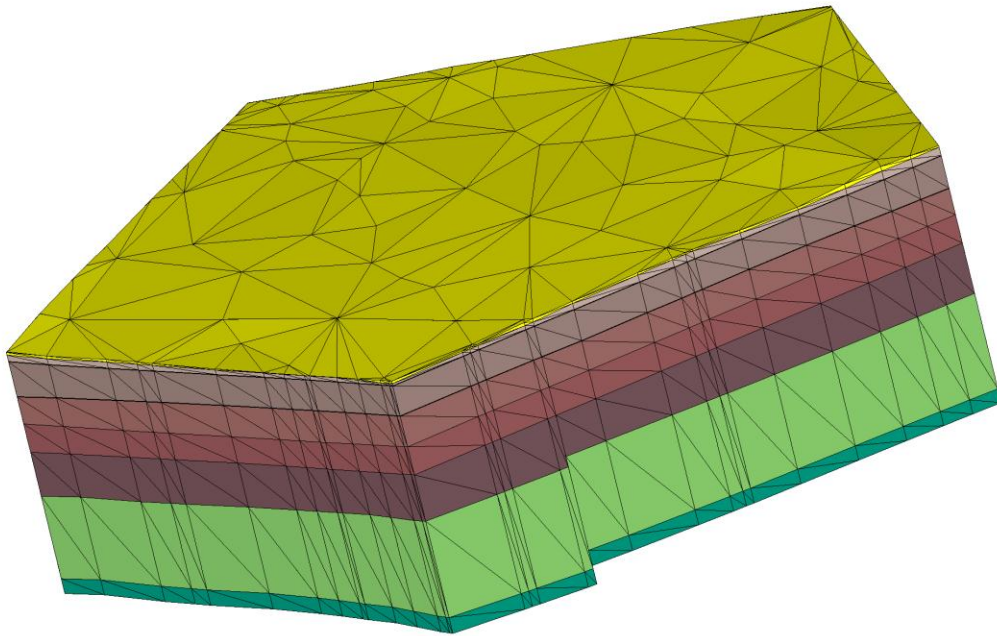


Baltic artesian basin(BAB)



BAB territory covers the area of several countries, therefore international collaboration with different state agencies in acquiring the geological data is essential

Structure of the geometry model

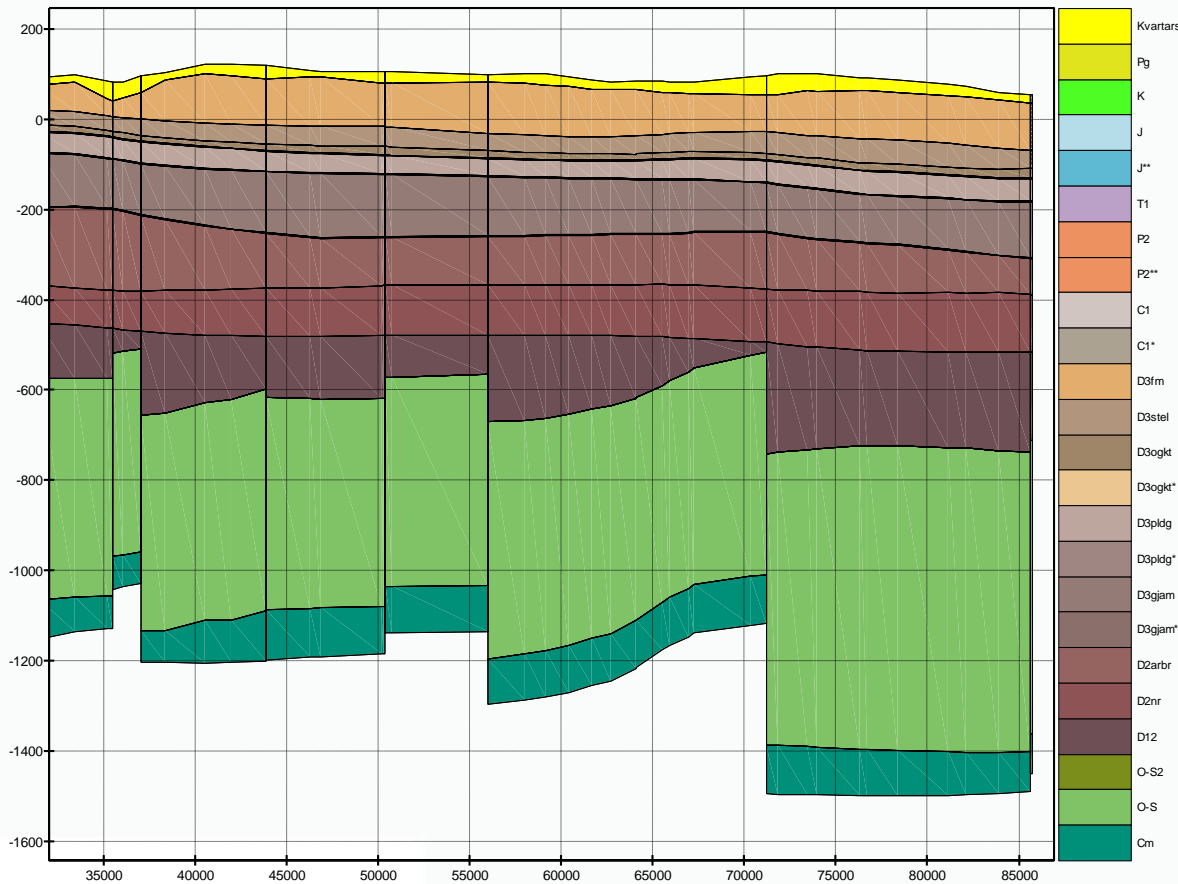


Structure of the geometry

- Finite element triangular meshplot
- Geological structure is designed in layers, covering all of the model area
- Structure permits 0 thickness layers outside the geological unit boundaries



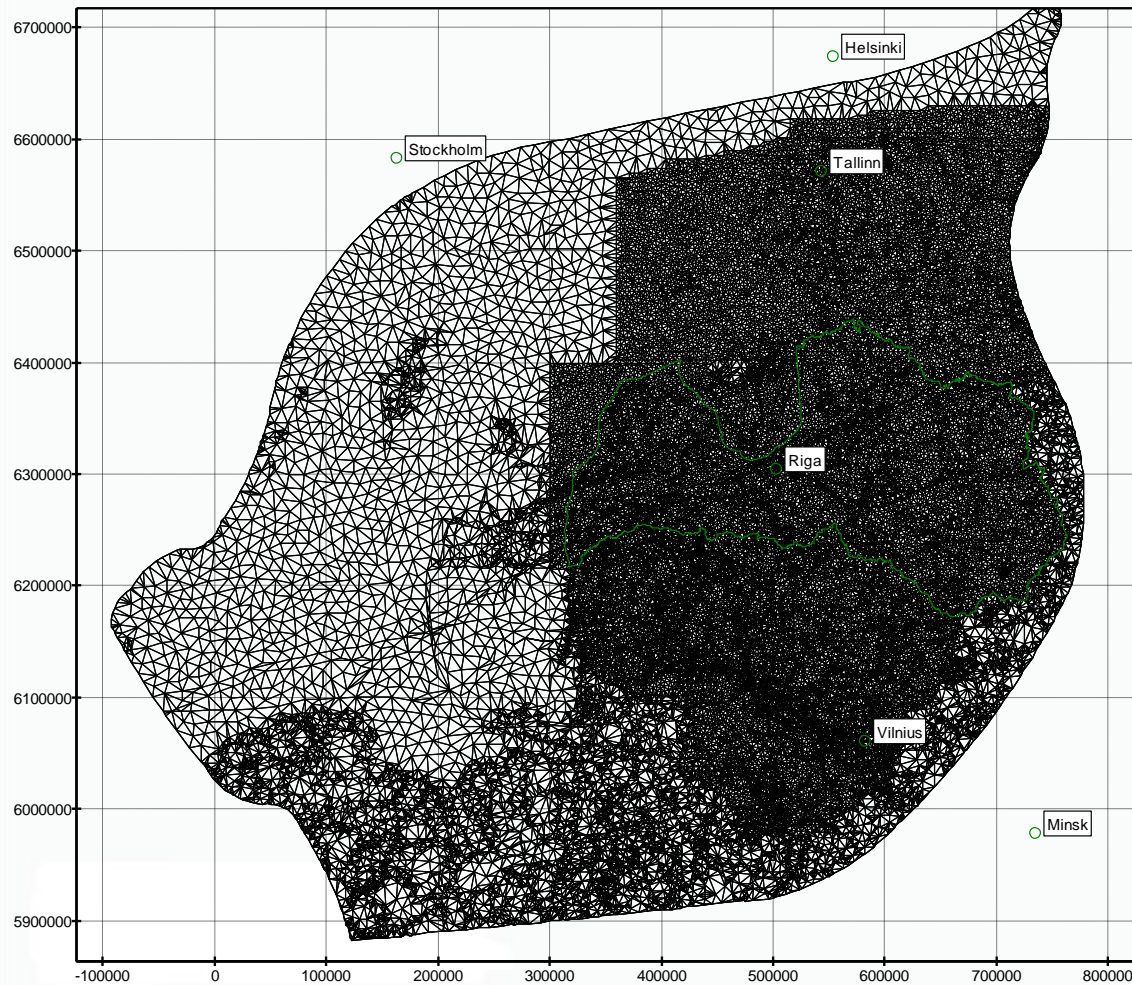
Structure of the geometry model



Tectonic faults are included as vertical planes along which vertical displacement of strata occurred



Structure of the geometry model



Horizontal resolution of the model is controlled by the density of the geological data

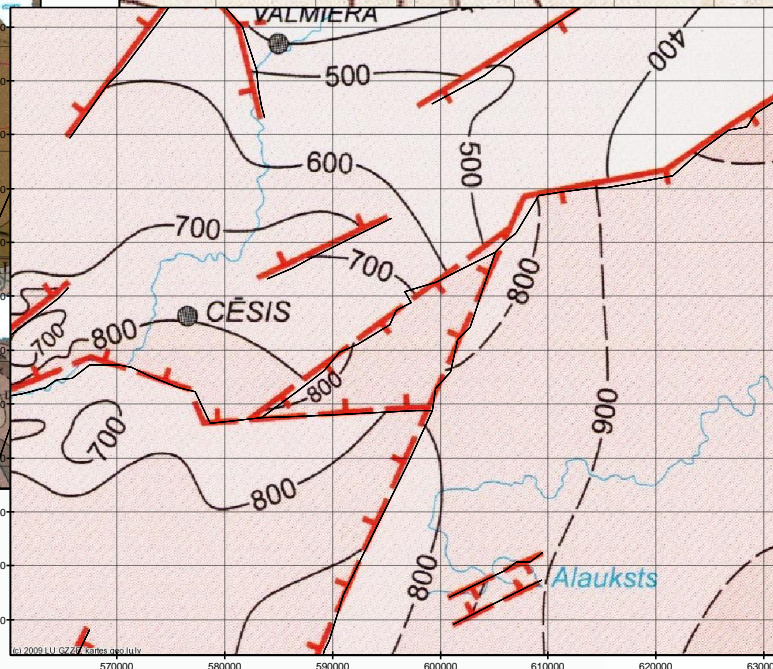
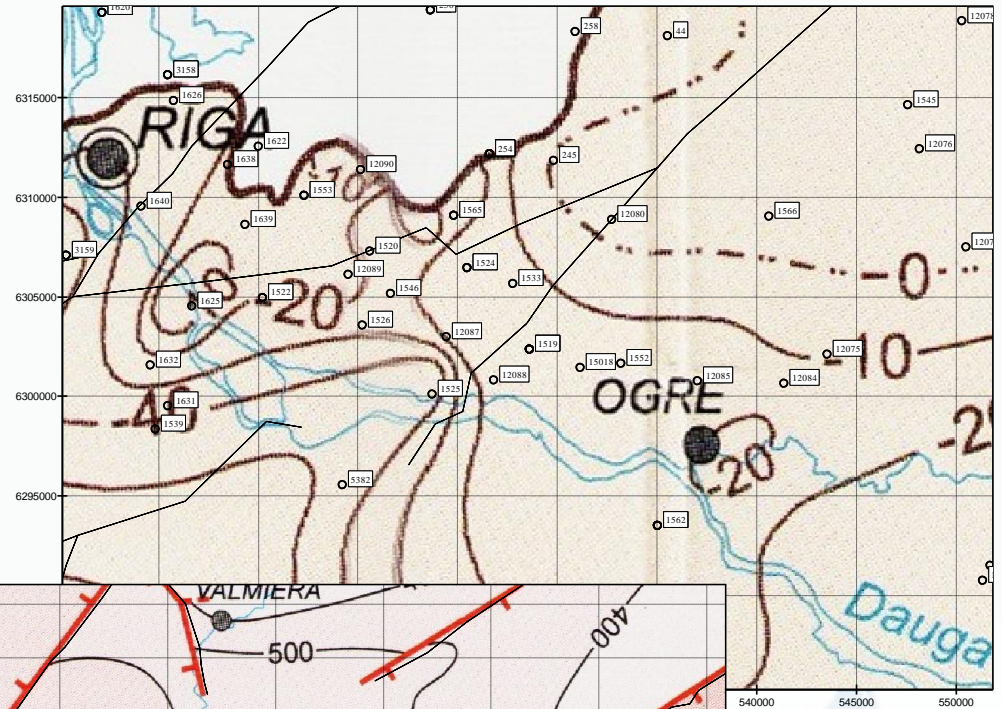
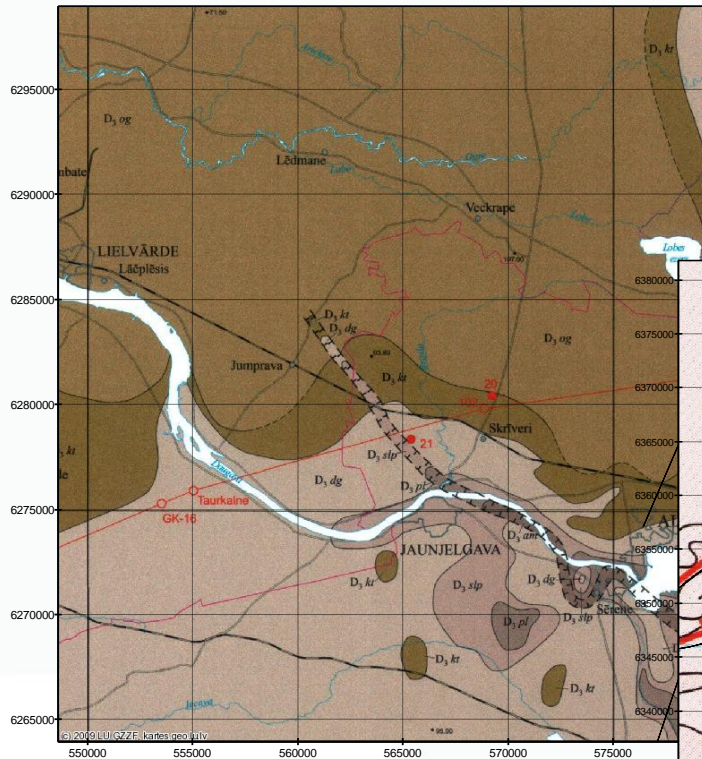
- In the Baltic states resolution (length of the element face) varies between 1 - 2 km

In Poland and Kaliningrad – 10 km

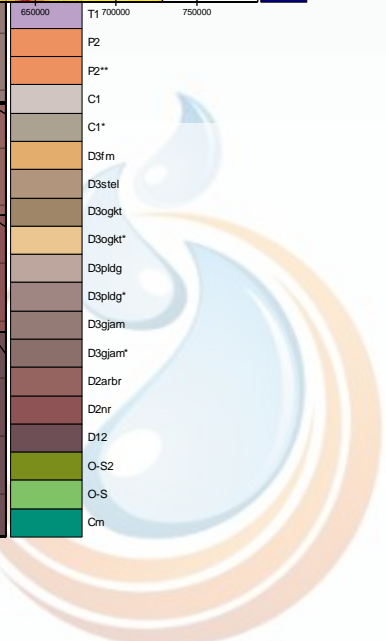
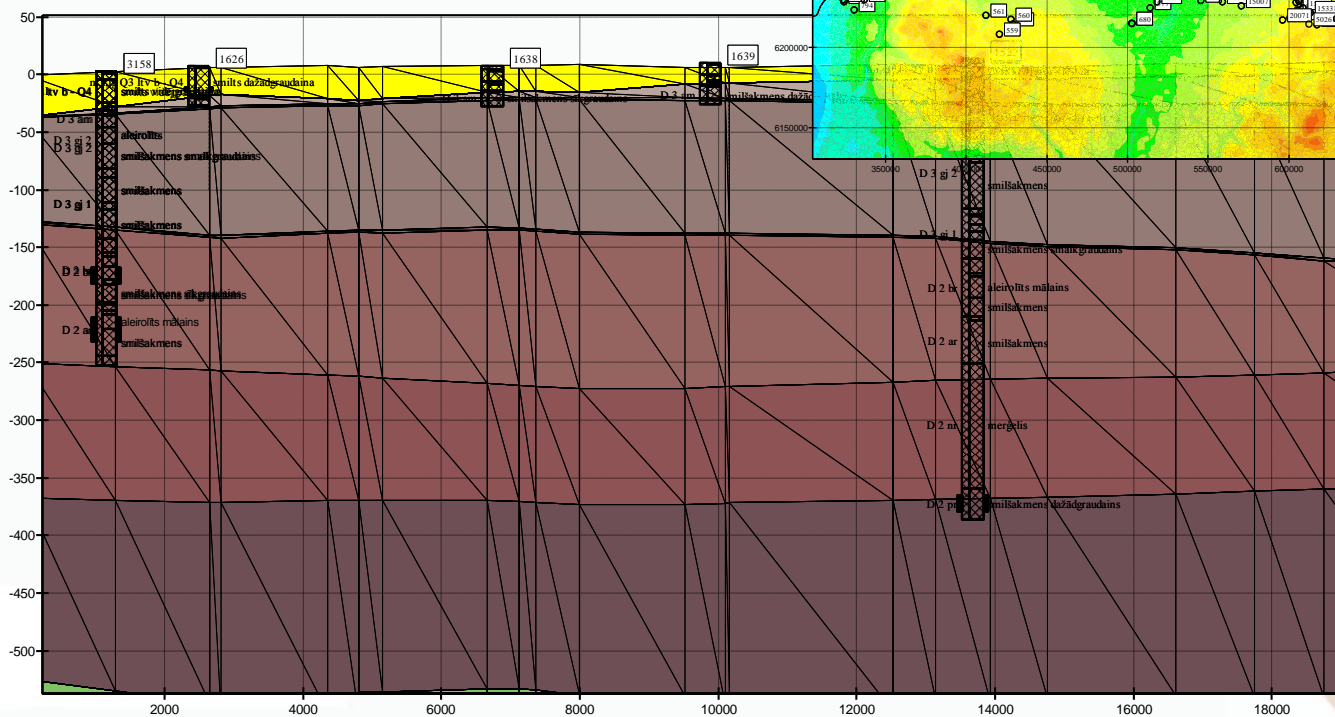
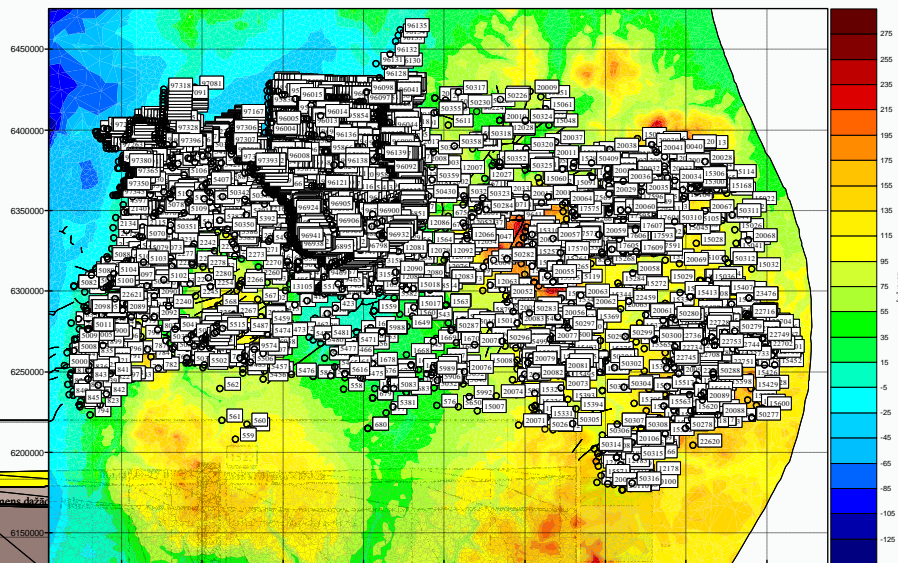
In the Baltic sea – 20 km

Data

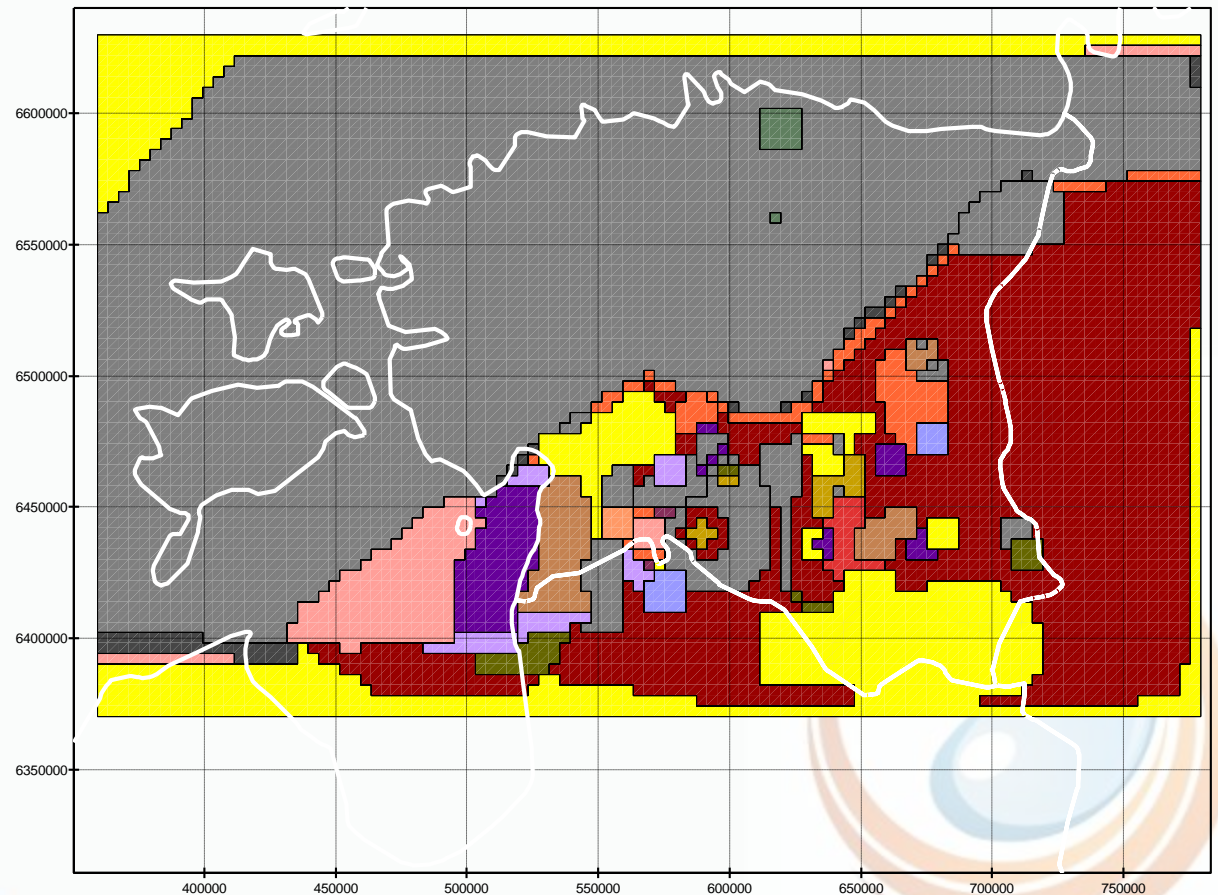
- Geological, structural and hydrogeological maps



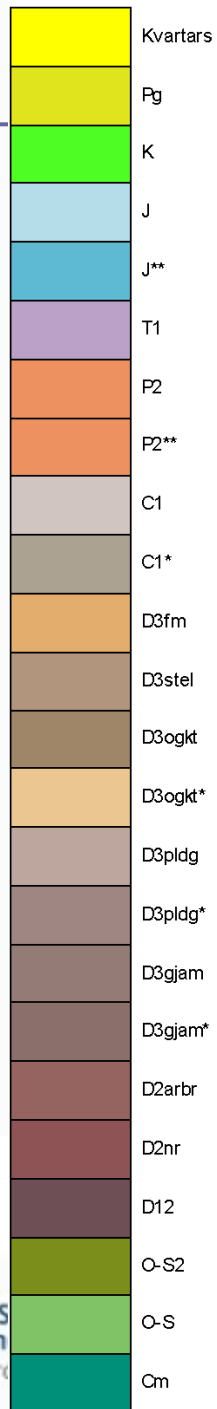
- Borehole Database covering the territory of Latvia



- External sources: models, published data, e.g. Hydrogeological model of territory of Estonia developed by Dr. Leo Vallner...



Stratification of the geological structure V0



Currently geological structure consists of 24 layers distinguished on the basis of each geological unit hydraulic properties and geological data resolution

In total aquitards, and aquicludes?

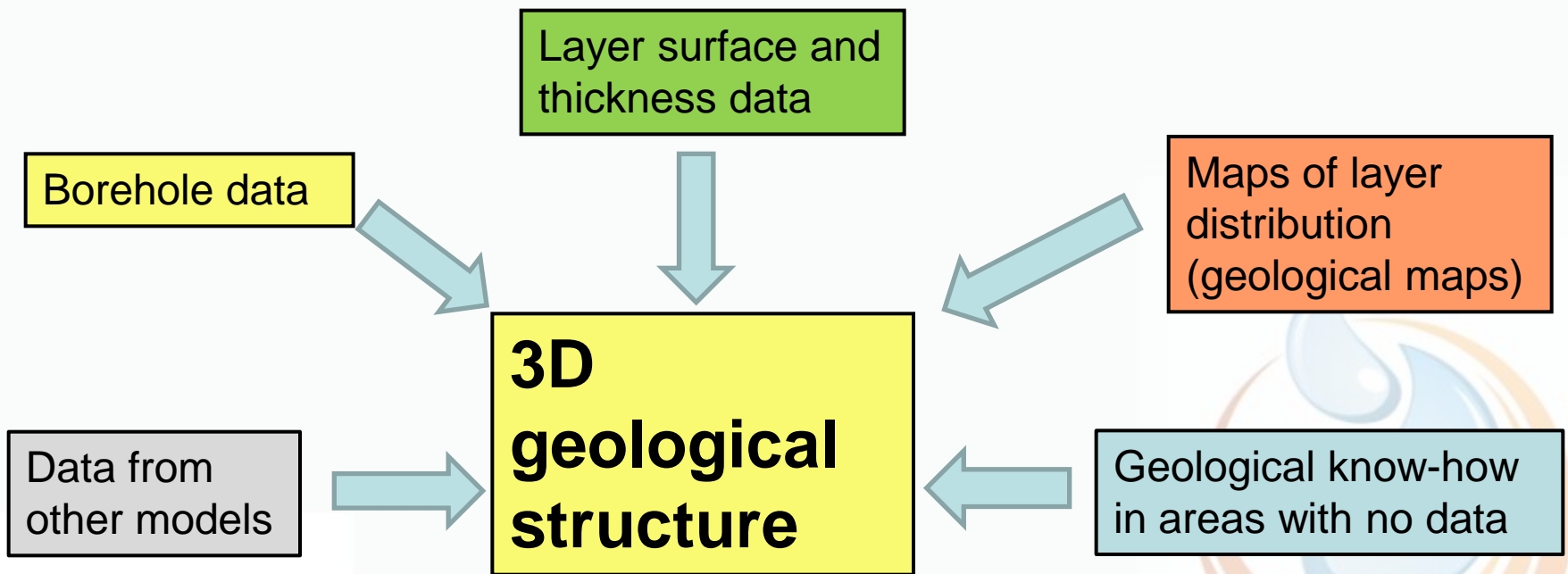
Each stratified layer is assumed to have similar hydraulic properties

In V0 Quaternary sequence is treated as a single layer with varied water permeability as deduced from the borehole data



Building of geological structure

Each layer surface is composed of several data sources depending on data availability, data quality etc.

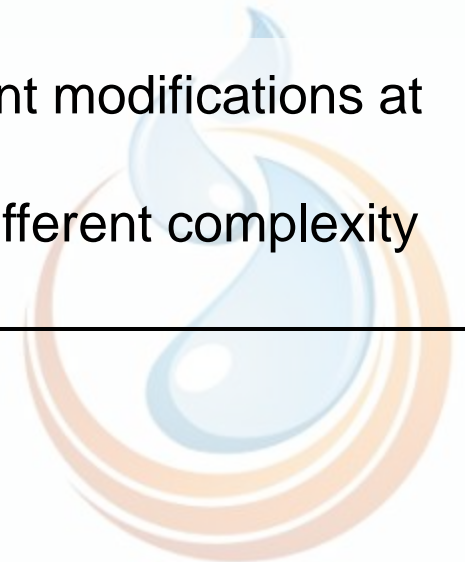


Building of geological structure

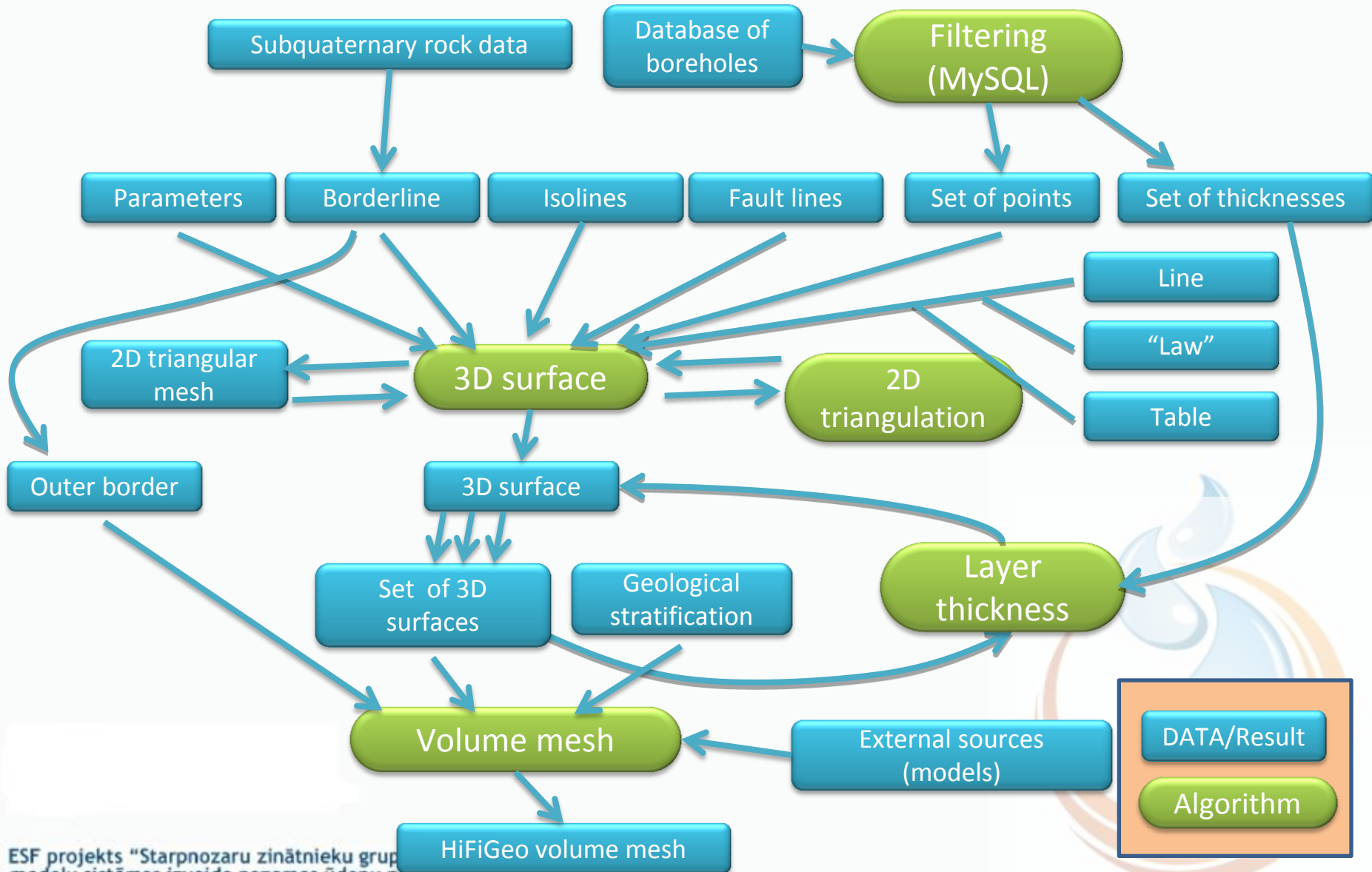
3D geological structure of the model is composed of different data sources. To implement all of the available data into geometrical model a set of operations is developed, known as assamblage of algorithms. Algorithms which define individual geological surfaces are subdivided into individual blocks.

Applied algorithms are implemented using especially developed script language. This approach has several advantages:

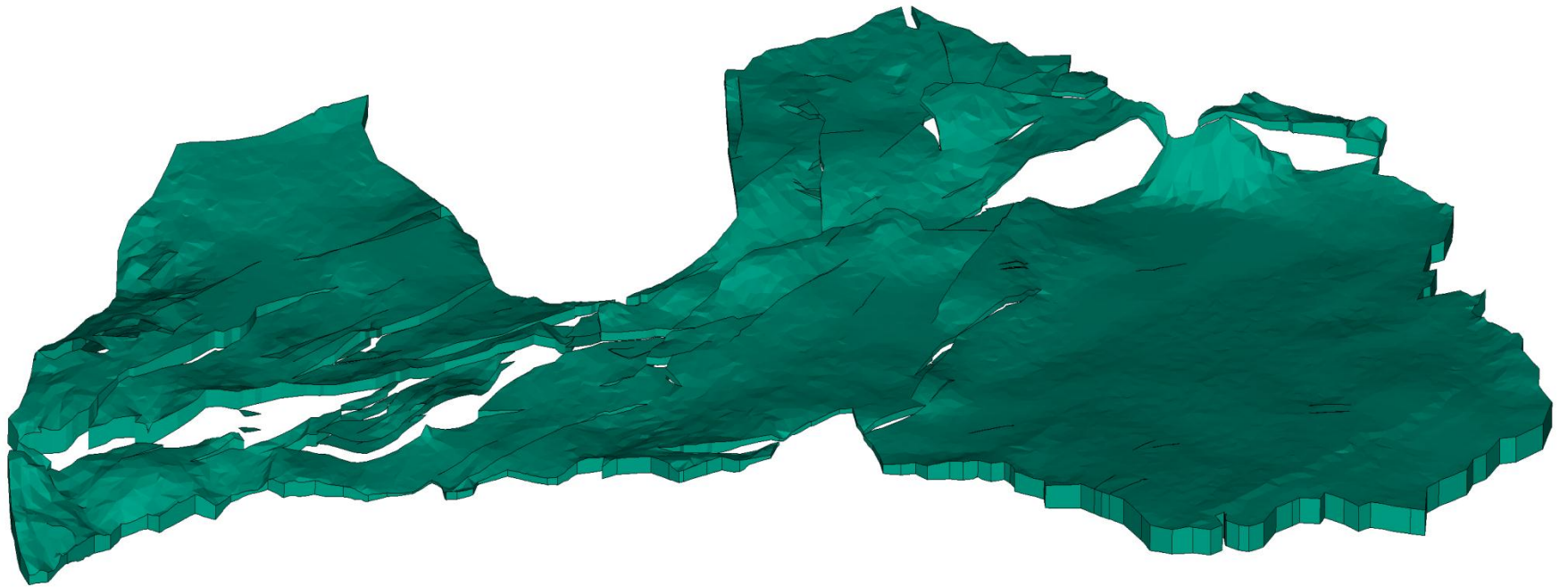
1. Flexibility in choosing ways to build the structure
2. Parallelization in developing/updating of different structure elements
3. Documented and repeatable structure building path
4. Possibility to rebuild the structure with slight or significant modifications at any time
5. Possibility to build, and maintain several structures of different complexity simultaneously



Building of geological structure

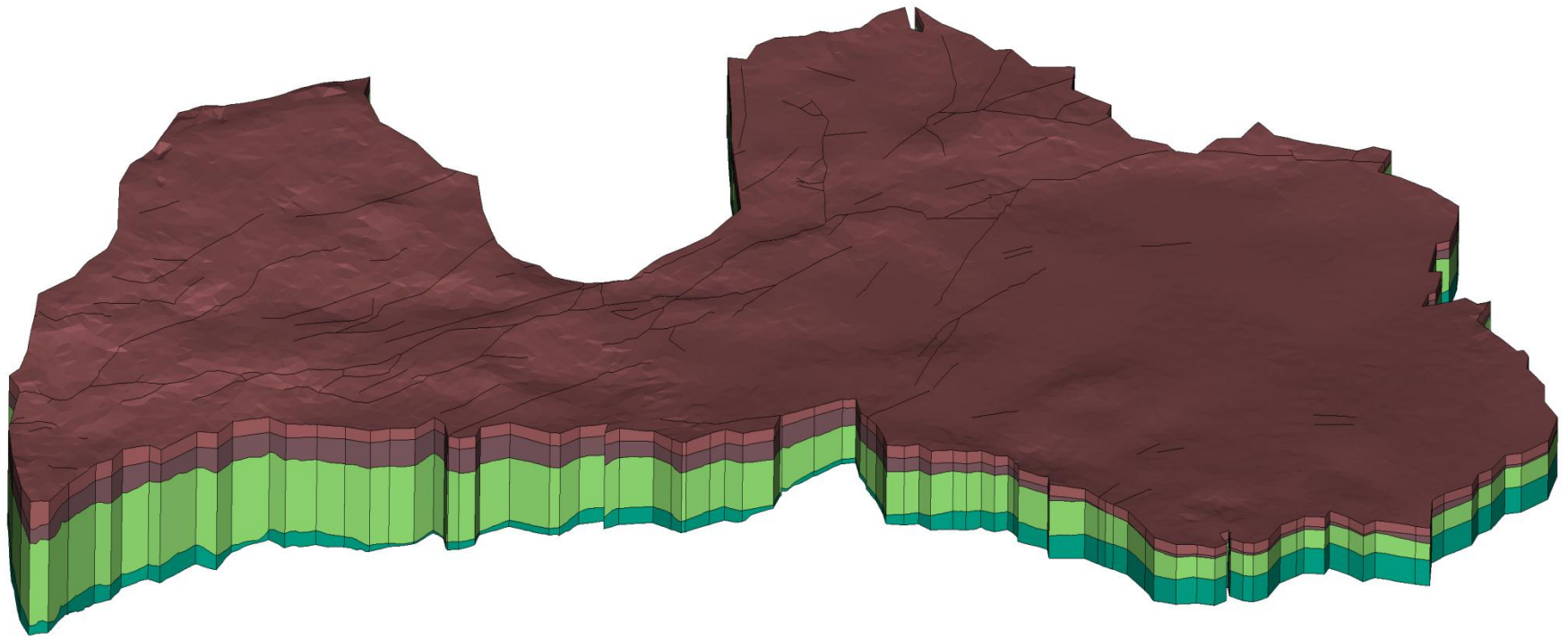


Cambrian surface, Latvia



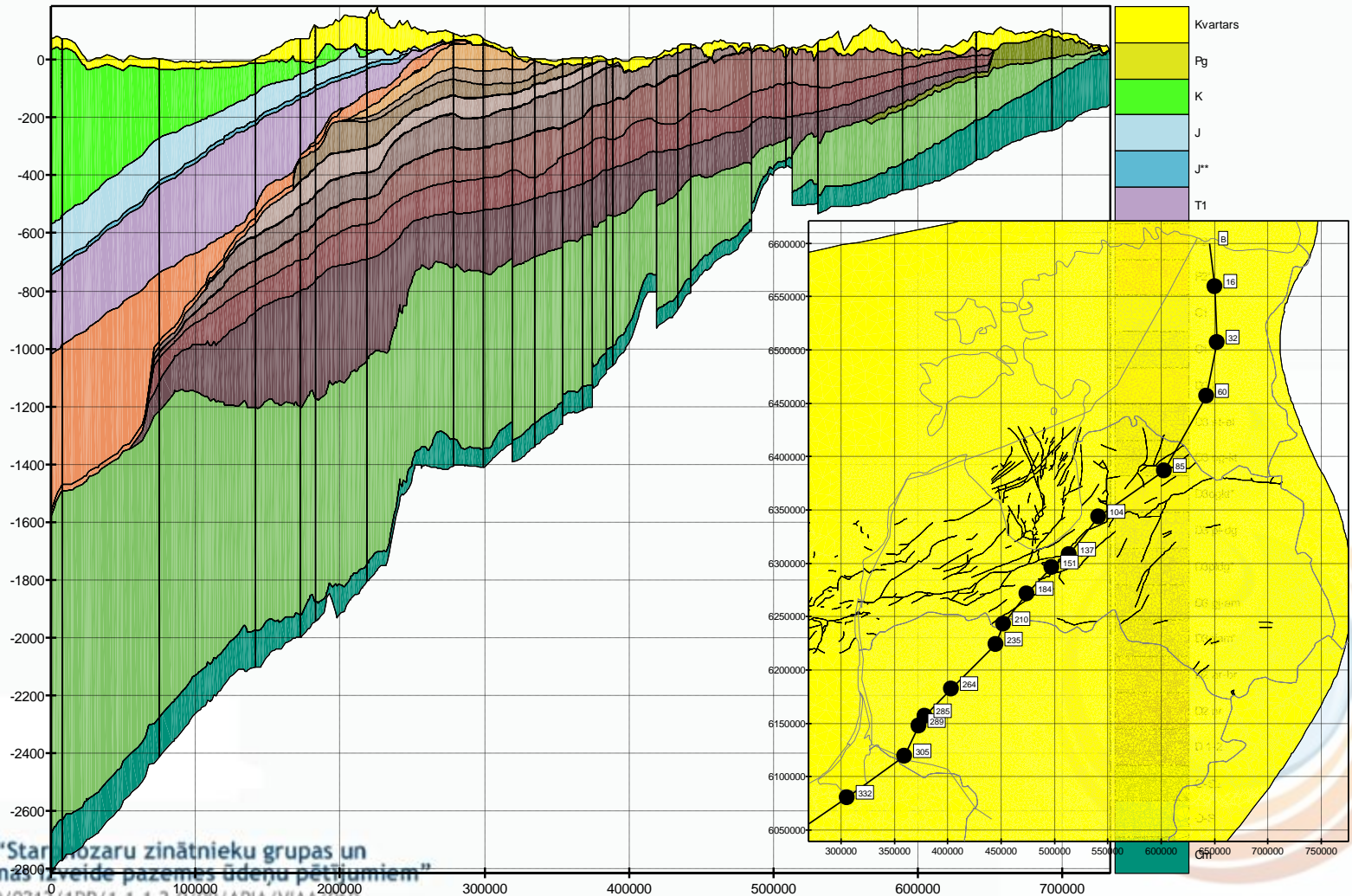
Geological structure V0

D2 nr surface

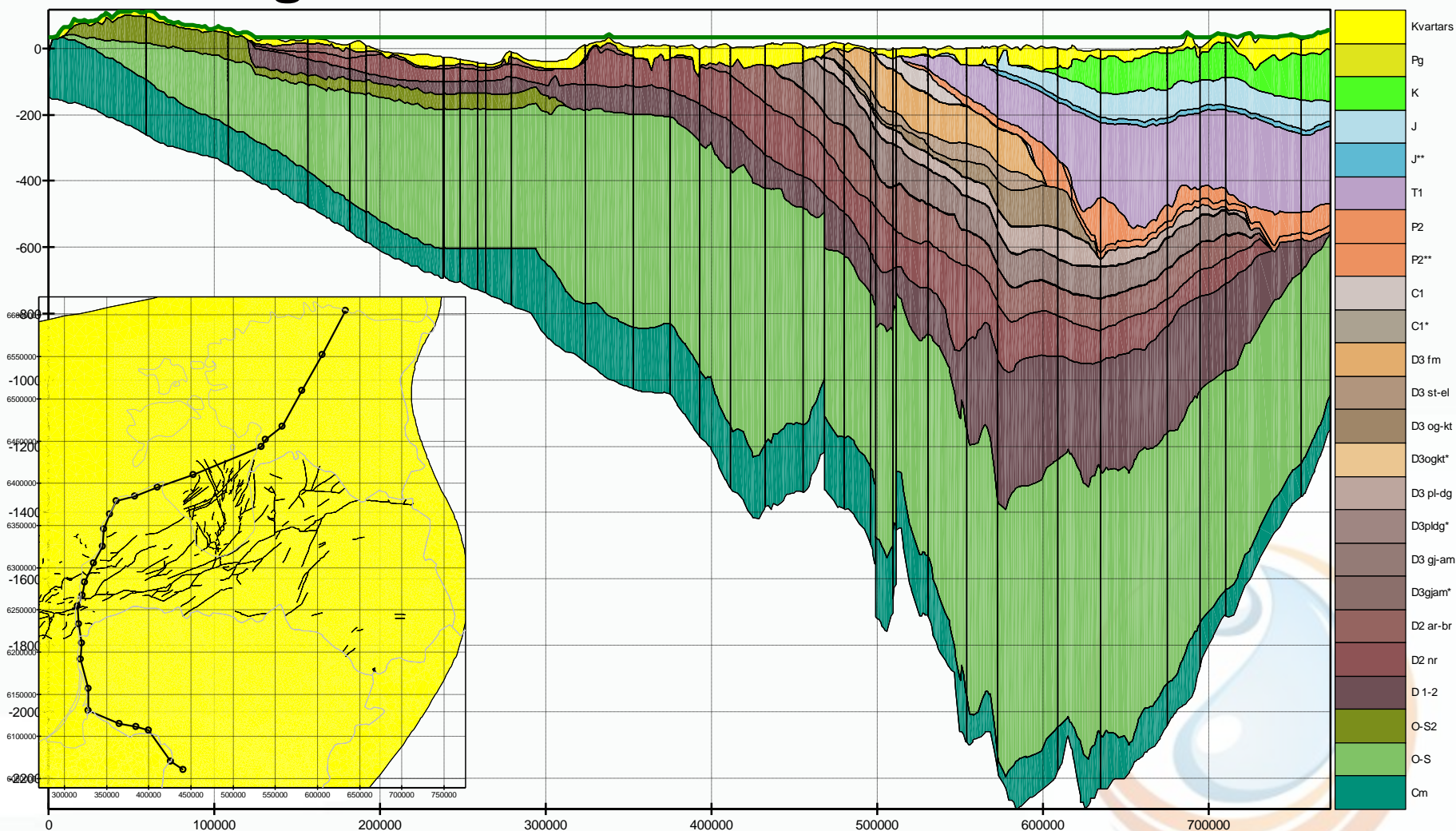


Geological structure V0

Geological cross section through the Baltic states



Geological cross section across the Baltics-2



Future developments of geological structure

- Improved stratification
- Improved input data analysis
- Algorithmization of the hydraulic permeability distribution
- Algorithmization of the Quaternary sequence
- Local tectonic structures, characterization of faults and surrounding geometry

