Geological 3D model of the Cenozoic subsurface of Flanders

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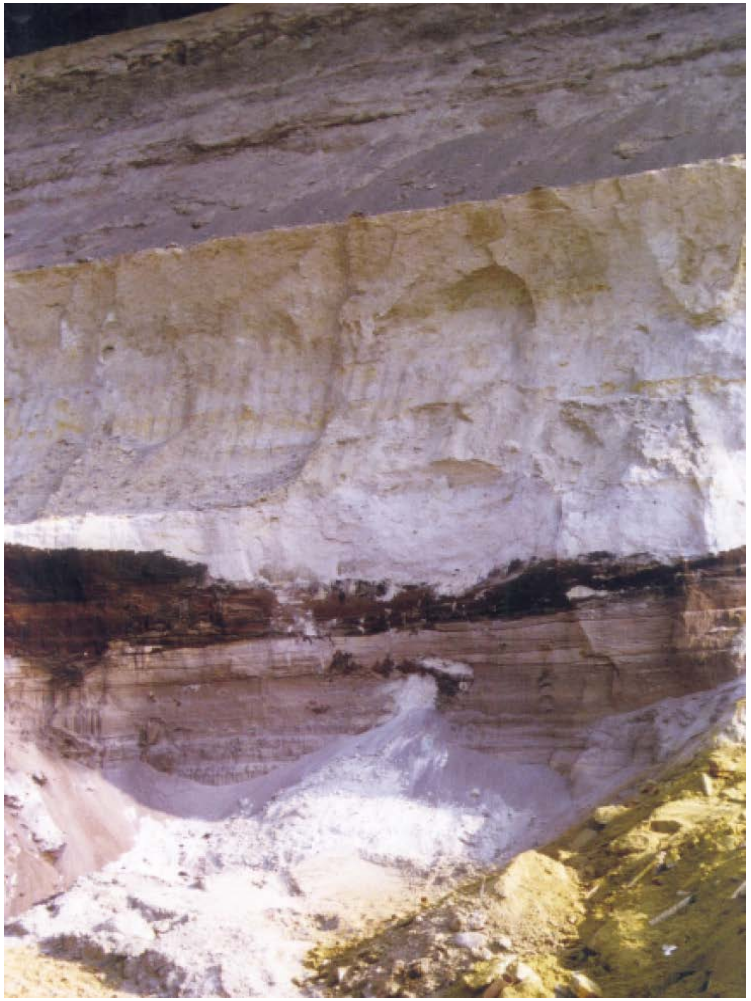
Outline

- Background
- Geographical setting
- Geological setting
- Modelling
- Results



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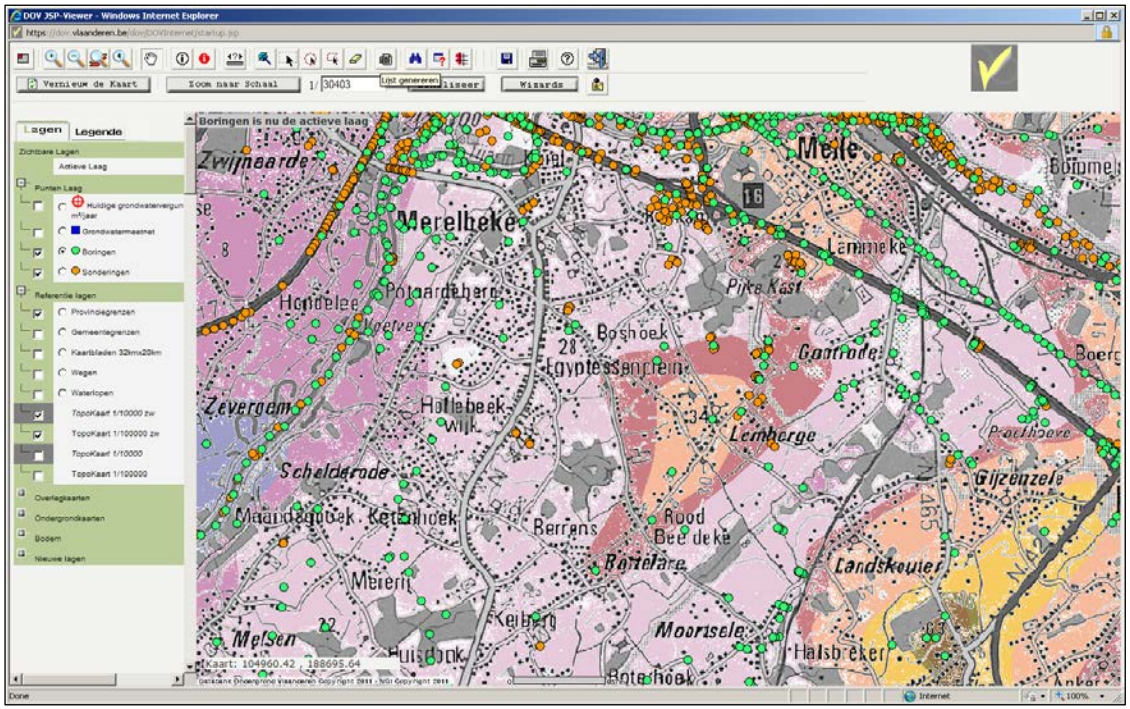
Background – *Who & What?*

- Funded by the Flemish Government (National Resources)
- Goal: generating a geologically realistic 3D model of the Flemish subsurface, free accessible via http://dov.vlaanderen.be



Untill now:
2D maps

Background – *Why?*

- Thick Quaternary cover → Limited direct info about Tertiary
- Important and extensively exploited Tertiary sand and clay cover (hydrology, nuclear waste, extraction,…)
- Request after a quick and easy way to extract information about the complete subsoil of an area by just one click

Now: 2D

Future: 3D

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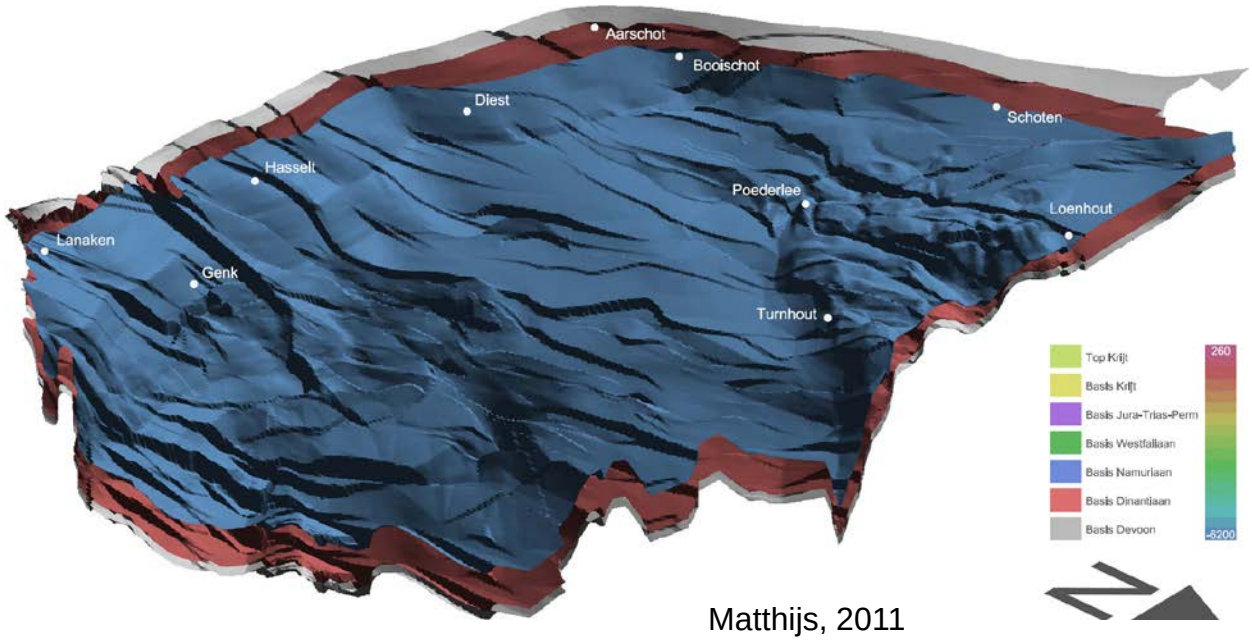
Background – *When?*

- Since 2006, Palaeozoicum, Mesozoicum and Quaternary have been modelled
- Modelling of the rest of the Cenozoic (Tertiary) is planned to be finished in the end of 2012



Matthijs, 2011

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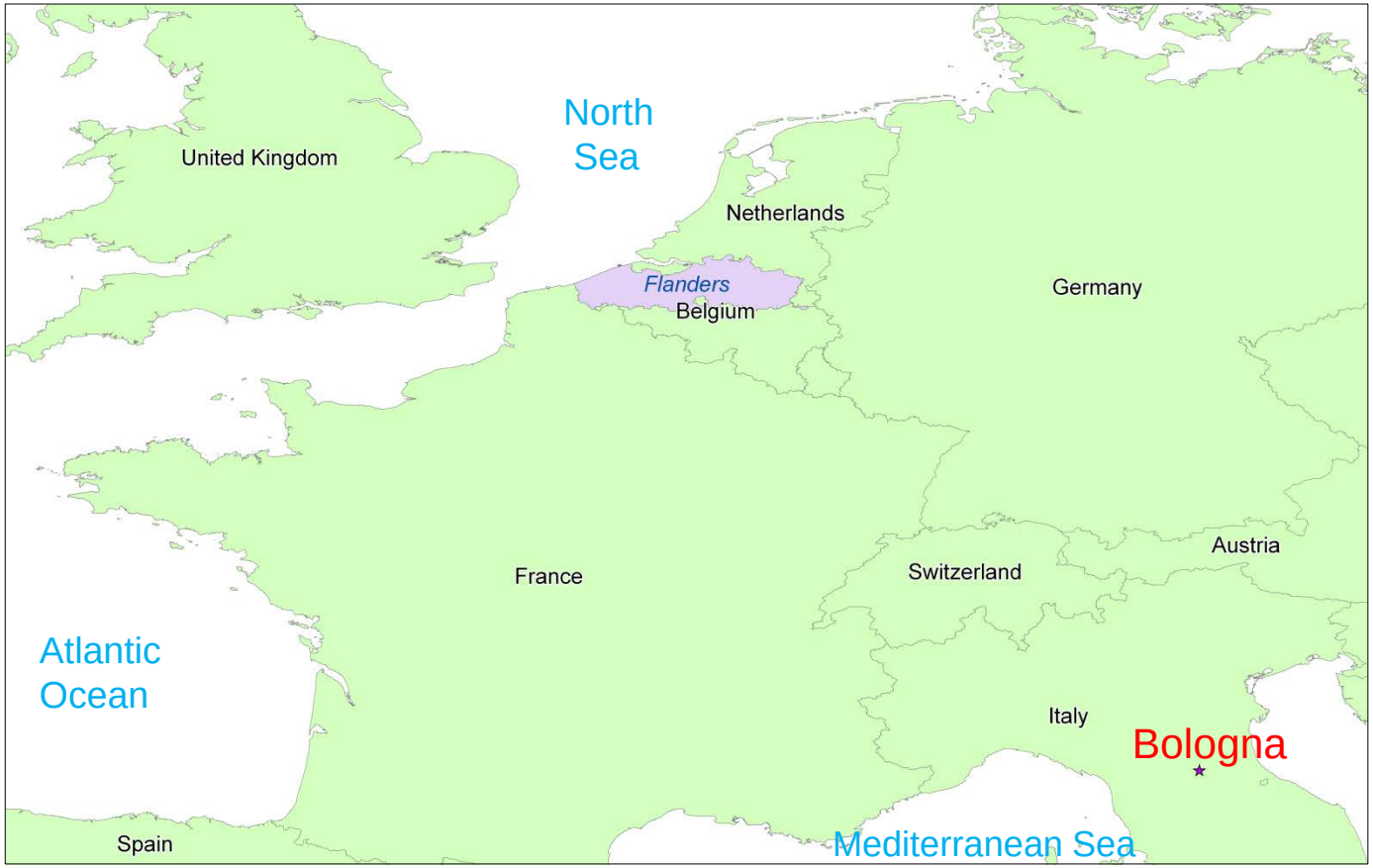
Background – *Where?*

» Northern part of Belgium, southern bight of the North Sea



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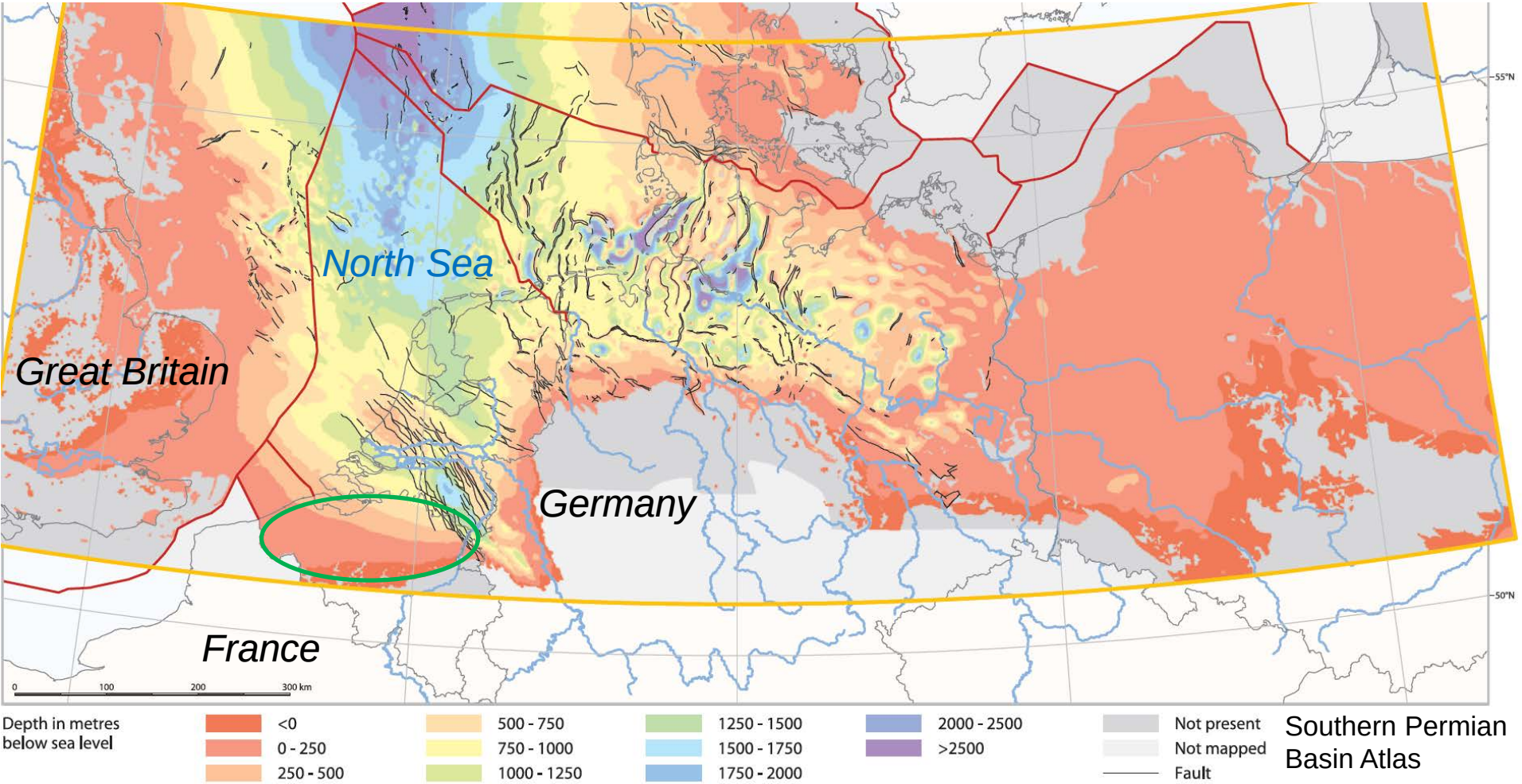
Geological setting – *Base Tertiary*



Southern Permian Basin Atlas

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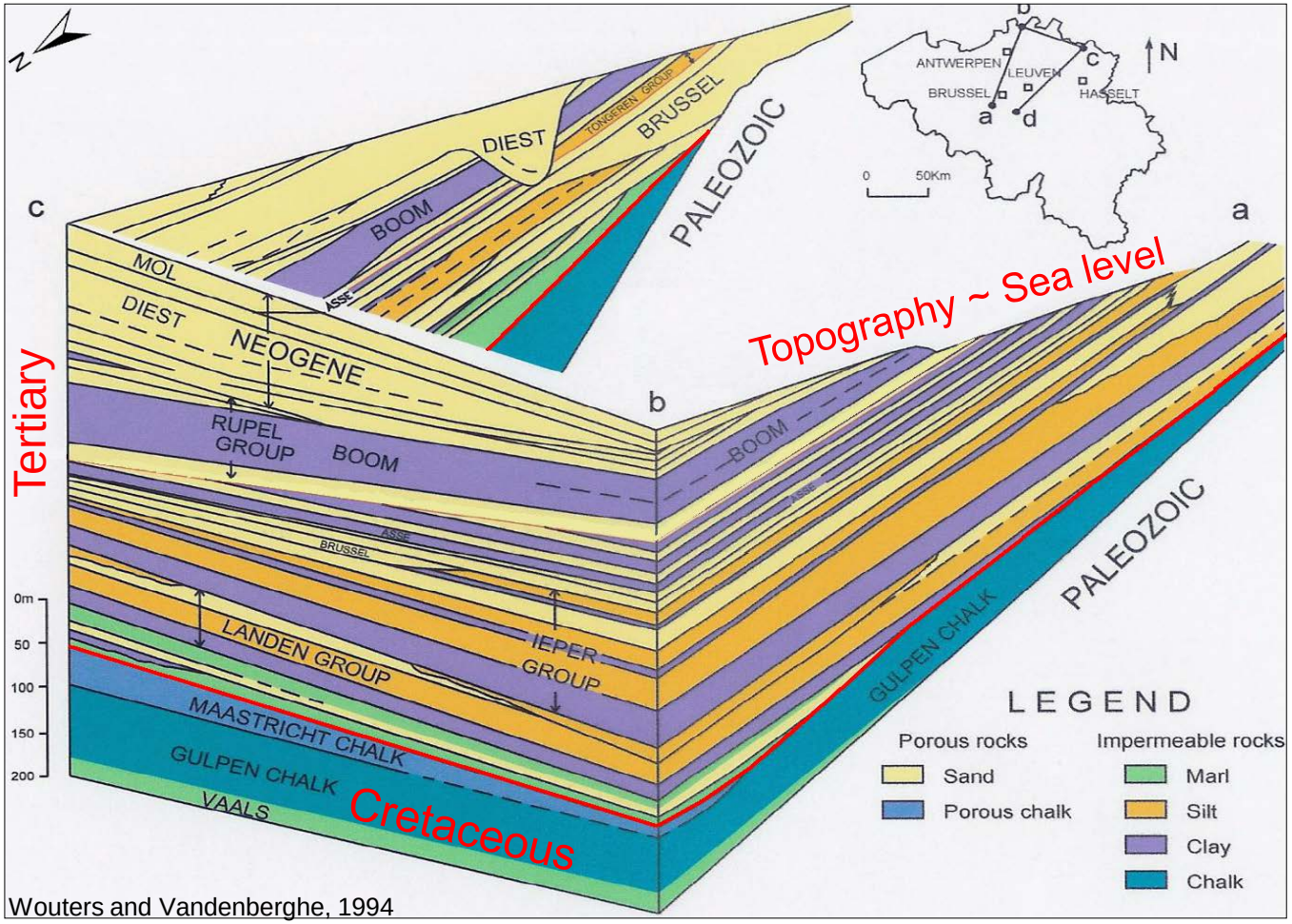
Geological setting – *Sands & Clays*



Wouters and Vandenberghe, 1994

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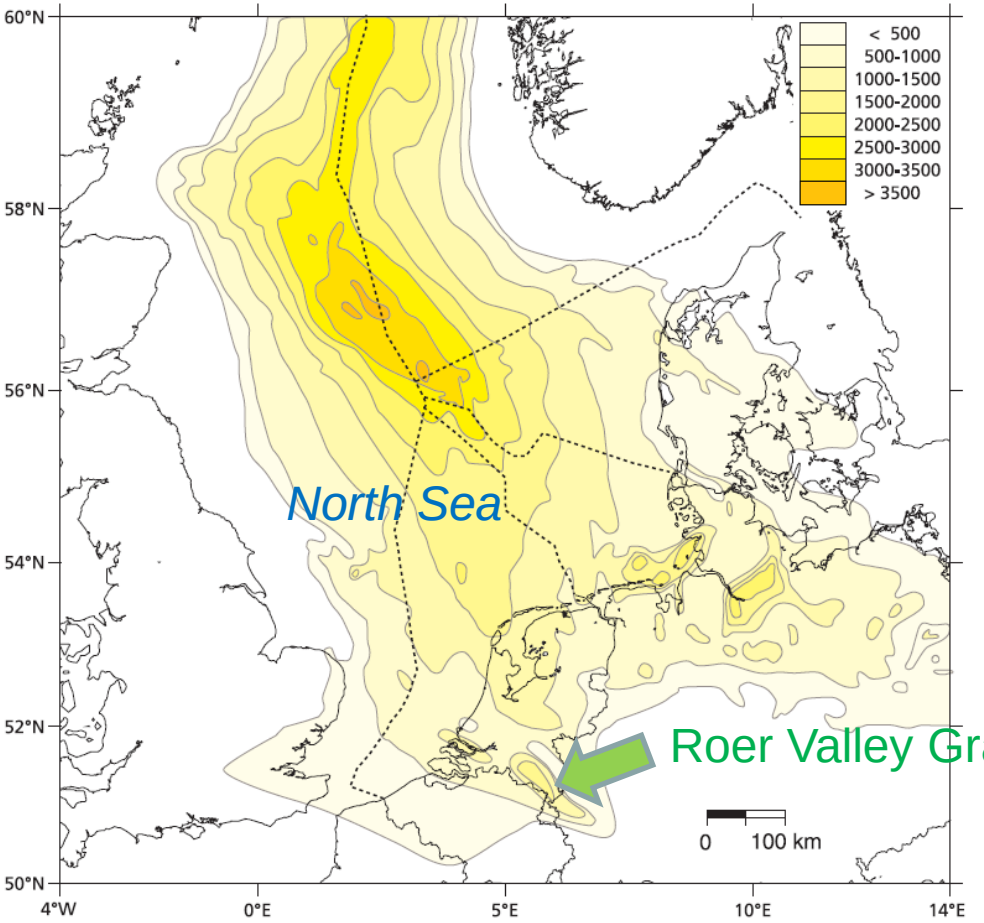
Geological setting – *Thickness Tertiary*



Wong *et al., 2007*

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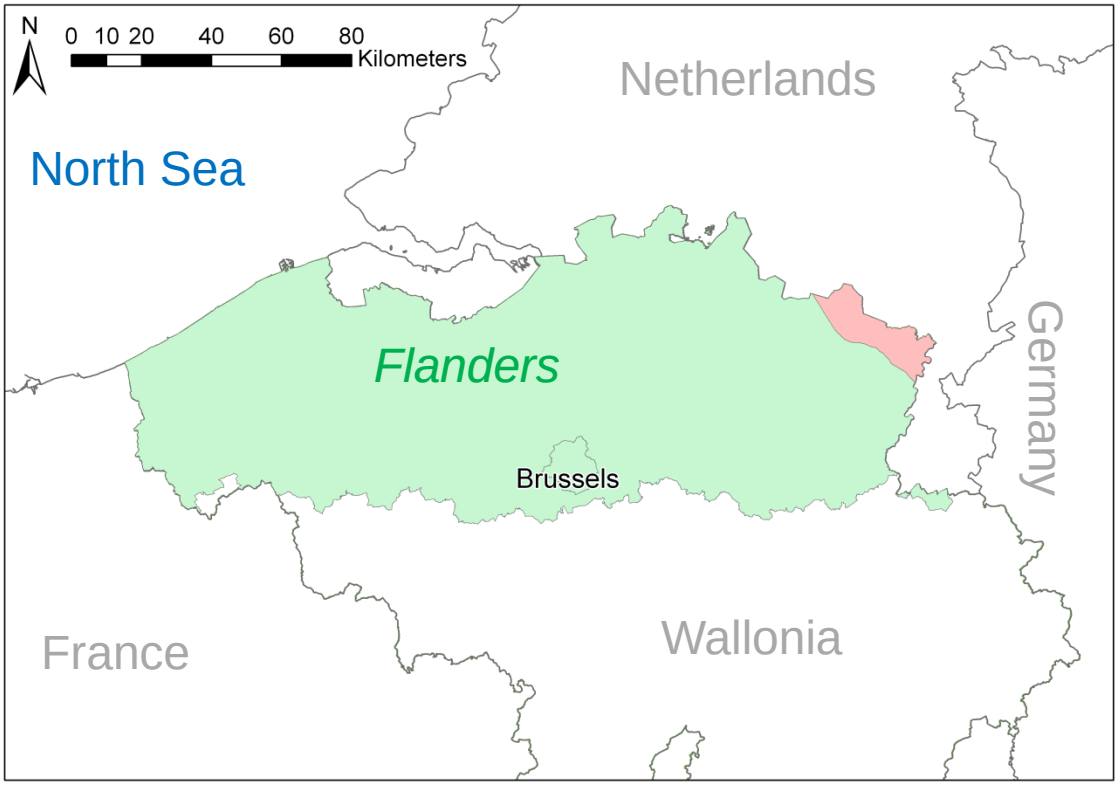
Modelling – *Two approaches*

- Green: modelling based on borehole data
- Red : modelling based on seismic data



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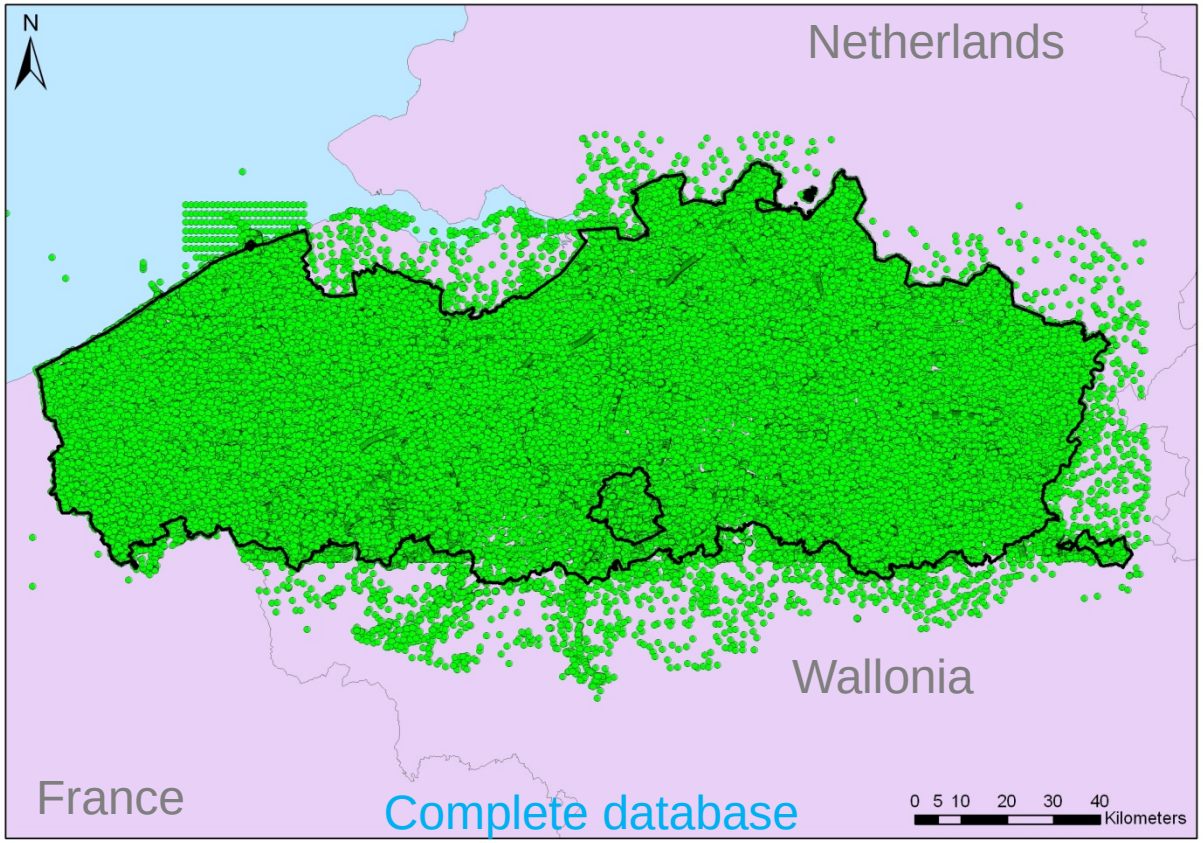
Modelling – *Datapoints*

» Database comprises > 130.000 lithologs



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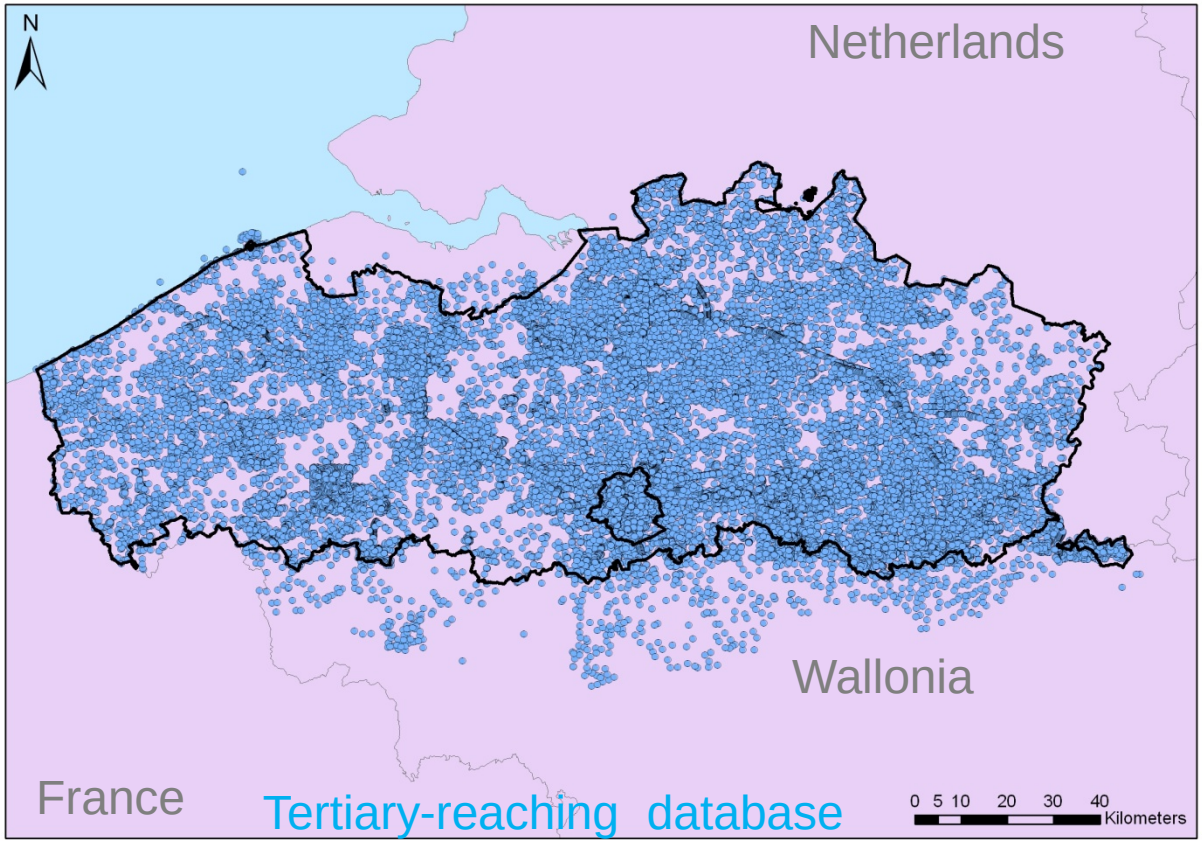
Modelling – *Datapoints*

» 3D model based on > 30.000 datapoints



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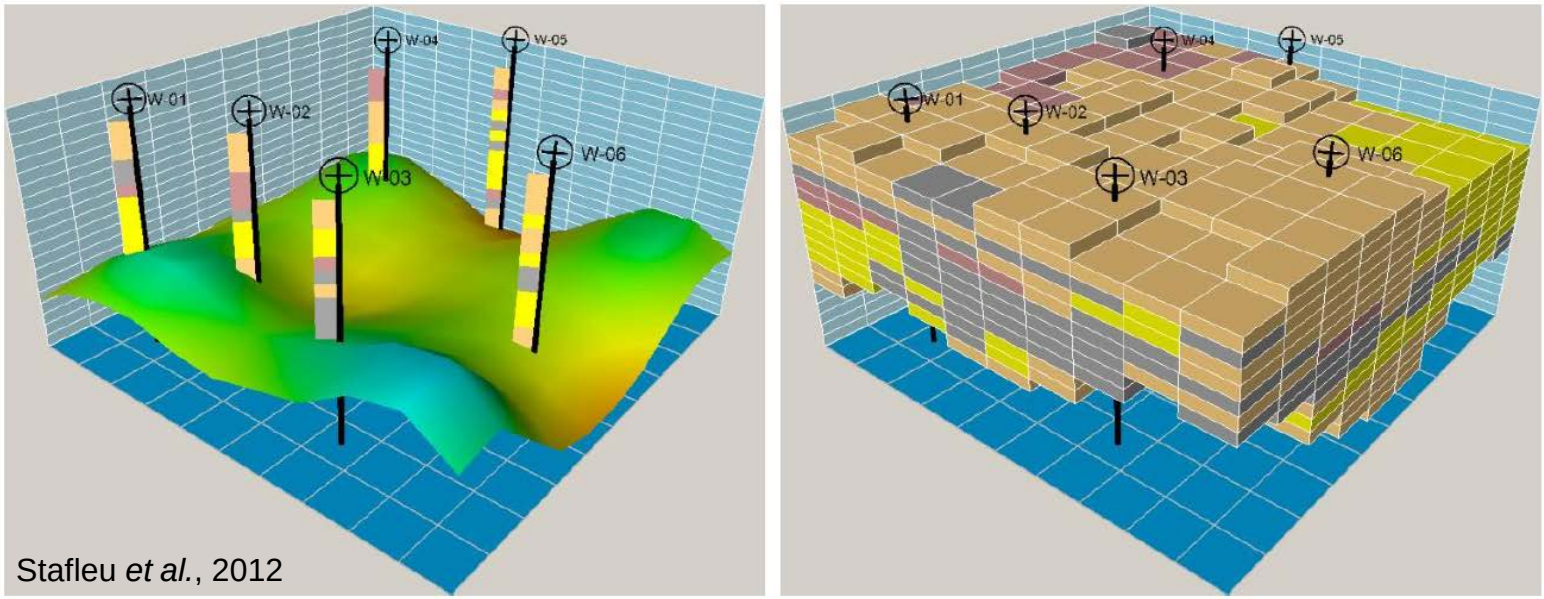
Modelling – *Model type*

- Constructed model of the Cenozoic of Flanders is a *2,5D model*, a.k.a. *Layer (cake) model*
- Modelling of the basal surfaces of the main strata, but nothing in between



Stafleu *et al.*, 2012

- Later on, transformation to a 3D-Voxel-model

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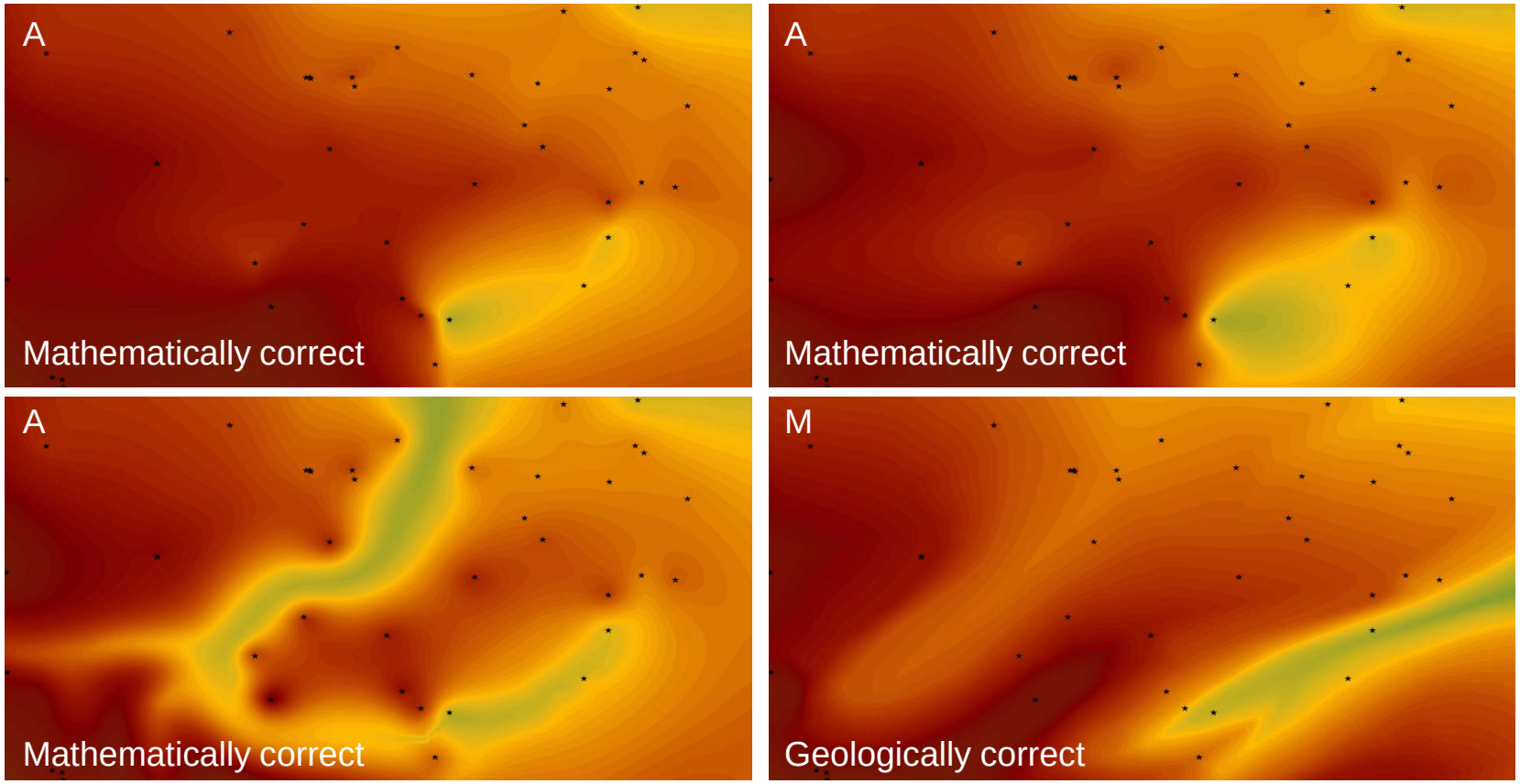
Modelling - *Interpolation*

» Necessarity of geologists input (3x automated, 1x manual)



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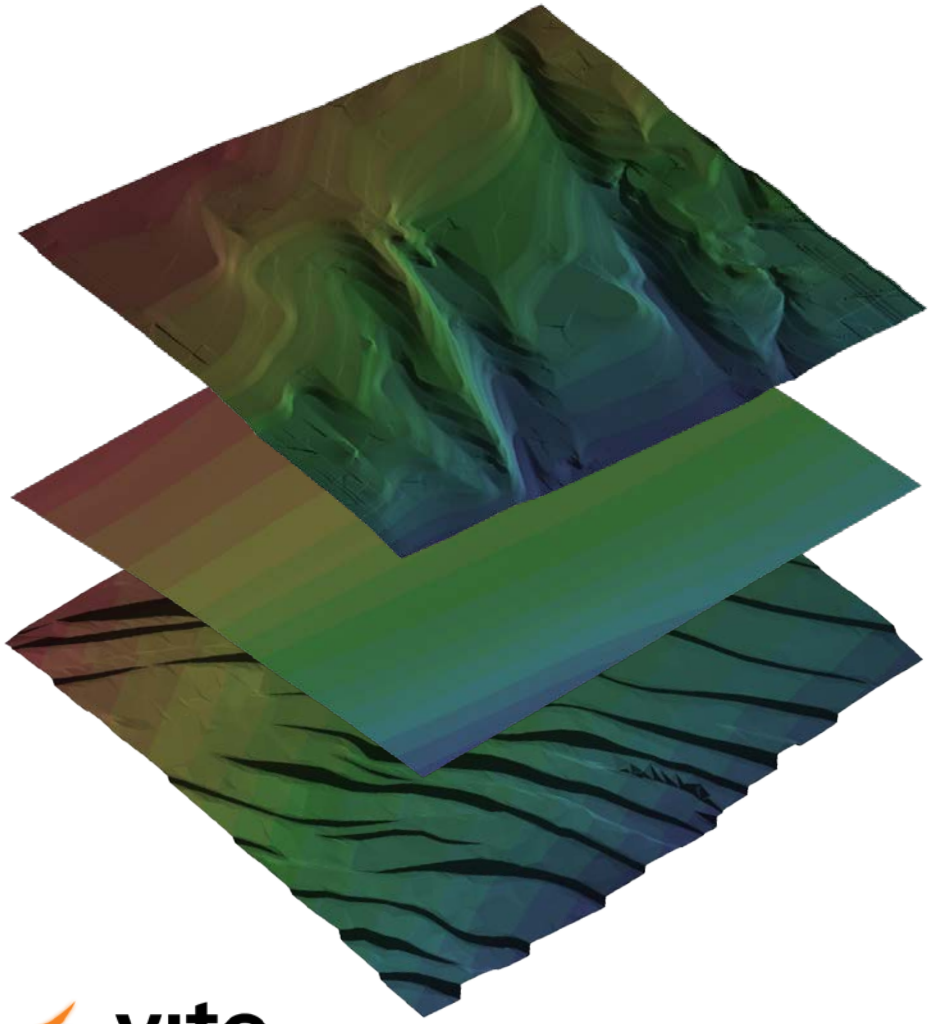
Modelling – *Prior knowledge*



- Nature of the basal plane is forced into the model

- **Gullies incised**
  - Curved surface
  - Geologist + PC
- **Planar**
  - Regular surface
  - PC
- **Faulted**
  - Partitioned surface
  - Geologist + PC

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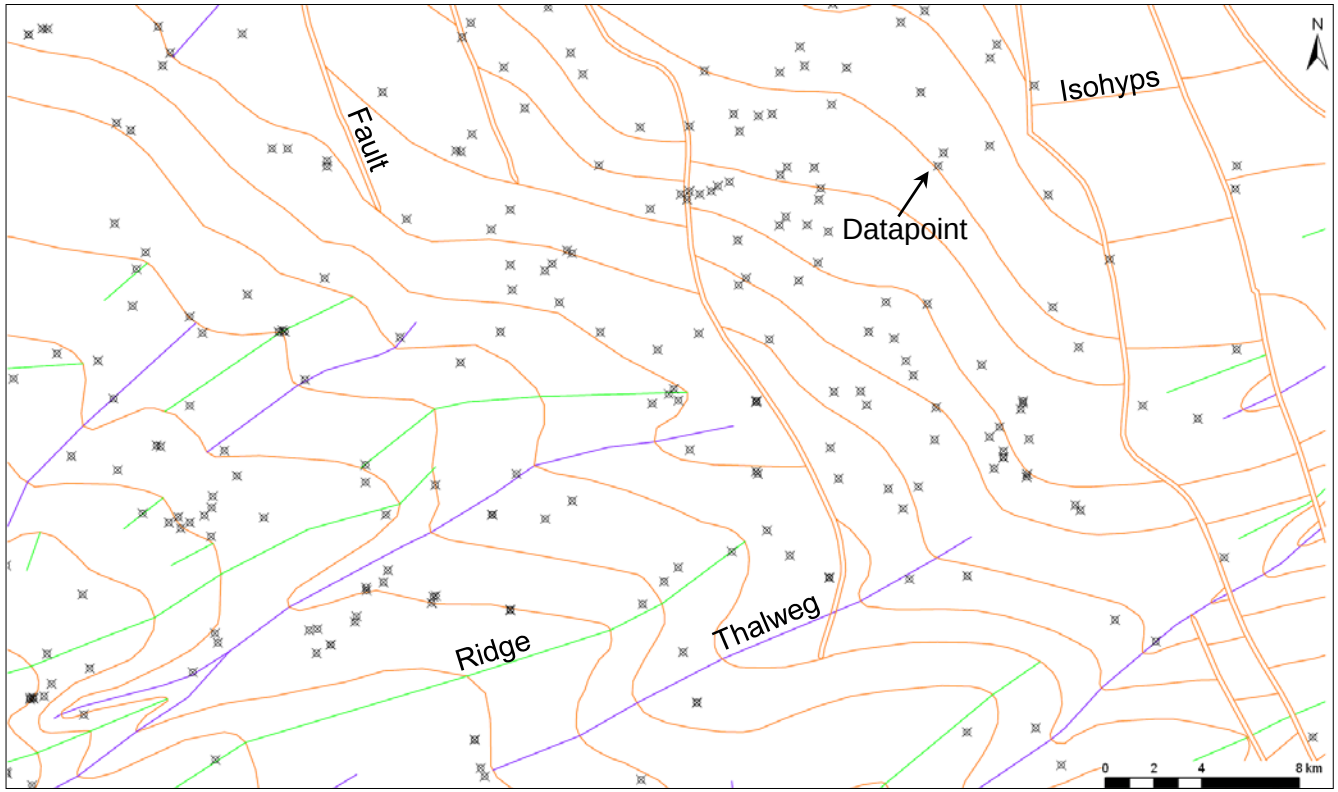
Modelling – *Practical*

» Isohypses, ridges, thalwegs and faults are imported into CAD-environment as 3D-polylines



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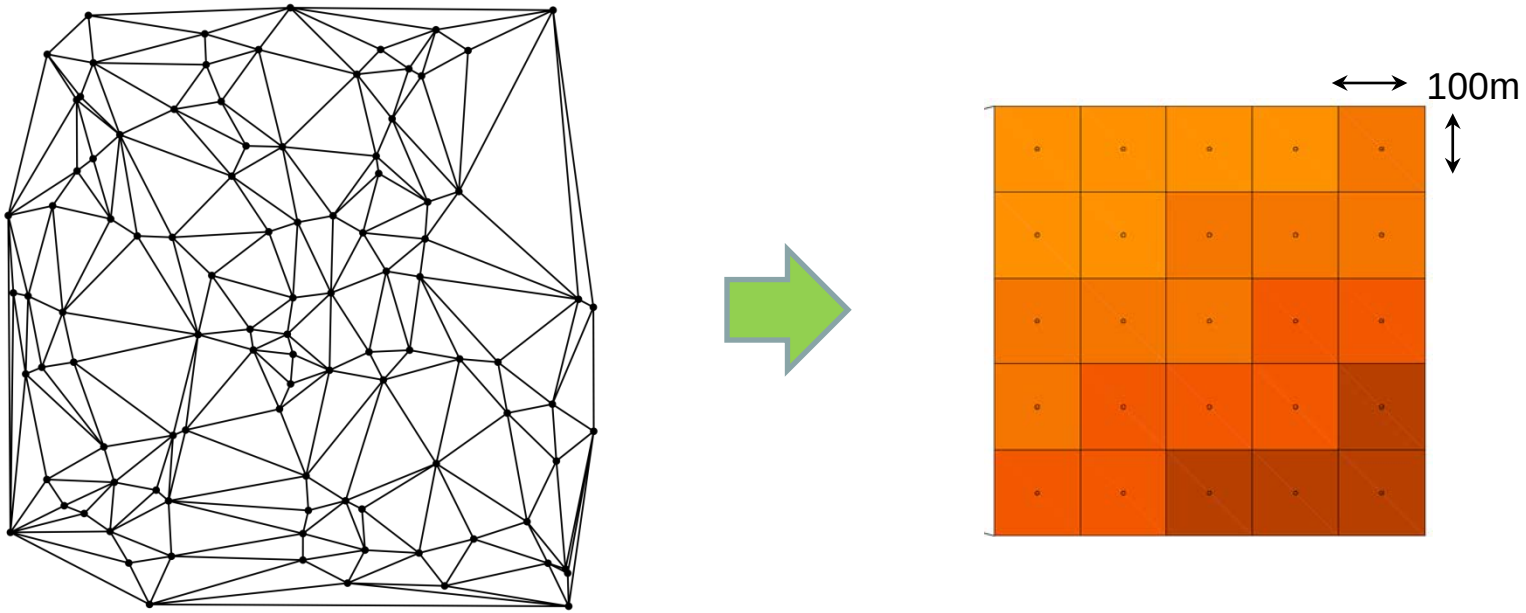
Modelling – *Practical*

- Isohypses, ridges, thalwegs and faults are imported into CAD-environment as 3D-polylines
- Via triangulation, a new grid is created and stored as a raster-file



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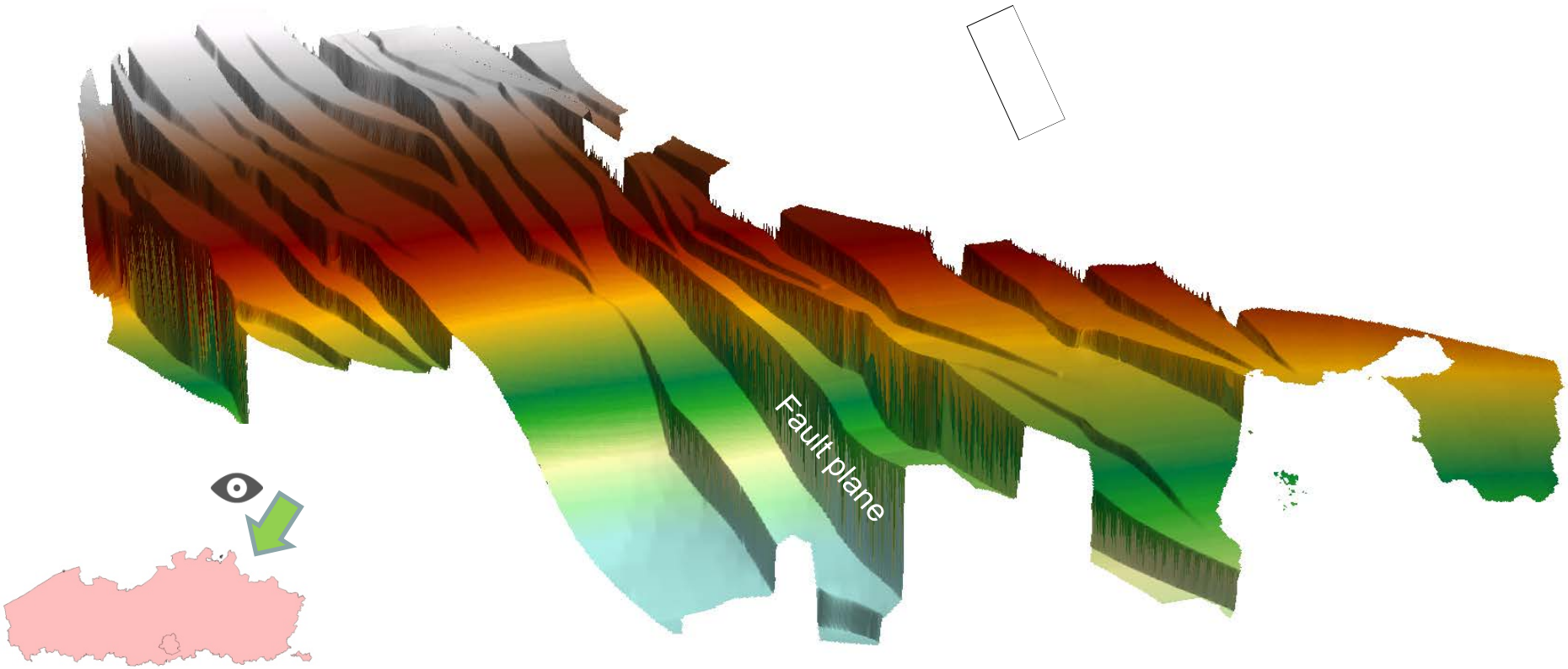
Results – *Examples*

» 3D-view Voort Formation
(vertical exaggeration 70x)



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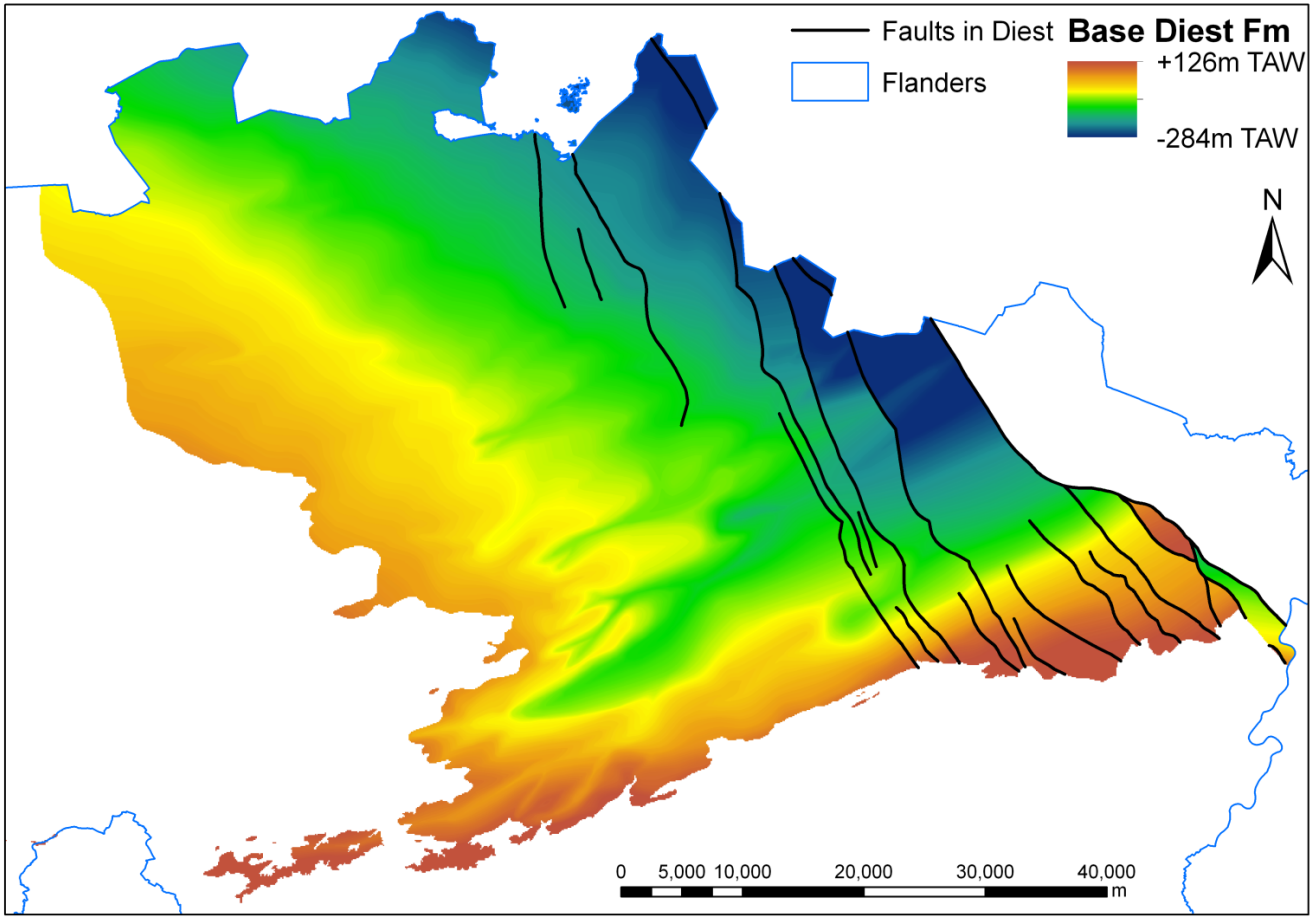
Results – *Examples*

» 2D-view Diest Formation



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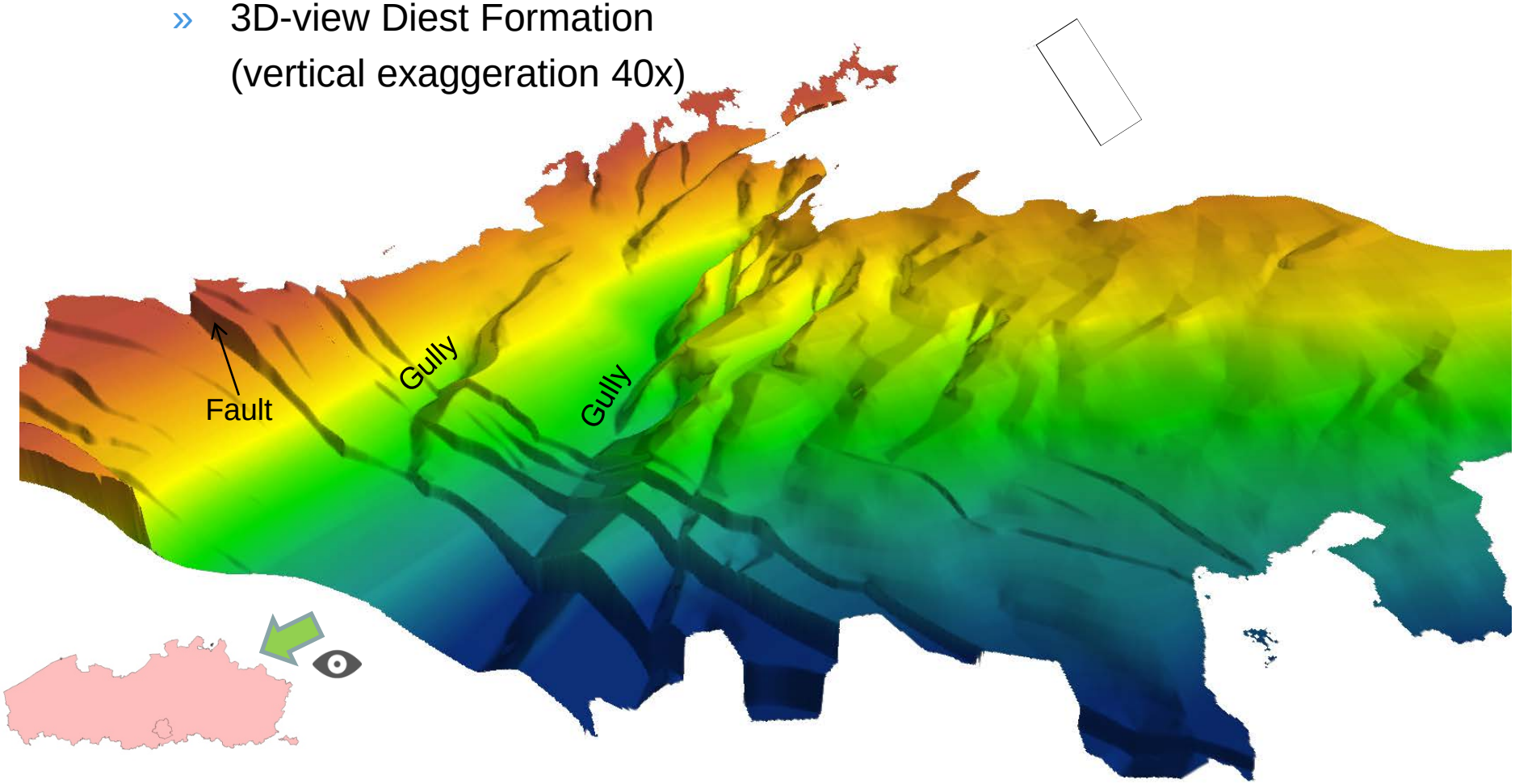
Results – *Examples*

» 3D-view Diest Formation
(vertical exaggeration 40x)



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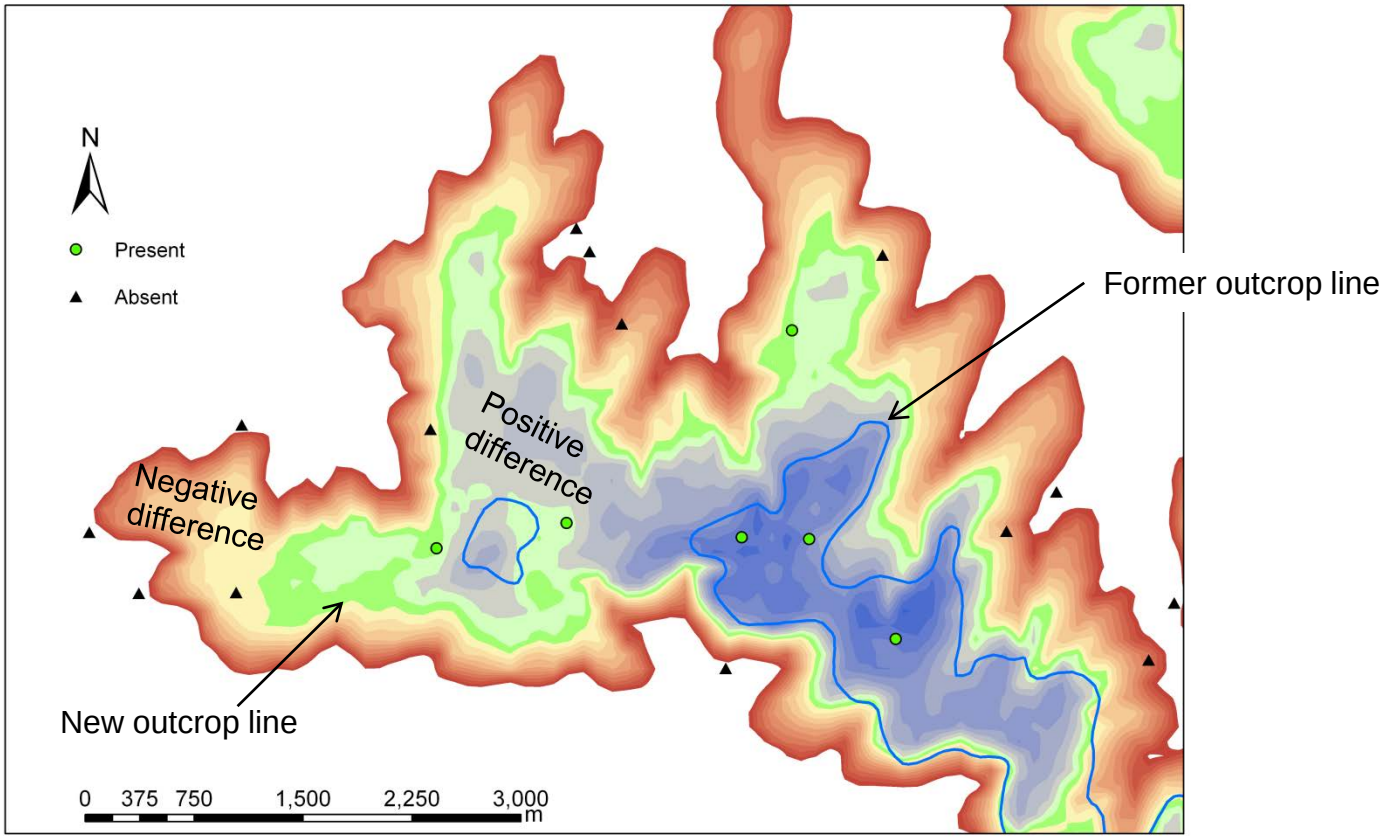
Results – *Outcrop zone*

» Subtracting the grid from the base of a crosscutting formation or the Quaternary creates a new subcrop/outcrop zone



Thank you for your attention!
Questions?