



H3O

a (hydro)geological model that opens the frontier

Ronald Vernes , Jef Deckers, Griet Verhaert and Erik Heskes



Flanders
State of the Art

provincie limburg

TNO innovation
for life



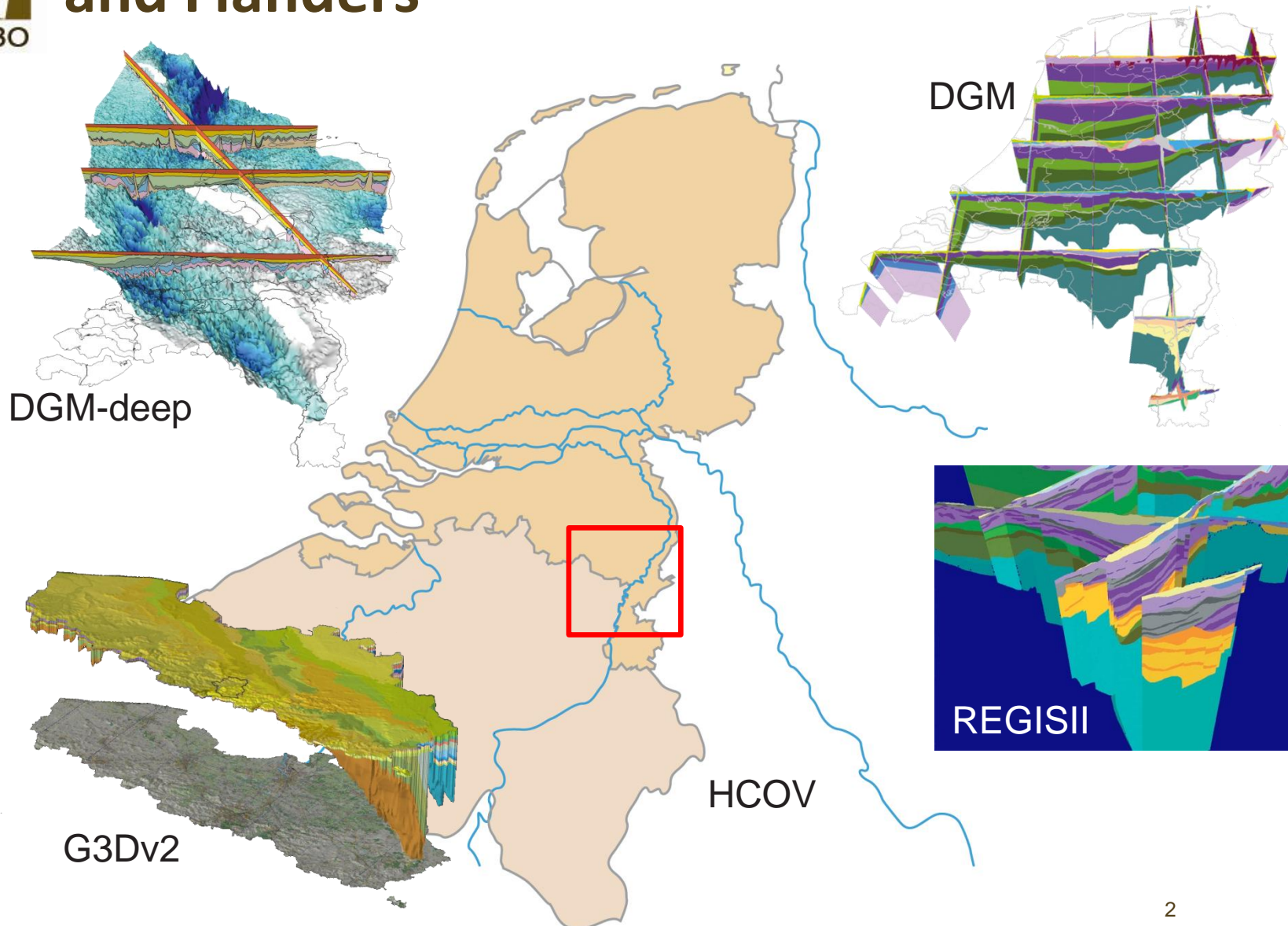
Provincie Noord-Brabant

vito
vision on technology





Models of the subsoil of the Netherlands and Flanders







Project area - Roer Valley Graben



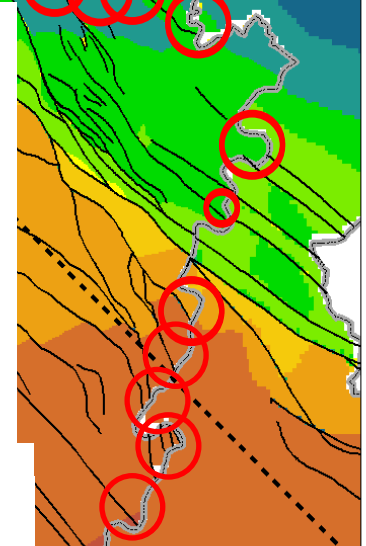
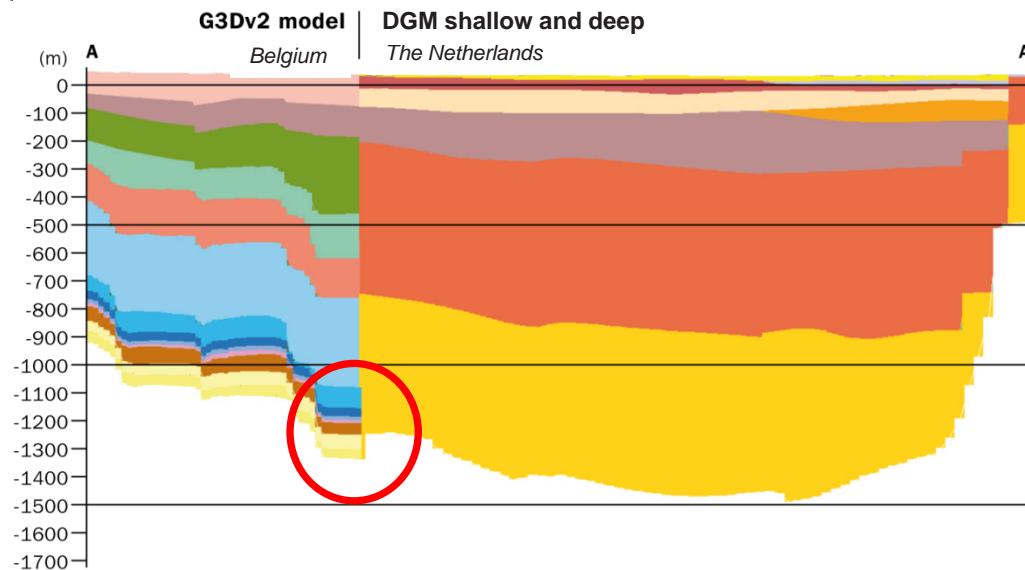
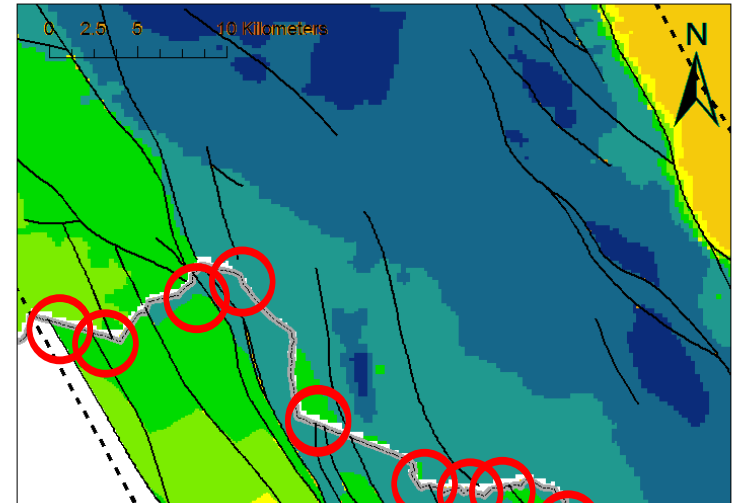
Model area = 1950 km²

-  fault zones
-  modelled H3O-area



Inconsistencies between models along the frontier

- » Different (hydro)geological classification systems (i.e. nomenclatures)
- » Non-matching of faults
- » Jumps in depth and thickness of (hydro)geological units
- » Differences in detail between (hydro)geological models





Goals H3O-project

Main goal

“To attune jointly the geological and hydrogeological models of the Netherlands and Flanders along the frontier”

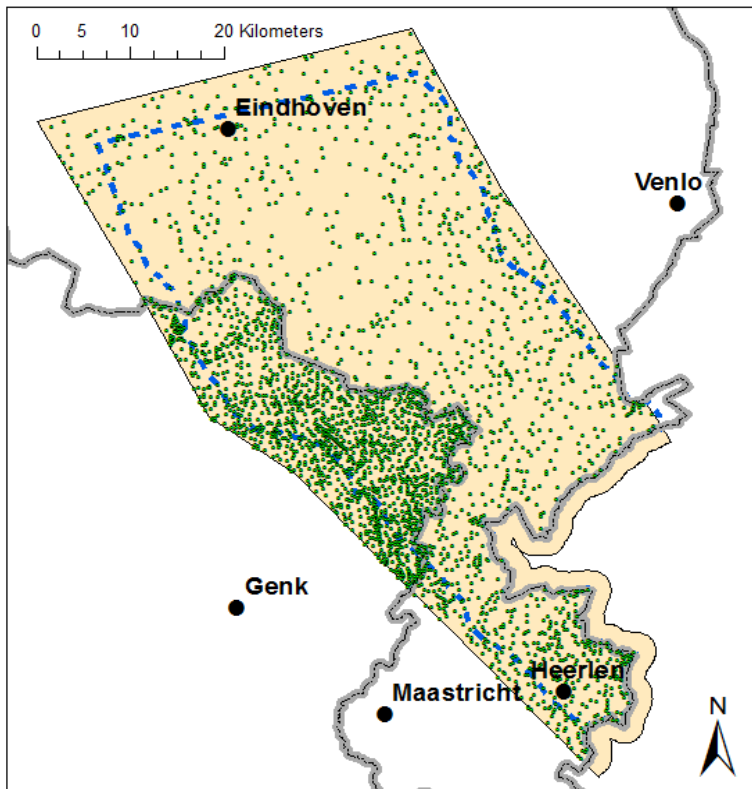
Specific goals pilot project H3O-Roer Valley Graben

- › *One cross-border 3D **geological and hydrogeological layer model***
- › *Of the **Cenozoic** (to about 1800 m depth)*
- › *Of the **Roer Valley Graben** in Southeast Netherlands and Northeast Flanders*
- › *Based on existing raw data*



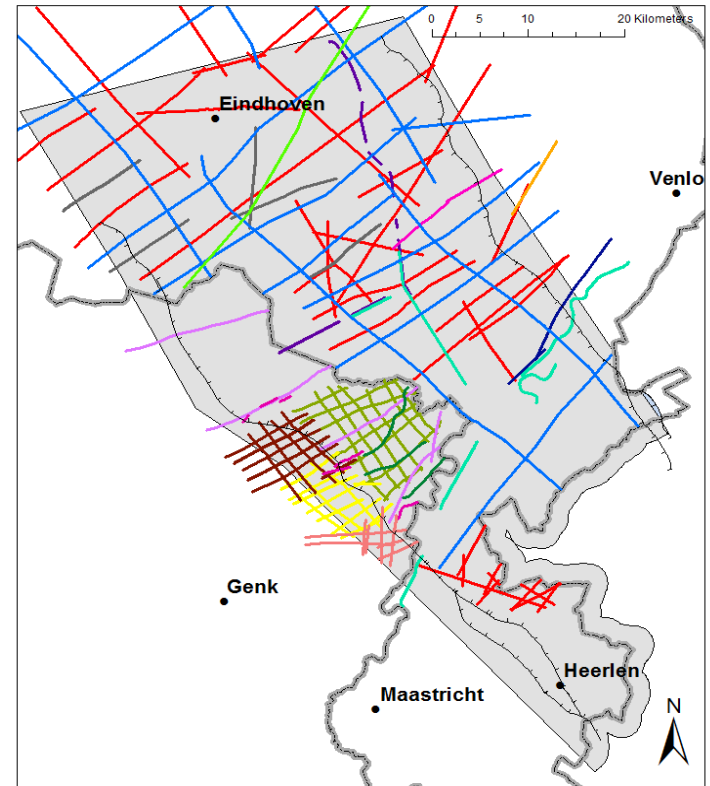
Data inventory and collection – the main primary data

Well data



n = 2939

2D Seismic data





Correlation of Dutch and Flemish (hydro)geological units – some examples

Dutch

Flemish

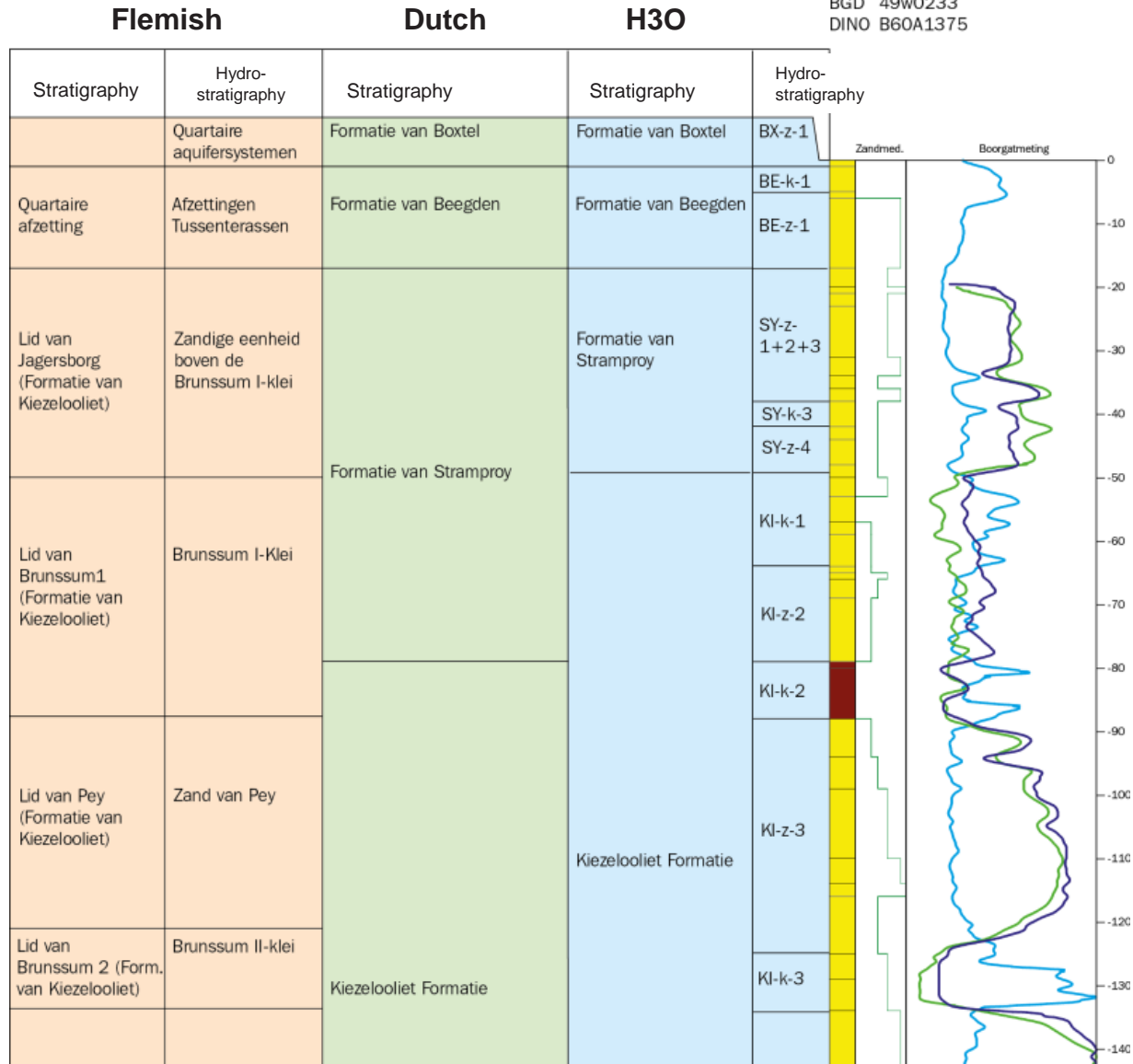
H3O

Dutch stratigraphic unit (Formation - Member)	Dutch hydrogeological unit (cf. REGIS II.2)	Flemish stratigraphic unit (Formation - Member)	Flemish hydrogeological unit (cf. HCOV)		Resulting H3O unit Geological model	Resulting H3O Unit Hydrogeological model					
Waalre <i>undifferentiated</i>	PZWA-z-1	Kempen Group	0220	0221-0223	Waalre	PZWA-z-1					
	WA-k-1					WA-k-1					
	PZWA-z-2					PZWA-z-2					
	WA-k-2					WA-k-2					
	PZWA-z-3					PZWA-z-3					
WA-k-3	WA-k-3										
PZWA-z-4	PZWA-z-4										
Maassluis	MS-z-1					Kieseloolite - Jagersborg (from Reuver clay on)	0200	0210	Kieseloolite	MS-z	
	MS-k-1										
	MS-z-2										
	MS-c										
	MS-k-2										
MS-z-3											
Kieseloolite - undefined	KI-z-1	Kieseloolite - Brunssum I Kieseloolite - Pey Kieseloolite - Brunssum II Kieseloolite - Waubach	0210	0212 0213 0214	Kieseloolite						KI-z-1
Kieseloolite – Brunssum	KI-k-1										KI-k-1
	KI-z-2										KI-z-2
	KI-k-2										KI-k-2
	KI-z-3					KI-z-3					
	KI-k-3					KI-k-3					
Kieseloolite - Waubach	KI-z-4					KI-z-4	0215	Kieseloolite	KI-z-4		
	KI-k-4					KI-k-4					
	KI-z-5					KI-z-5					
Oosterhout	OO-z-1 + OO-z-2								Oosterhout	OO-z-1 + OO-z-2	
	OO-c				Oosterhout	OO-c					
Inden <i>undifferentiated</i>	IE-z-1	Inden (+ reworked Breda (new))	0210/0230	0234/0215	Inden	IE-z-1					
	IE-k-1					IE-k-1					
	IE-z-2					IE-z-2					
	IE-k-2					IE-k-2					
	IE-z-3					IE-z-3					



(Re)interpretation existing well data

DOV kb18d49w-B232
 BGD 49w0233
 DINO B60A1375

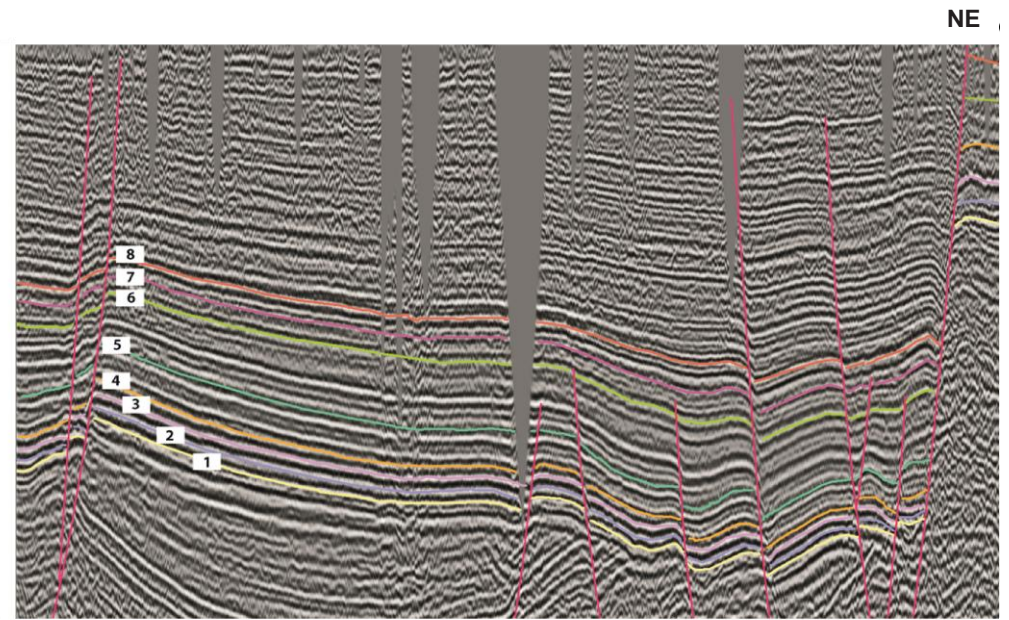
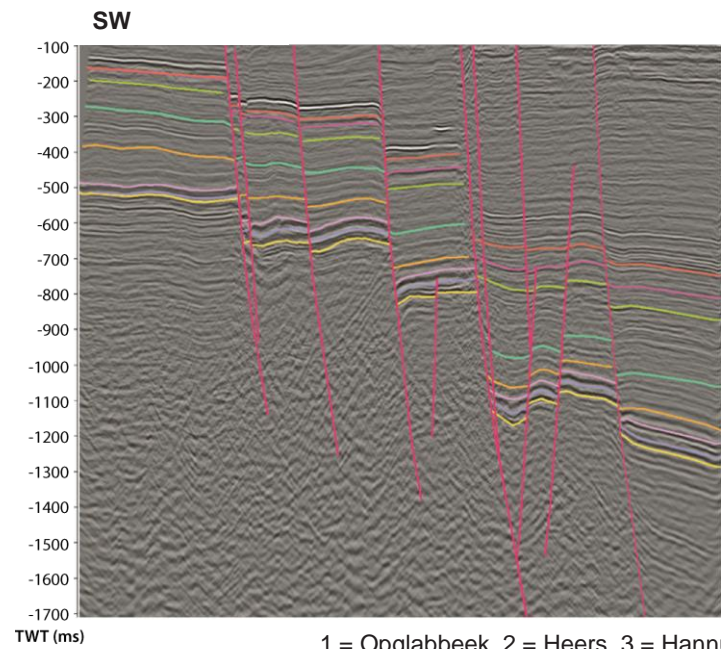




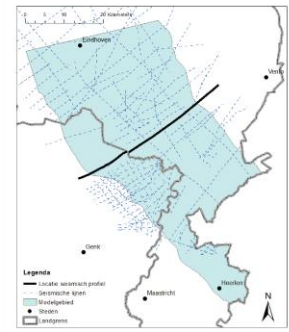
(Re)interpretation of existing seismic data

Belgium

The Netherlands



1 = Opglabbeek, 2 = Heers, 3 = Hannut, 4 = Sint-Huibrechts-Hern/Bilzen, 5 = Voort (0254-2), 6 = Voor (0255), 7 = Voort (0254-1), 8 = Bolderberg





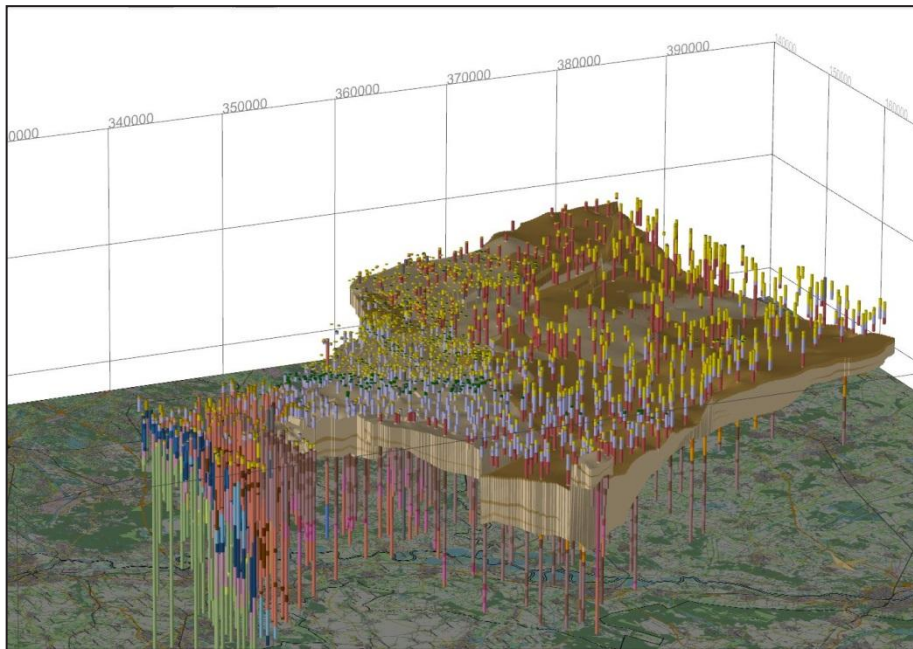
3D modelling - Combining two methods

Shallow Units

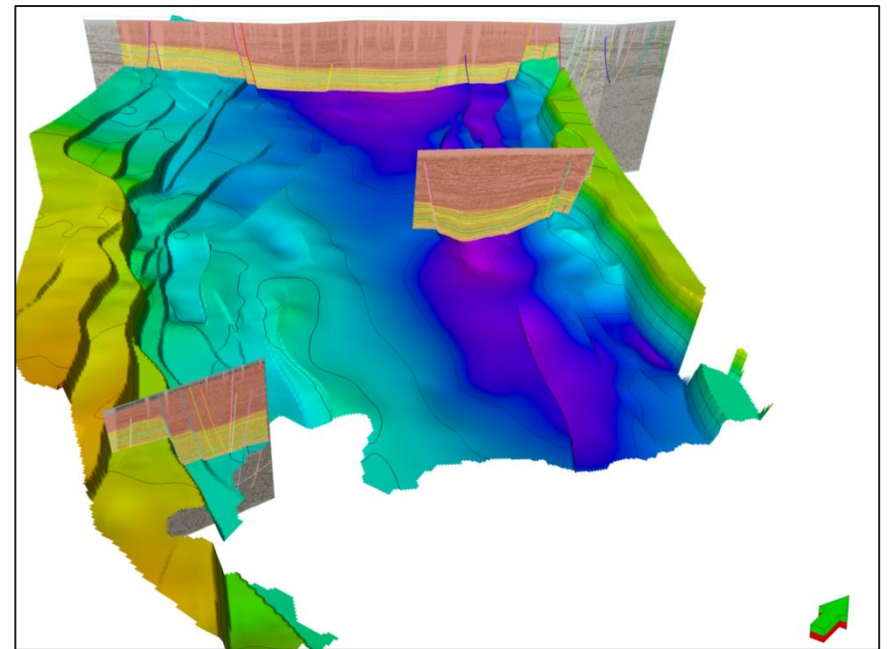
- » Late Miocene to Holocene units
- » Well data
- » Vertical fault planes
- » Isatis

Deep Units

- » Paleocene to Late Miocene units
- » 2D seismic data + few well data
- » 3D fault planes
- » Petrel



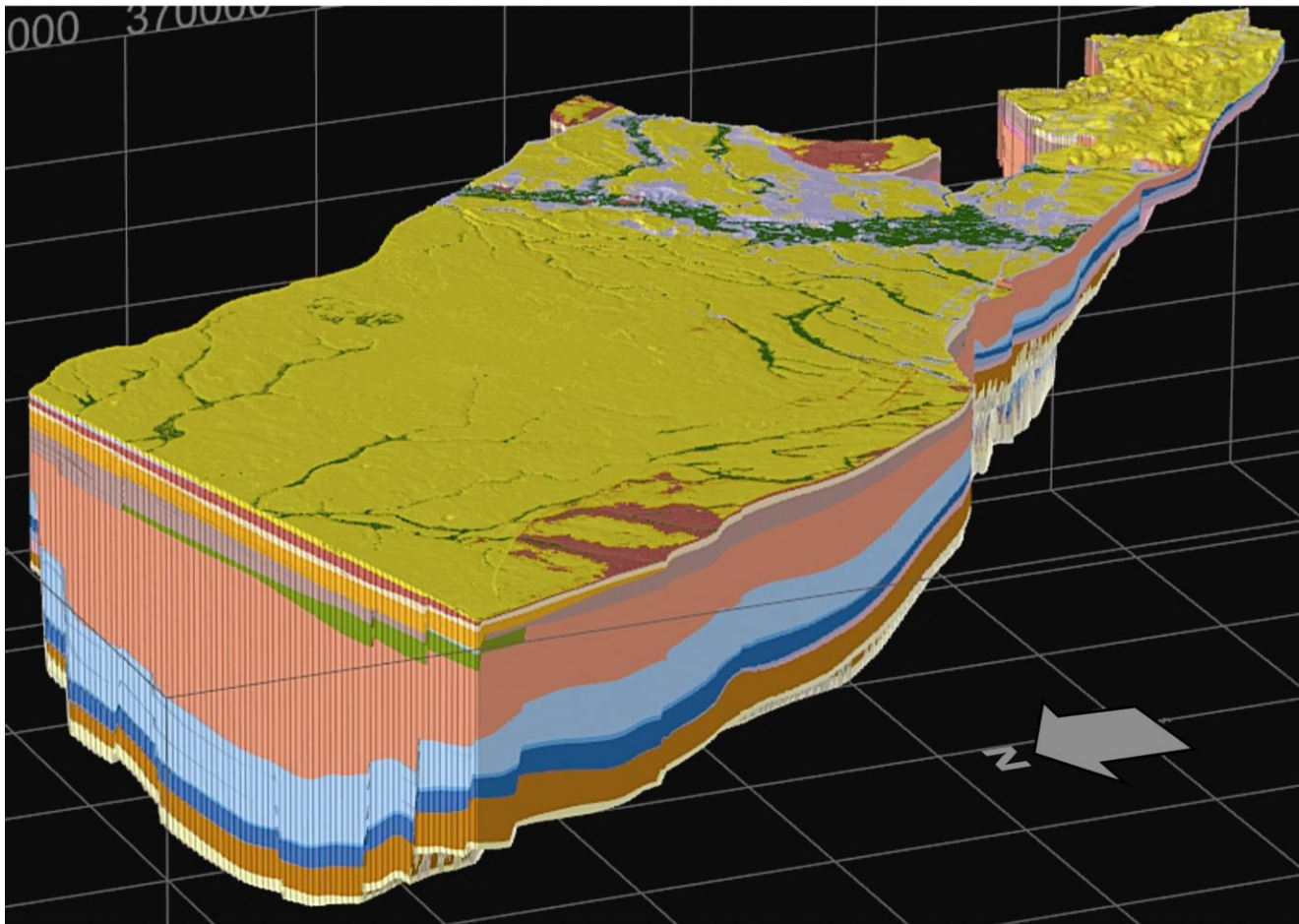
3D model of the Stramproy Formation



Base of the Oplabbeek Formation



Results – 3D Geological Model



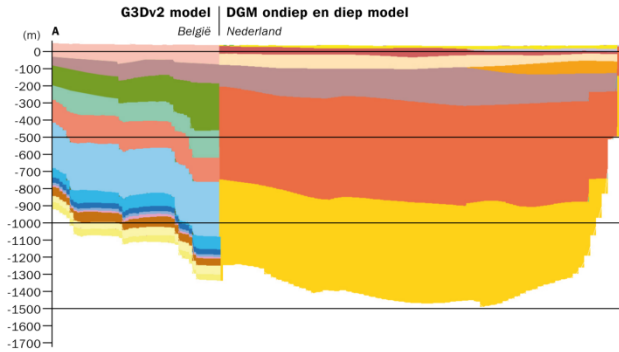
- Holocene
- Boxtel Formation
- Beegden Formation
- Sterksel Formation
- Stramproy Formation
- Waalre Formation
- Maassluis Formation
- Kieseloolite Formation
- Oosterhout Formation
- Inden Formation
- Diest/Bolderberg/Ville Formation
- Voort Formation
- Eigenbilzen Formation
- Boom Formation
- Bilzen Formation
- Borgloon Formation
- Sint-Huibrechts-Hern Formation
- Hannut Formation
- Heers Formation
- Opglabbeek Formation

SubsurfaceViewer ©

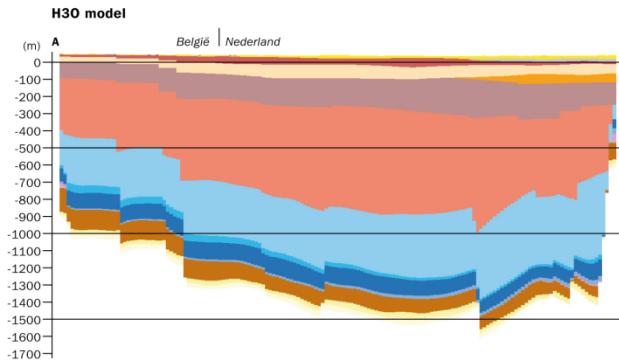


Results – old versus new geological models

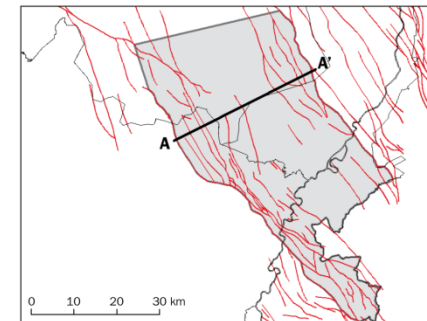
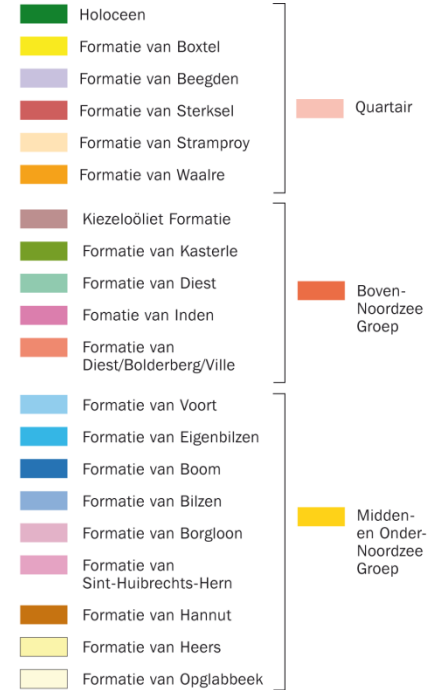
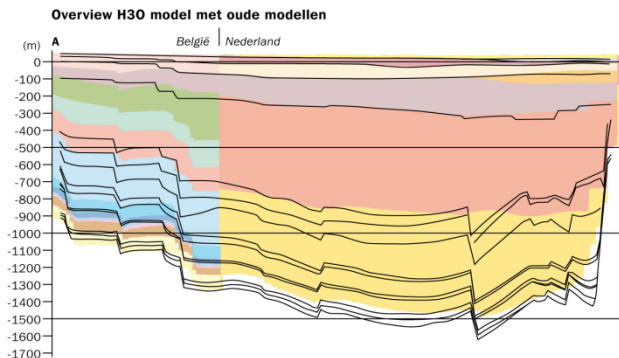
Old models



New model



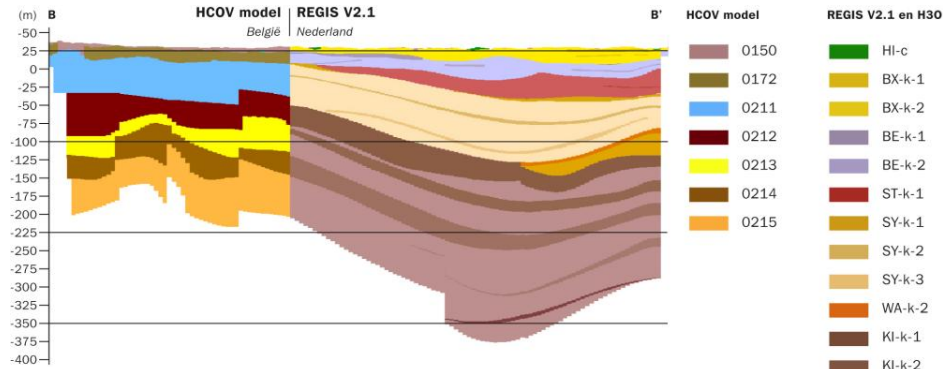
Improvements



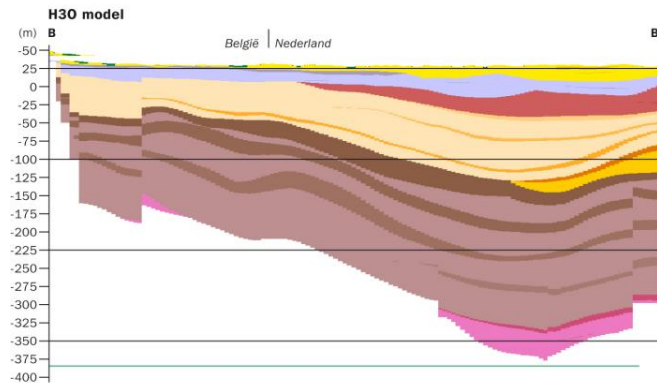


Results – old versus new hydrogeological models

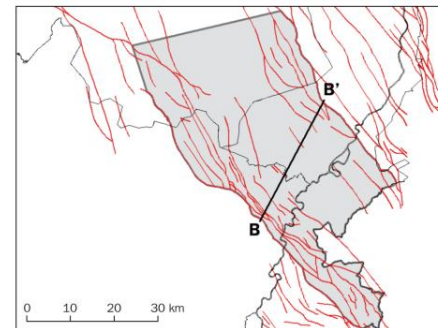
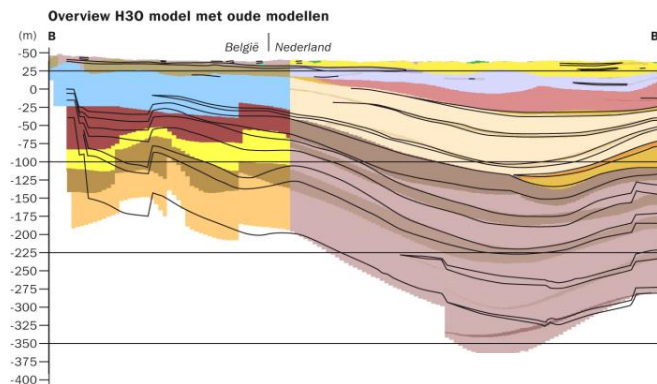
Old models



New model



Improvements





Main conclusions

- » Workable correlation between Belgian and Dutch (hydro)geological units.
- » Workable modelling approach resulting in one geological and one hydrogeological model of the Cenozoic of the entire model area.
- » Without inconsistencies along the frontier.



Final results available online in Flemish and Dutch subsurface databases

DINOloket

Data en Informatie van de Nederlandse Ondergrond

dov.vlaanderen.be

Welkom bij de Databank Ondergrond Vlaanderen

over DOV | contact | aansprakelijkheid | DOV-publicaties | english

U bent hier: [dov.vlaanderen.be](#) > [geologie](#) > H3O-Roerdalslenk

H3O-Roerdalslenk

Algemeen

- > [Wat is H3O-Roerdalslenk?](#)
- > [Studiegebied:](#) Topokaart, fence diagram, Roerdalslenk in 3D
- > [Problematiek, doelstelling en projectorganisatie](#)
- > [Resultaten](#)
- > [Referentie](#)
- > [Voorstelling H3O-project 13 maart 2014 te Maastricht](#)

DATA

- Resultaten in Belgisch coördinatenstelsel:**
 - > [Overzicht databestanden](#)
 - > [Databestanden: MXD, GIS-bestanden, rapport](#)
 - > [Correlatietabel H3O-modeleenheden](#)
 - > [Rapport](#)
- Resultaten in Nederlands coördinatenstelsel:**
 - [Website DINOloket](#)
- Voorzien in 2015:**
 - > DOV-services
 - > DOV-metadata
 - > H3O-Roerdalslenkmodel in de 3D SubsurfaceViewer ©



H3O-Roerdalslenk is een (hydro)geologisch 3-dimensionaal model van de ondergrond van de Roerdalslenk. Het grensoverschrijdende karakter van de modellering staat centraal. Daarbij werden de Cenozoïsche (Quartaire, Neogene en Paleogene) afzettingen in het Nederlands Limburgse, het zuidoostelijk Noord-Brabantse en het Vlaamse deel van de Roerdalslenk gemodelleerd.

De resultaten van H3O-Roerdalslenk werden opgeleverd in zowel het Nederlandse als het Belgische coördinatenstelsel en referentieniveau. Voor Vlaanderen is dit het referentiestelsel Belge Lambert 1972 en TAW (Tweede Algemene Waterpassing) en voor Nederland in RD en NAP (Nieuw Amsterdams Peil).

Het H3O-Roerdalslenk-project werd in 2012 opgestart en gepubliceerd in juli 2014.

Downloads project H3O Roerdalslenk

In het kader van dit project is een grensoverschrijdend, up-to-date, driedimensionaal geologisch en hydrogeologisch model van het Limburgse, Zuidoost-Brabantse en Vlaamse deel van de Roerdalslenk gemaakt. Hier kunt u de resultaten van dit project downloaden. Deze resultaten bestaan uit het eindrapport en de digitale datasets van beide modellen (in het Nederlandse RD-coördinatenstelsel en NAP-referentieniveau). Beide modellen zijn op de website van de Databank Ondergrond Vlaanderen (DOV) ook beschikbaar in het Belgische Lambert-coördinatenstelsel en TAW-referentieniveau. Daarnaast kunt u op deze pagina het programma en de presentaties downloaden van de op 13 maart 2014 in het Gouvernement te Maastricht gehouden eindpresentatie van het project.

Eindrapport

- [Eindrapport \(9.98 MB, Pdf\)](#)

Datasets

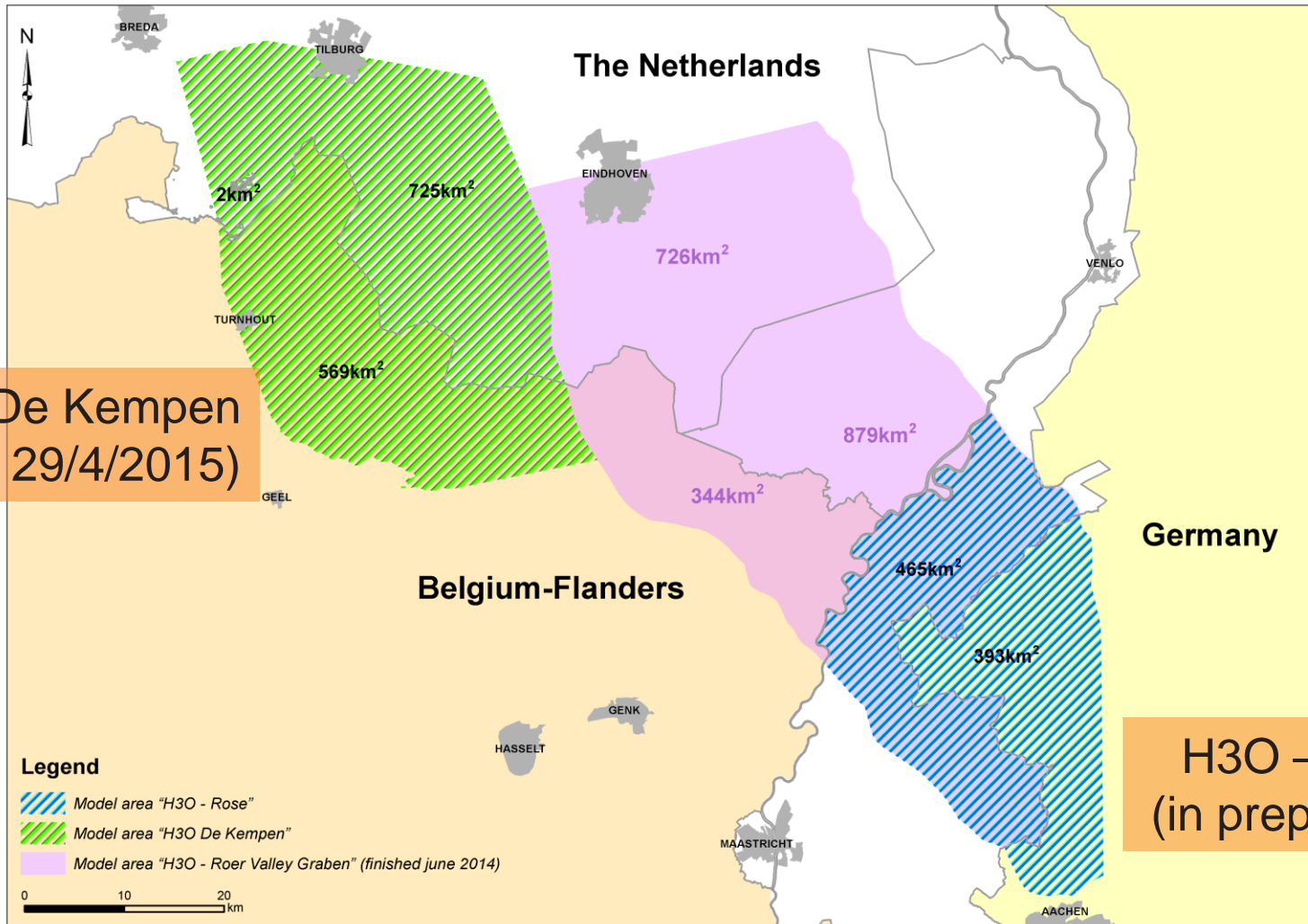
- [Datasets geologische en hydrogeologische model in RD en NAP \(297 MB, ZIP\)](#)
- [Datasets geologische en hydrogeologische model in Lambert en TAW \(website DOV\)](#)

Eindpresentatie 13 maart 2014

- [Programma \(196 KB, Pdf\)](#)
- [Presentatie "Een geologische verkenning van de Roerdalslenk" van Michiel Duser, BGD \(14.08 MB, Pdf\)](#)
- [Presentatie "H3O - Roerdalslenk" van Ronald Vernes, TNO en Jef Deckers, VITO \(4.81 MB, Pdf\)](#)
- [Presentatie "H3O nuttig voor Limburgs drinkwater!" van Maria Juhász-Hollerman, vmi WML, Juhász Advies \(2.48 MB, Pdf\)](#)



Follow up cross border projects



H3O – De Kempen
(started 29/4/2015)

H3O – Rose
(in preparation)



Acknowledgements

Flanders

- » VITO
- » Belgian Geological Survey
- » Natural Resources Service of the Flemish Government
- » Flemish Environment Agency

The Netherlands

- » Province of Limburg
- » Province of North-Brabant
- » TNO Geological Survey



Thank you for your attention