

Urban geology and three-dimensional (3D) city models: (it could be) a symbiotic relationship

Rouwen Lehné¹, Sonu Roy², Ina Lewin², Heiner Heggemann¹

1) *Hessian Agency for Nature Conservation, Environment and Geology*

2) *Technical University of Darmstadt*

3D city models are state of the art – Kassel 3D

← → ↺ 🏠 kassel.virtualcitymap.de/#/legend ☆ □ 👤 ⋮

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Kassel documenta Stadt Vermessung und Geoinformation

Kassel 3D - Digitaler Zwilling

🔍 Suche 📄 Inhalte ⓘ Hilfe ⚙️ Einstellungen

Themen & Inhalte

Grundkarten

- Orthophoto 2020 ☒
- Orthophoto 2017

3D Stadtmodell

- Gebäude Modell
- Gebäude realistisch ☒
- Sommerbäume
- Winterbäume
- Punktwolke Vegetation
- Punktwolke Stadtschleuse
- Obelisk - documenta 14 ☒
- Himmelsstürmer - documenta 9 ☒
- Spitzhacke - documenta 7 ☒

Themen

- documenta
- Freizeit & Kultur

📄 PDF erzeugen

🔗 Link erzeugen

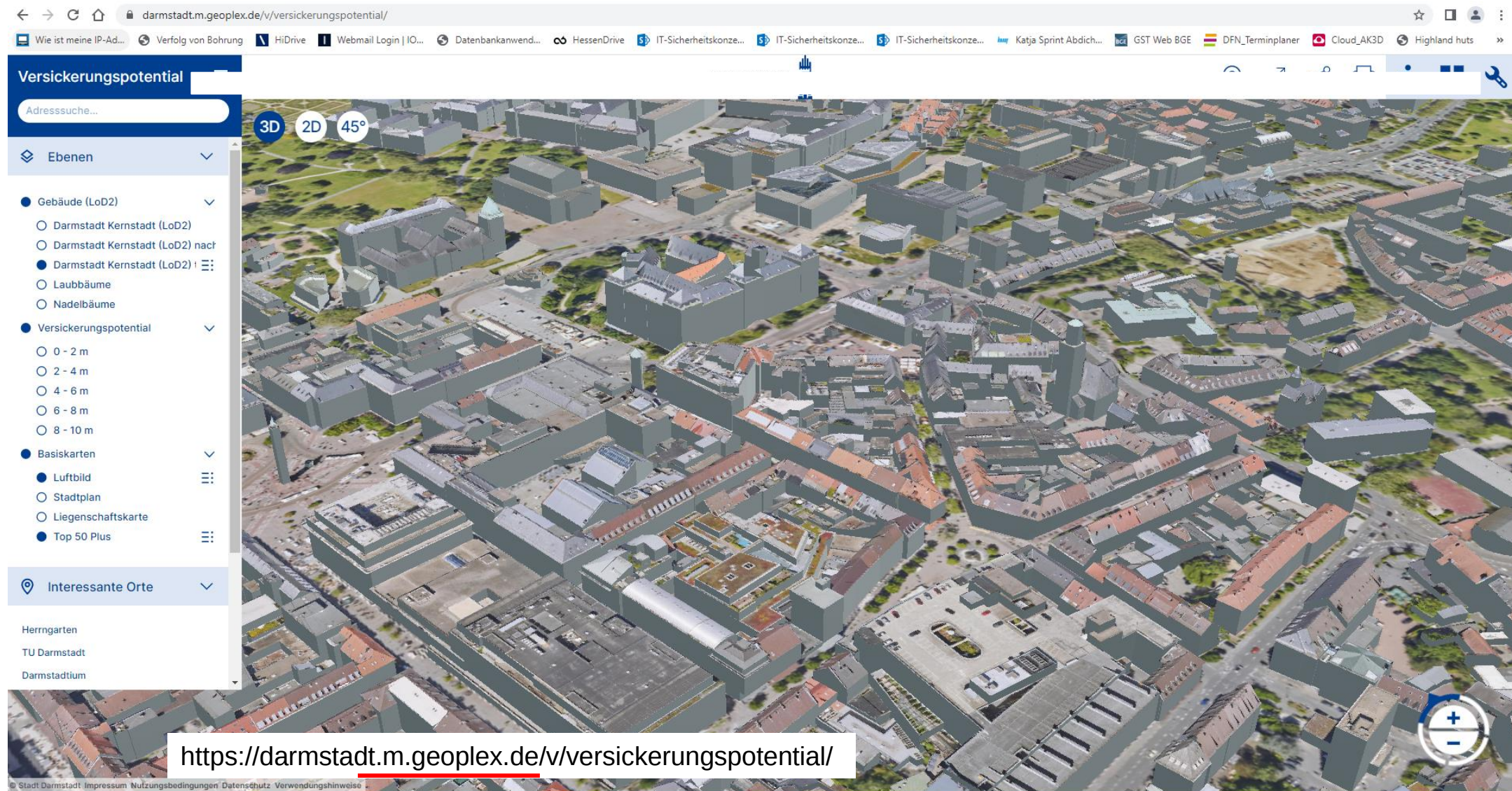
🗑️ Alle Einstellungen zurücksetzen



https://kassel.virtualcitymap.de/#/legend

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3D city models are state of the art – Kassel 3D



<https://darmstadt.m.geoplex.de/v/versickerungspotential/>

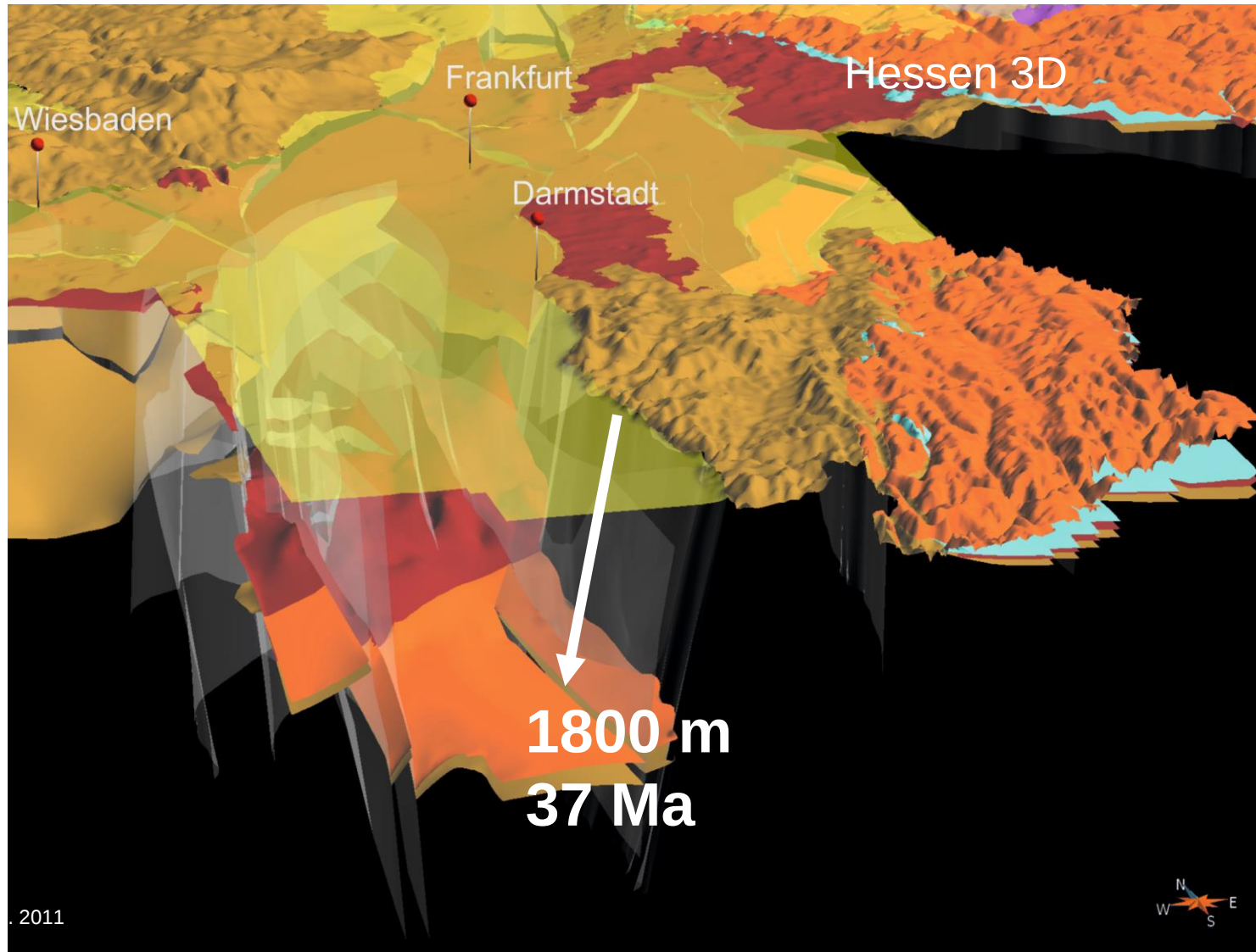


3D city models are state of the art – Kassel 3D

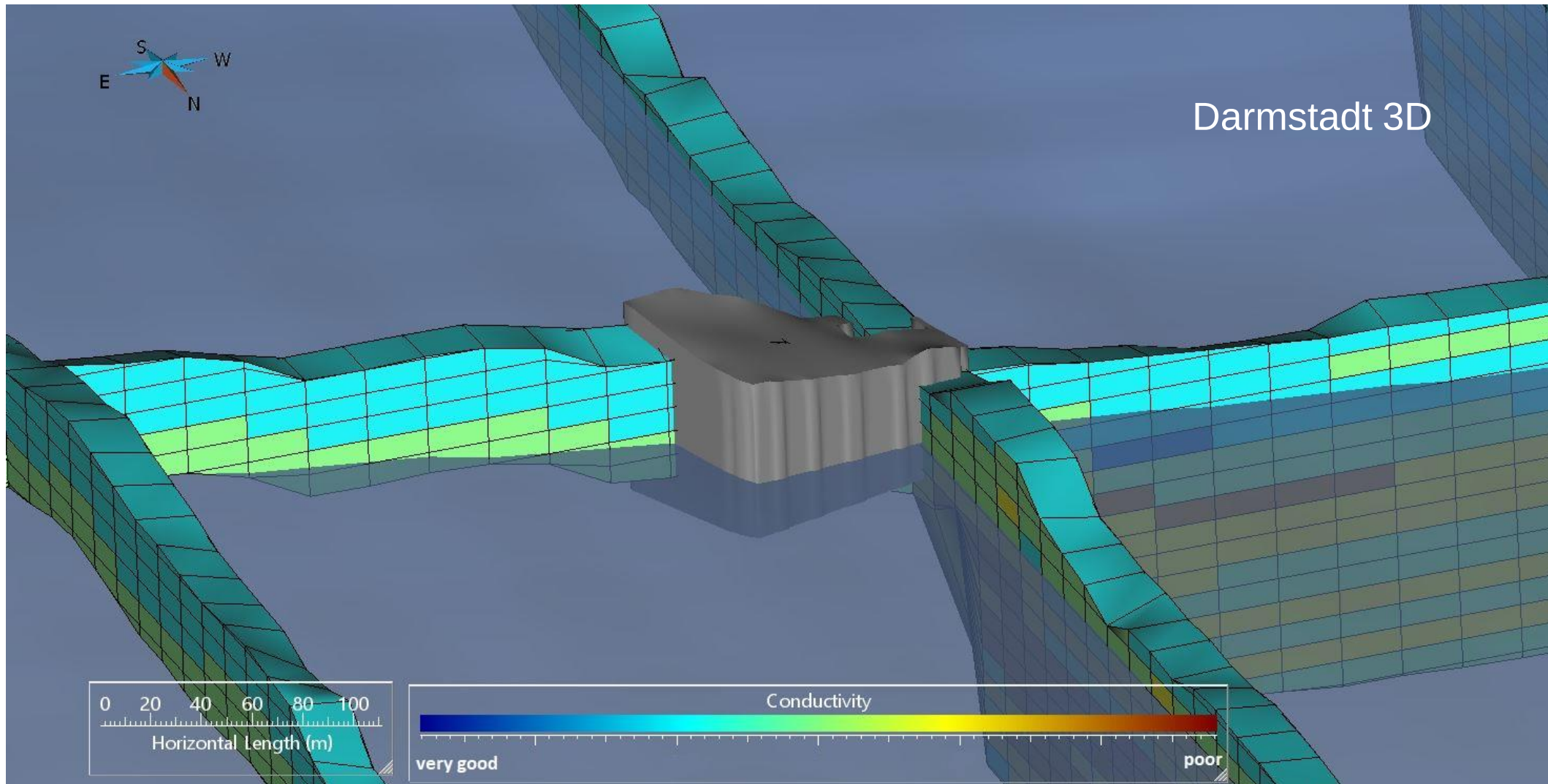
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And so is geological 3D modelling isolated



And so is geological 3D modellingand integrated

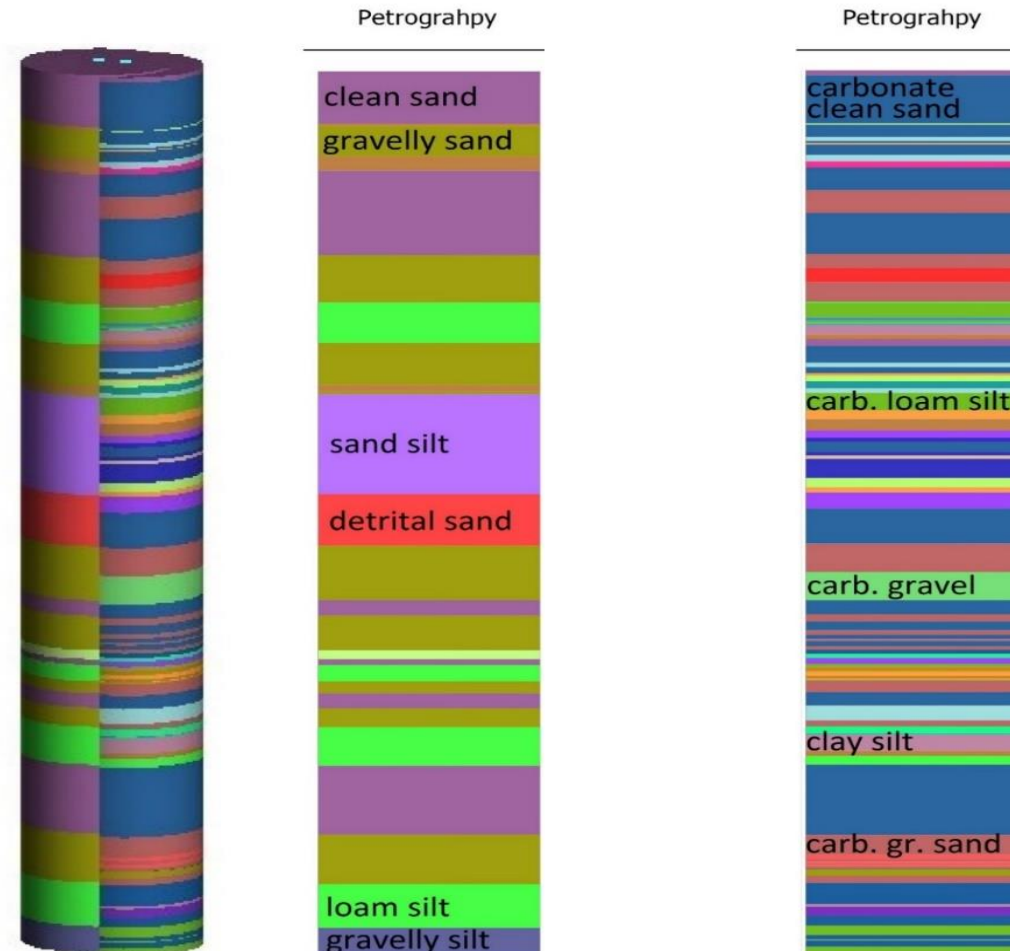


But why don't we see them together that often?



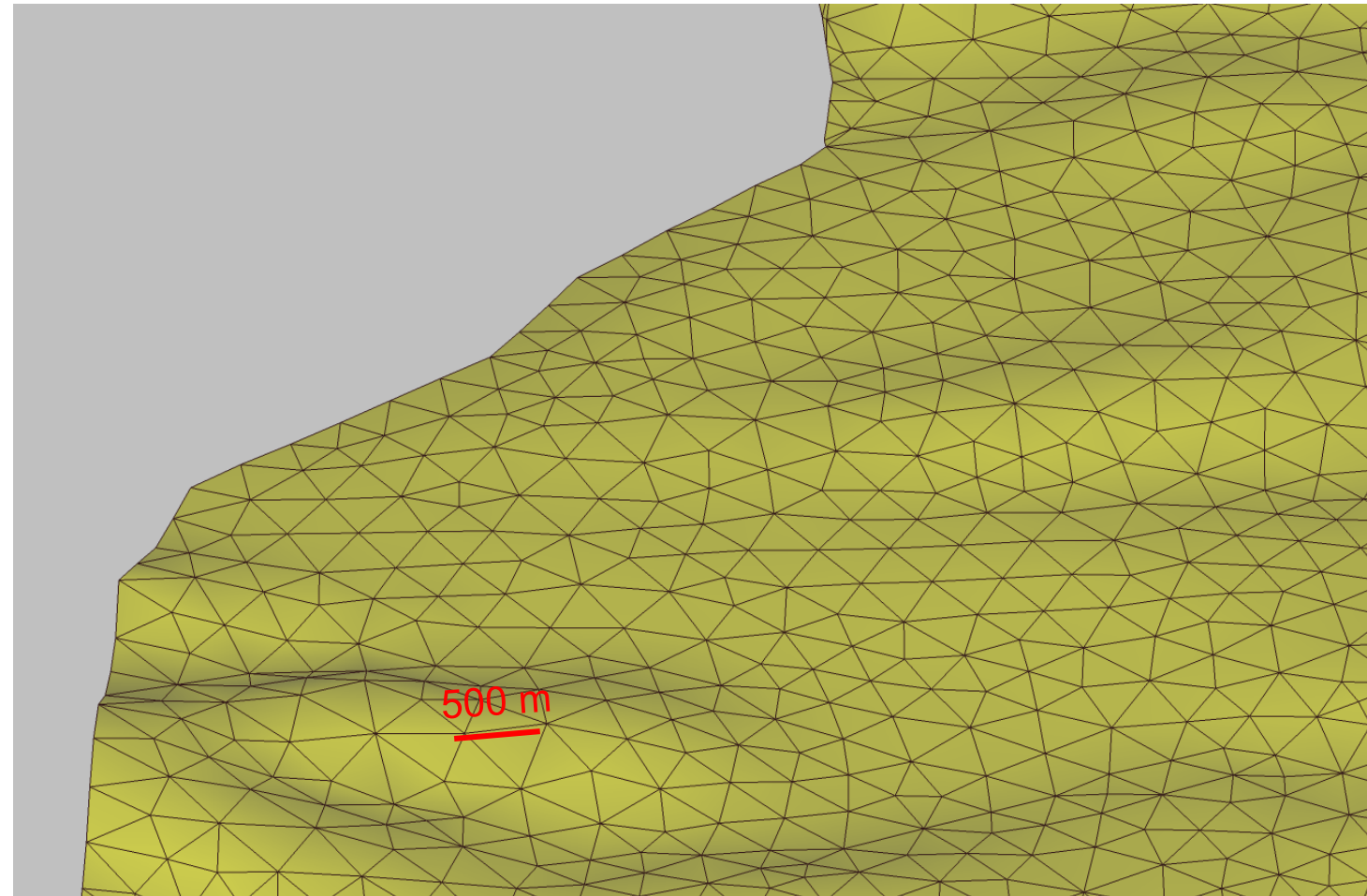
But why don't we see them together that often?

1) Geological semantics are often too complex and heterogenous



But why don't we see them together that often?

- 1) Geological semantic often is too complex and heterogenous
- 2) Geological content often does not have the required resolution



But why don't we see them together that often?

- 1) Geological semantic often is too complex and heterogenous
 - 2) Geological content often does not have the needed resolution
 - 3) Geological 3D-content usually is not interoperable
- Common 3D city model platforms do not support geological data formats
 - Interfaces for integration are rarely available, if at all

Gocad ASCII (.vs, .pl, .ts, .so, .sg, .vo, .gs)

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Legacy VTK Format (Binary)

SEGY rev2.0

OBJ

ESRI Shapefile (Collection)

ESRI Shapefile

ESRI Shapefile (Profile)

Geopackage (GPKG)

IFC v4.2

ResqML v2.0

GeoTIFF

Steps to address the lack of interoperability

- Establishing close cooperation with municipal stakeholders
- Defining urban geoparameter requirements in collaboration with cities
- Consolidating all available geological information
- Developing high-resolution/customized geological 3D information
- Analyzing existing IT infrastructures
- Implementing interfaces and standardized exchange formats
- Providing interoperable, service-based access to customized geological information in both 2D and 3D

Behind the scenes

Human interface (elaborating, translating, negotiating, mediating, de-escalating)

building authority

Road and civil construction authority

environmental authority

Municipal utility

3D-modeller

mapping geologists

engineering geologists

Soil scientists

geochemists

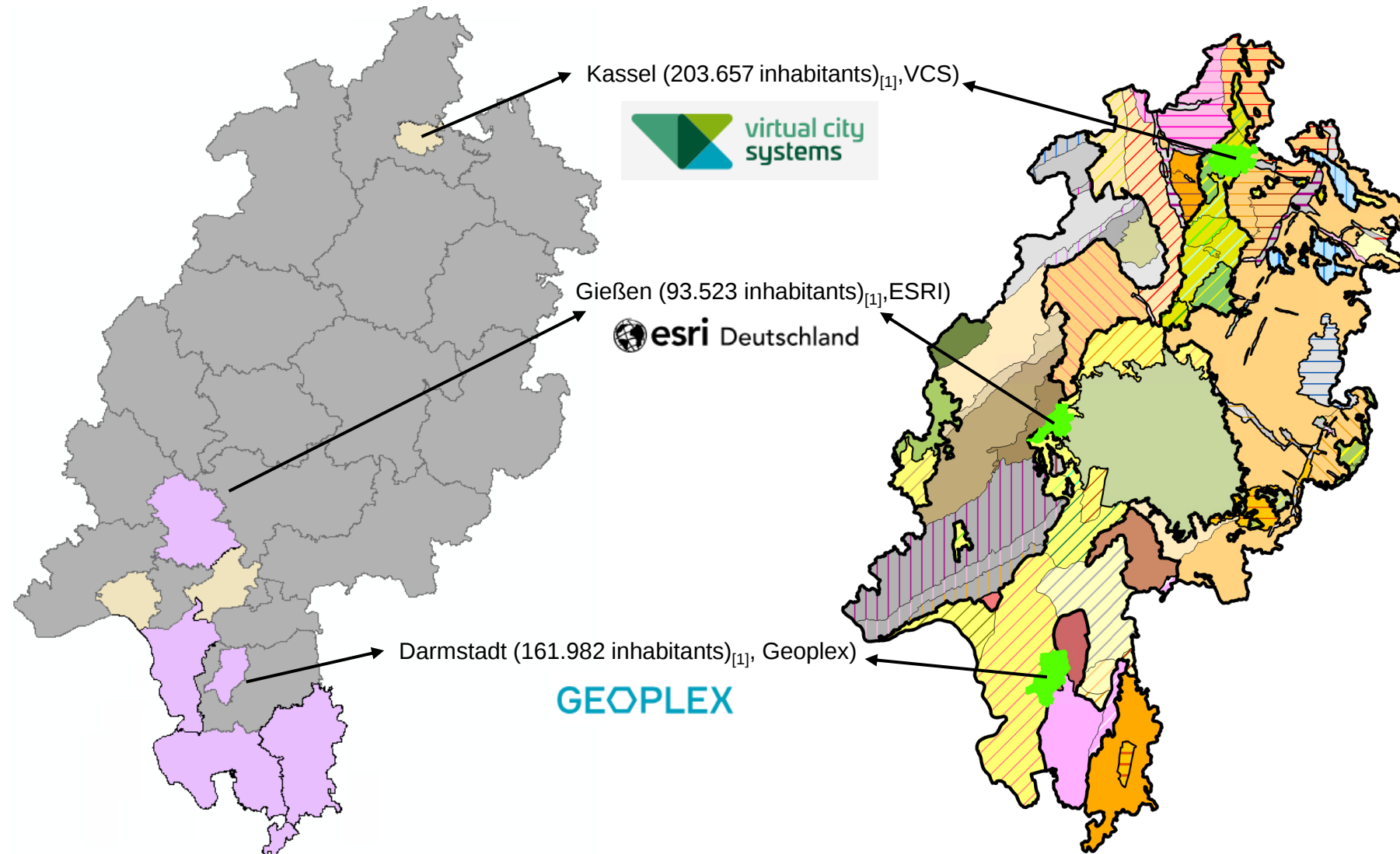
hydrogeologists

IT-security

Internal IT-infrastructure

IT service provider

Our work currently covers three project areas



Relevant topics cities

Urban Geoparameters	Kf	KG	IP	RP	GB	SD	BGS	BNB
Kassel	xxx	xx	xxx	x	x	xxx	xxx	xx
Gießen	xxx	xxx	xxx	xx	xxx	xxx	xxx	xx
Darmstadt	xxx	xxx	xxx	xxx	xx	xxx	xxx	x

Kf = Kf-permeabilities

KG = grain size distribution

IP = infiltration potential

RP = radon potential

GB = excavability

SD = absorbable soil pressure

BGS = weak construction ground

BNB = cohesive/non-cohesive

Relevant topics cities

Hydrogeology	FA	GWS	KA	HA	HT	EWS	LG	DFÜ
Kassel	xxx	xxx	-	x	xxx	xxx	x	x
Gießen	xxx	xxx	-	xxx	xx	xxx	?	?
Darmstadt	xxx	xxx	-	xxx	-	xxx	x	-

FA = depth groundwater table

GWS = variation gw table

KA = karst

LG = data logging

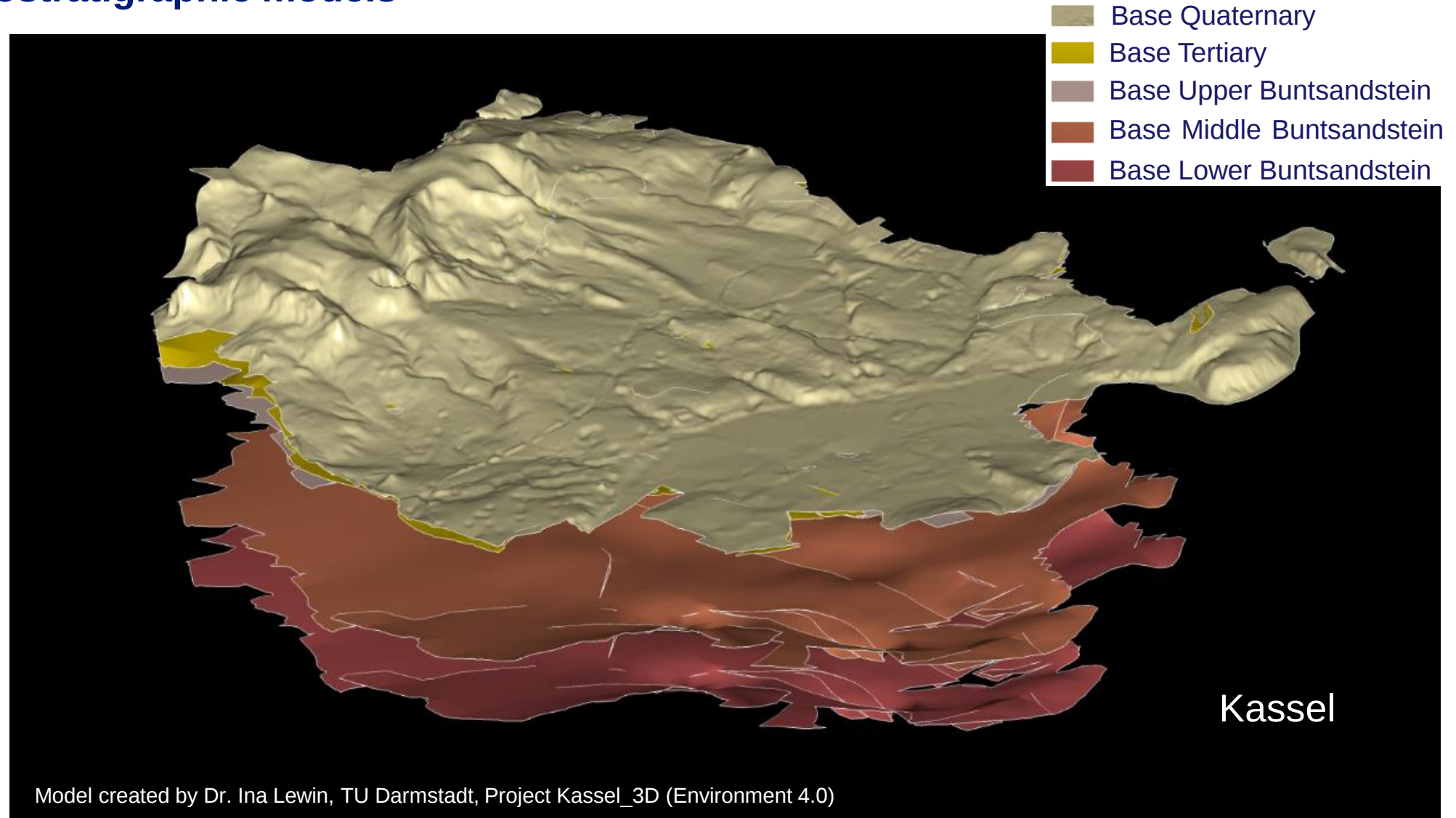
DFÜ = data transfer

HA = cavity type

HT = hydrothermie

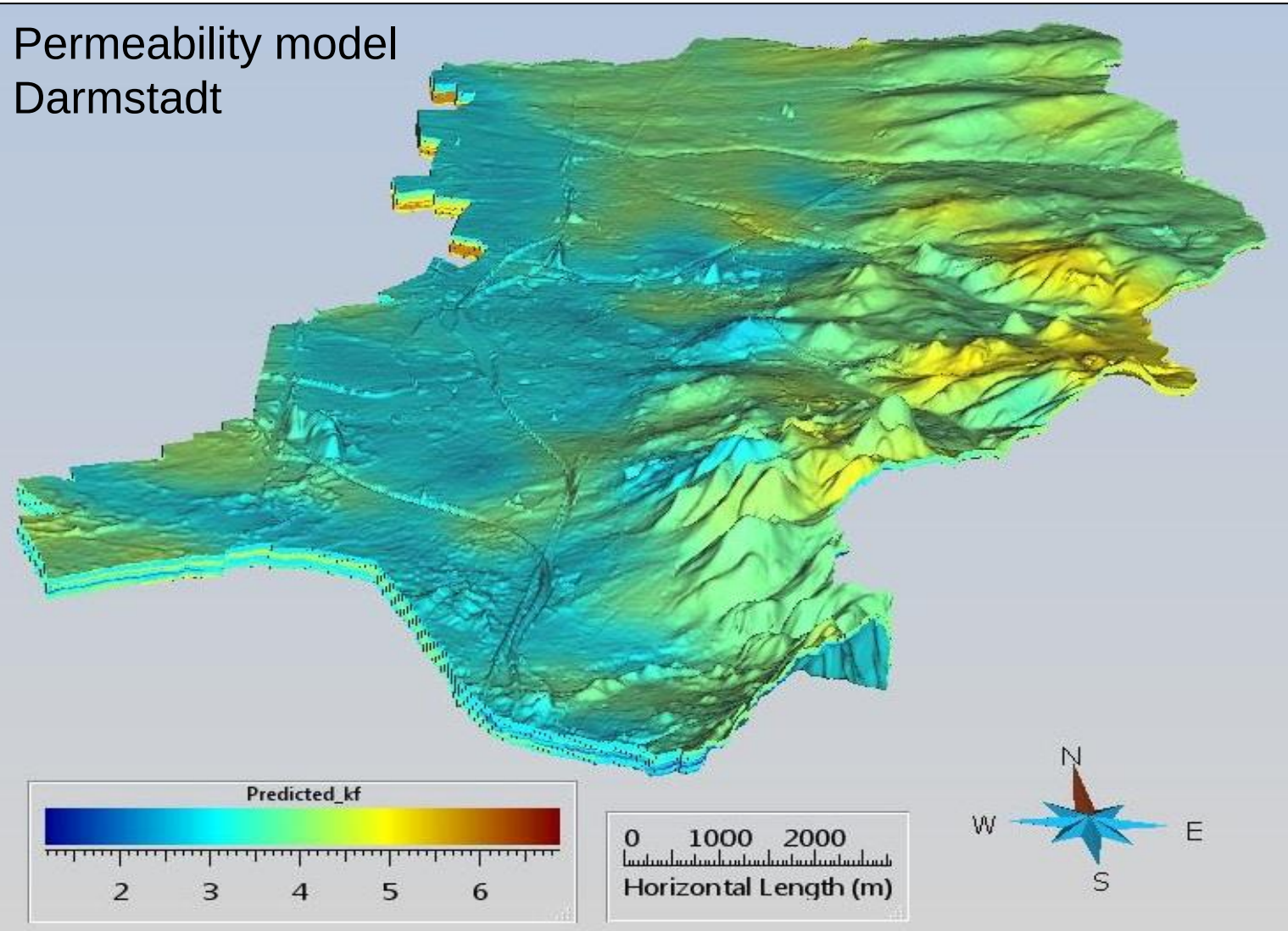
EWS = geothermal heat extraction

Lithostratigraphic models



Volumetric models

Permeability model
Darmstadt



Interoperable deployment enabled by GST

OGC-Interfaces + exchange formats > 3D city models

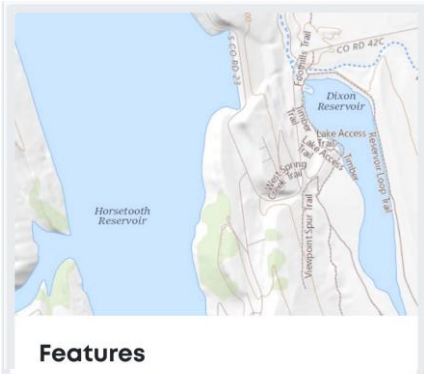


API	Point	Line	Triangle	Voxel	2D-Grid	Sgrid	Solid	Attribute	Symbology
3D GeoV	X	X	X	X	X	X	X	-	-
Styles	-	-	-	-	-	-	-	-	X
3D-Tiles	X	X	X	X	X	X	X	-	X

Supported by Geoplex and VCS, but not preferred by ESRI and QGIS

Interoperable deployment enabled by GST

OGC-APIs + exchange formats > GIS work environment



Exchange format
I3S

Getting connected!!

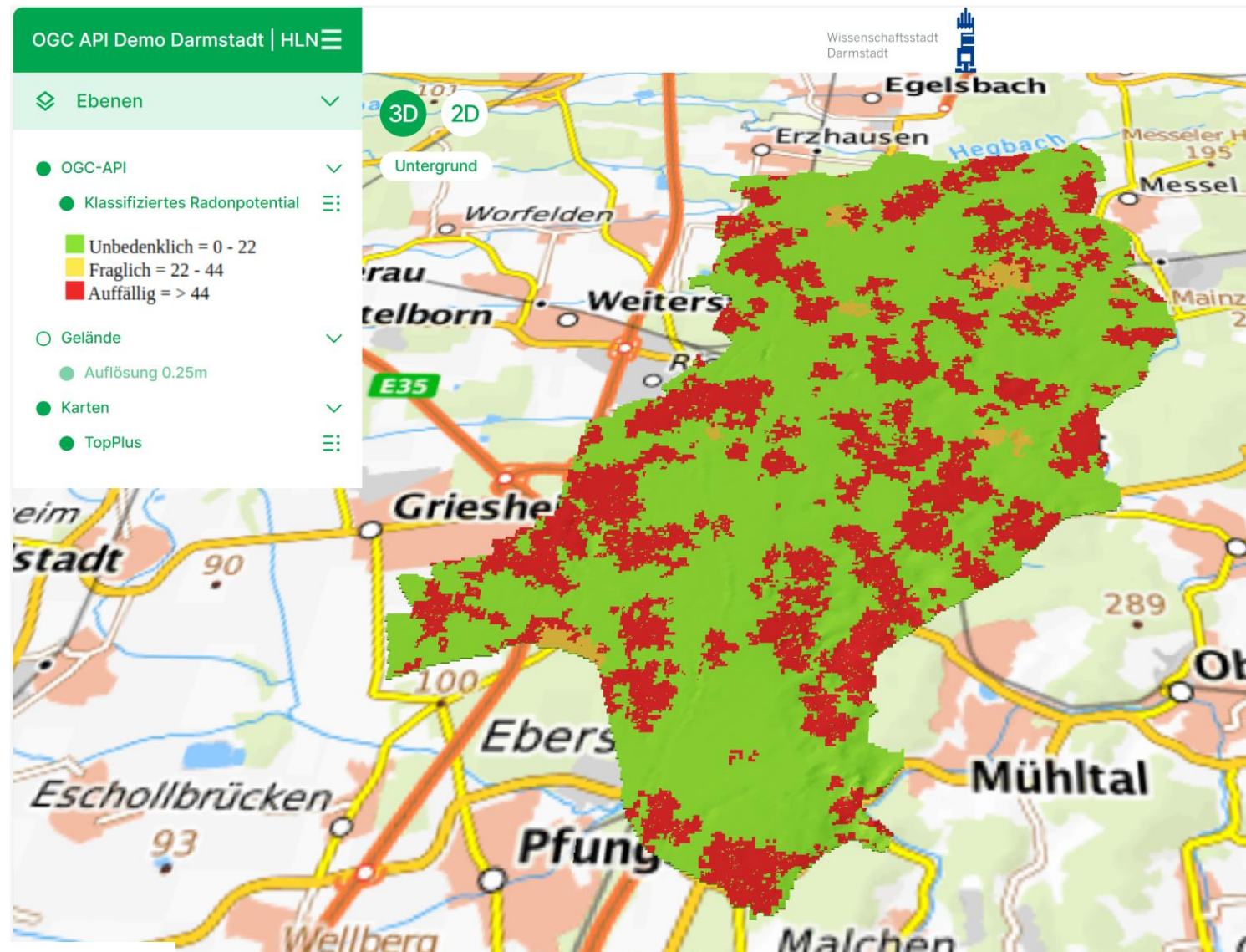
API	Point	Line	Triangle	Voxel	2D-Grid	Sgrid	Solid	Attribute	Symbology
Features	X	X	X	X	X	X	X	-	-
Styles	-	-	-	-	-	-	-	-	X
I3S	X	X	X	X	X	X	X	-	X

Supported/preferred by ESRI and QGIS (in realization)

Other formats?? (GOCAD ASCII, GeoH5, RescueML, IFC, GIFT)

Interoperable deployment enabled by GST

Radon potential in
Darmstadt city



Limited functionality in the 3D city work environments

Infiltration potential
Green = very good
Brown = limited suitability



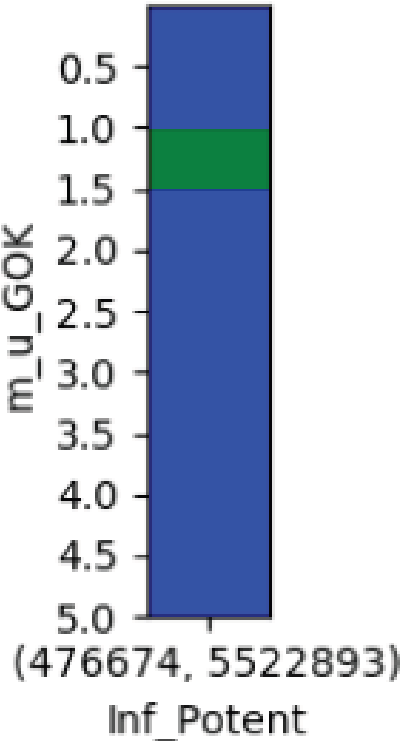
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Virtual drillings



Geology profile

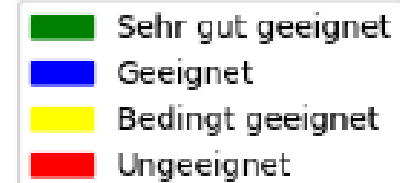
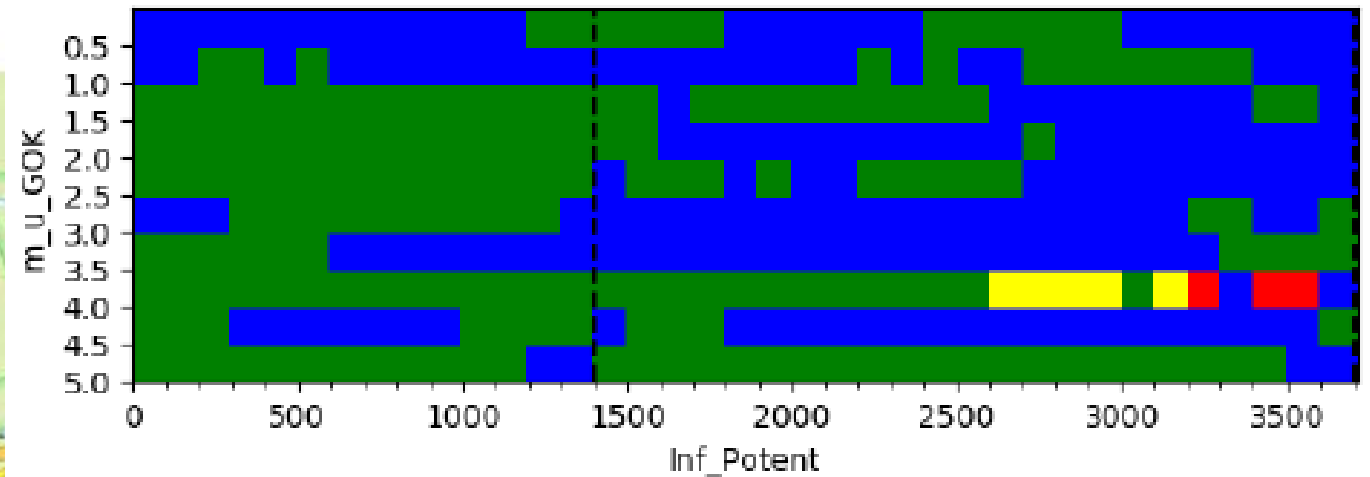
Übersicht



Cross sections

Geology profile

Übersicht



Thank You

rouwen.lehne@hlnug.hessen.de

