

Results of academic research for use in the daily business of geological survey



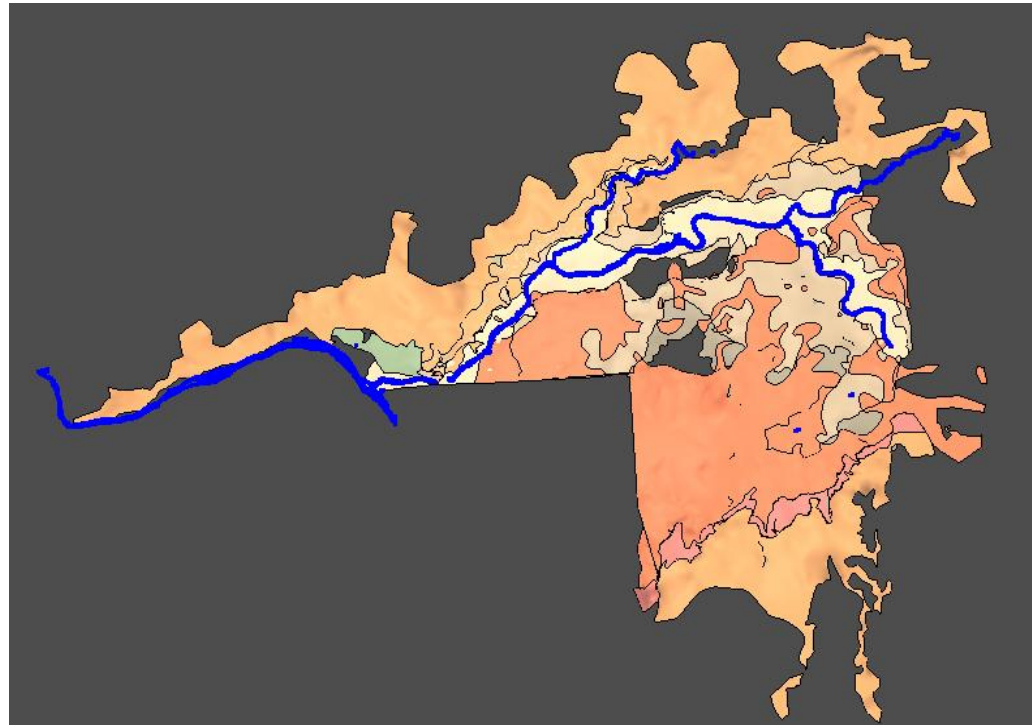
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Case Study Lower Main Plains

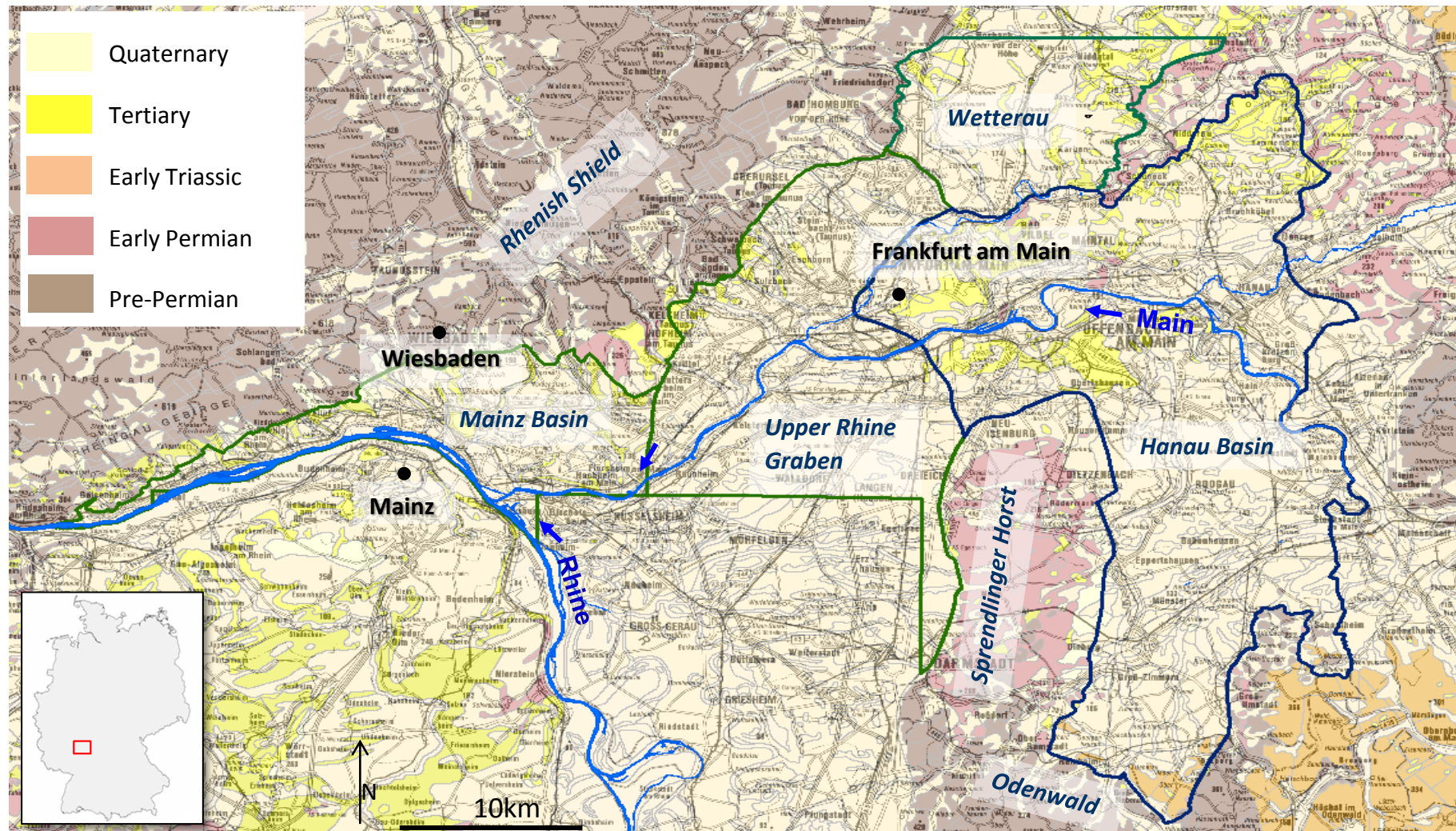
Hannah Budde⁽¹⁾, Christian Hoselmann⁽²⁾, Rouwen Lehné⁽²⁾, Heiner Heggemann⁽²⁾, Andreas Hoppe⁽¹⁾

⁽¹⁾ Technische Universität Darmstadt

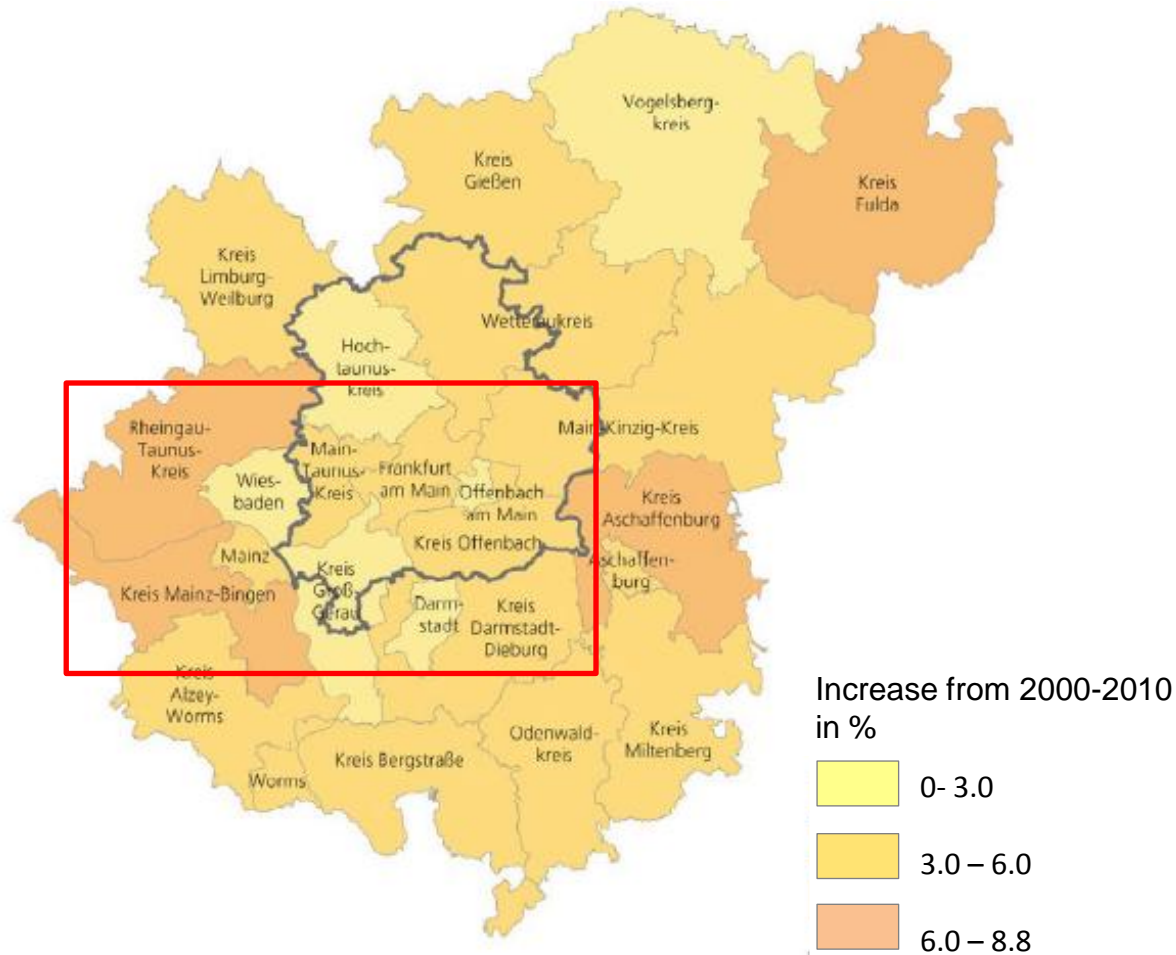
⁽²⁾ Hessisches Landesamt für Umwelt und Geologie (HLUG)



Case Study– The Lower Main Plains



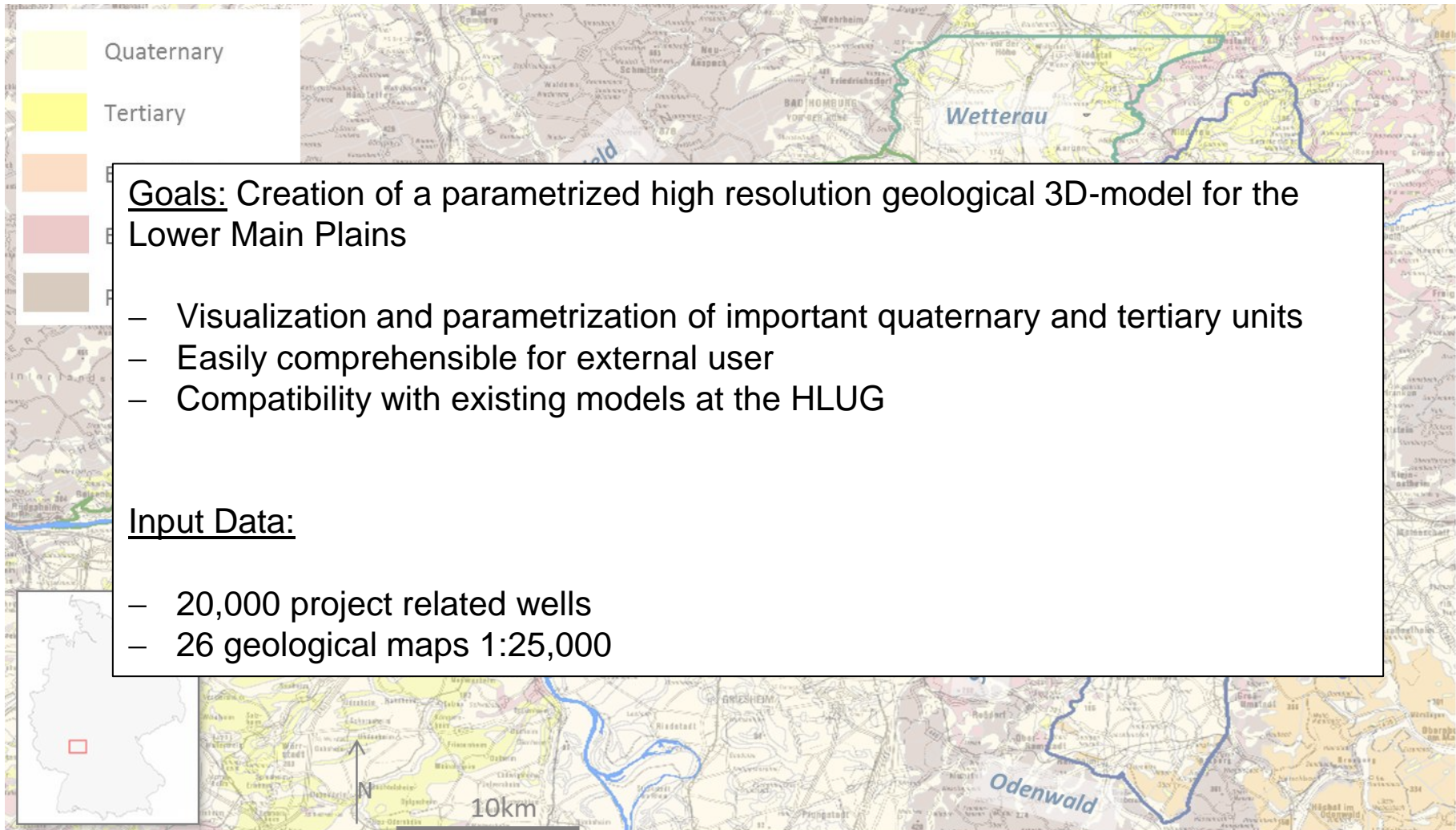
Settlement and infrastructure



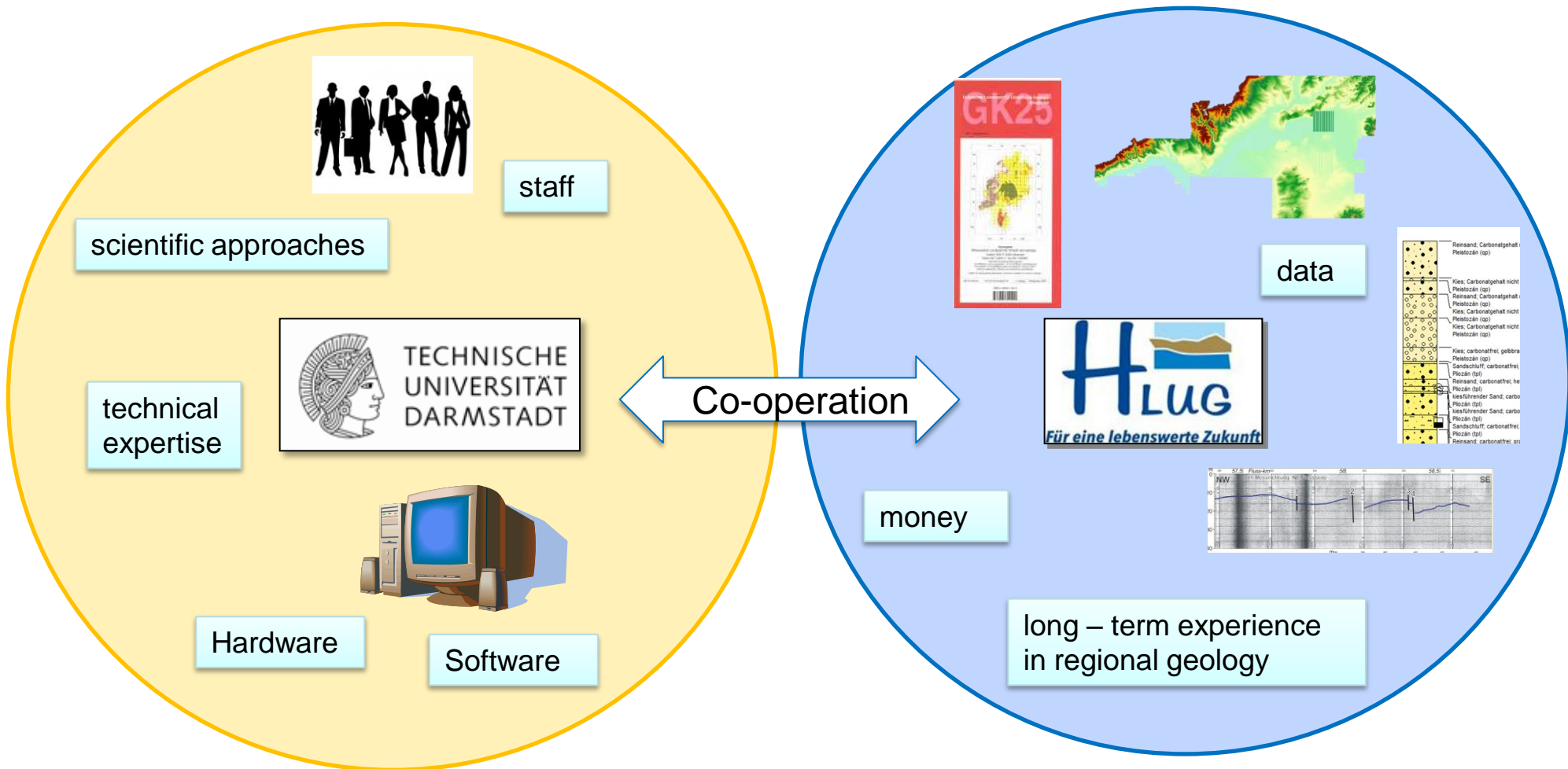
Frankfurt/Main:

- Centre Metropolitan Region Frankfurt/Rhine-Main
- ca. 700.000 inhabitants
- ca. 250 km²
- Surface sealing ca. 57%

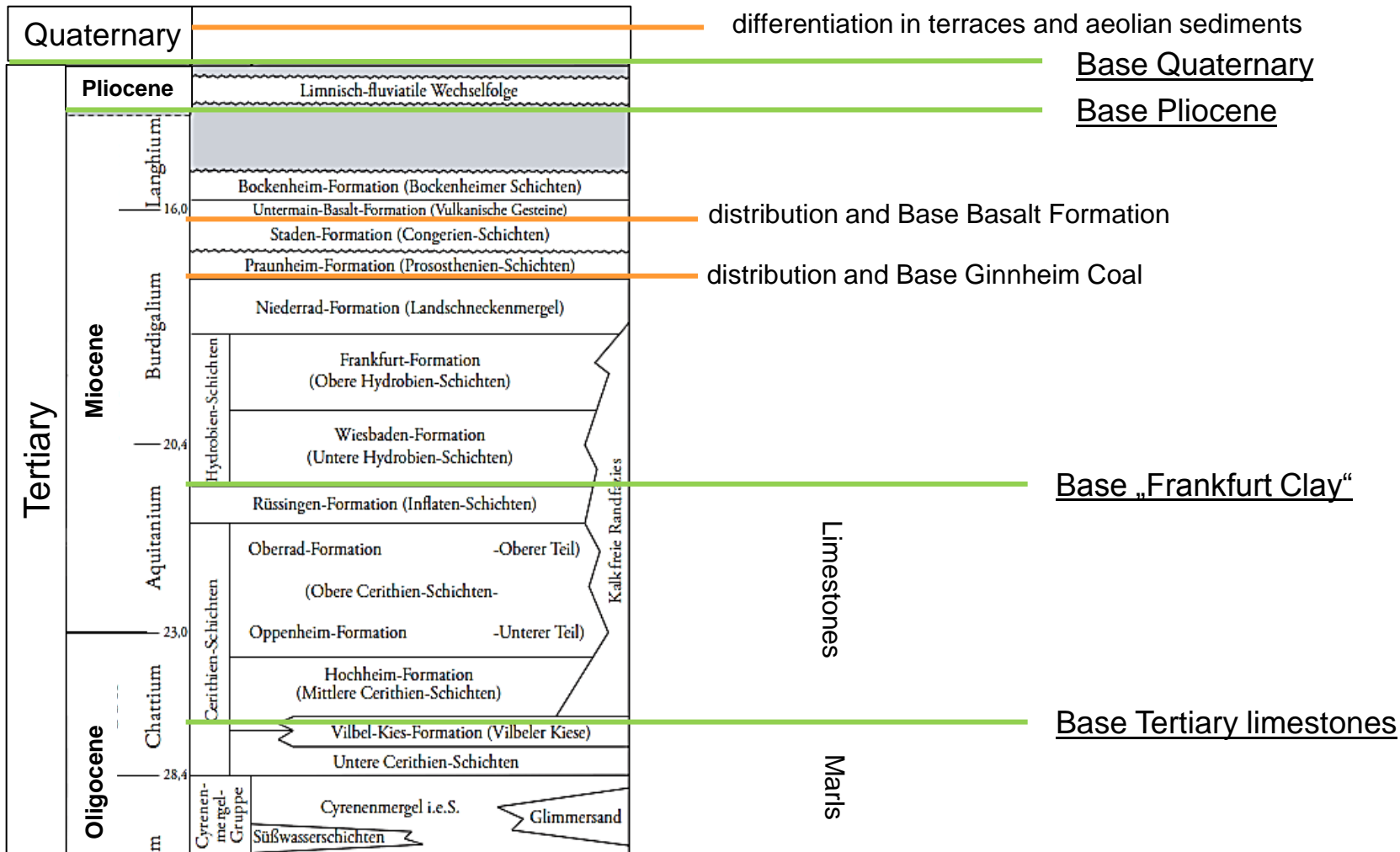
Study Area – The Lower Main Plains



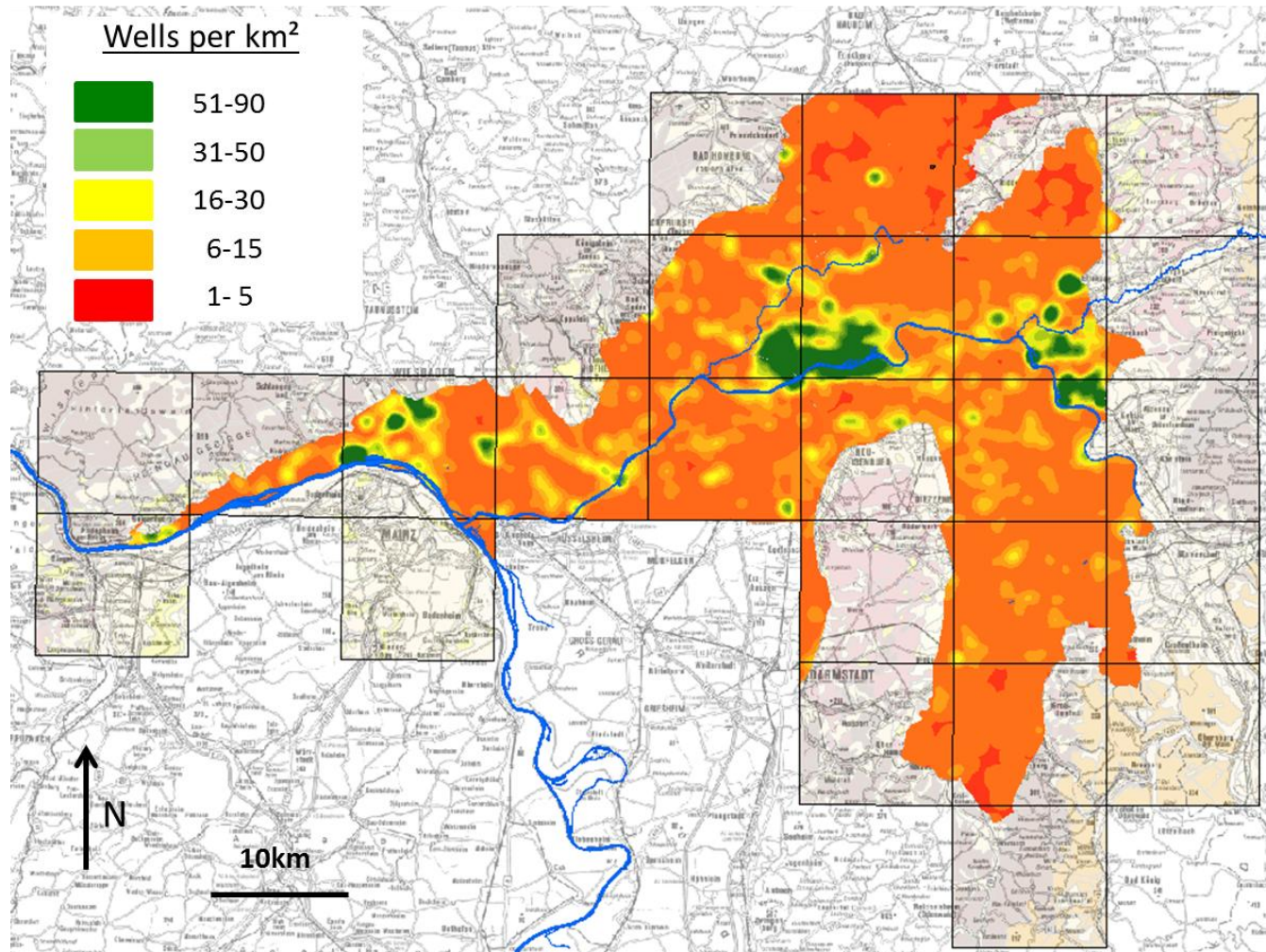
Co-operation



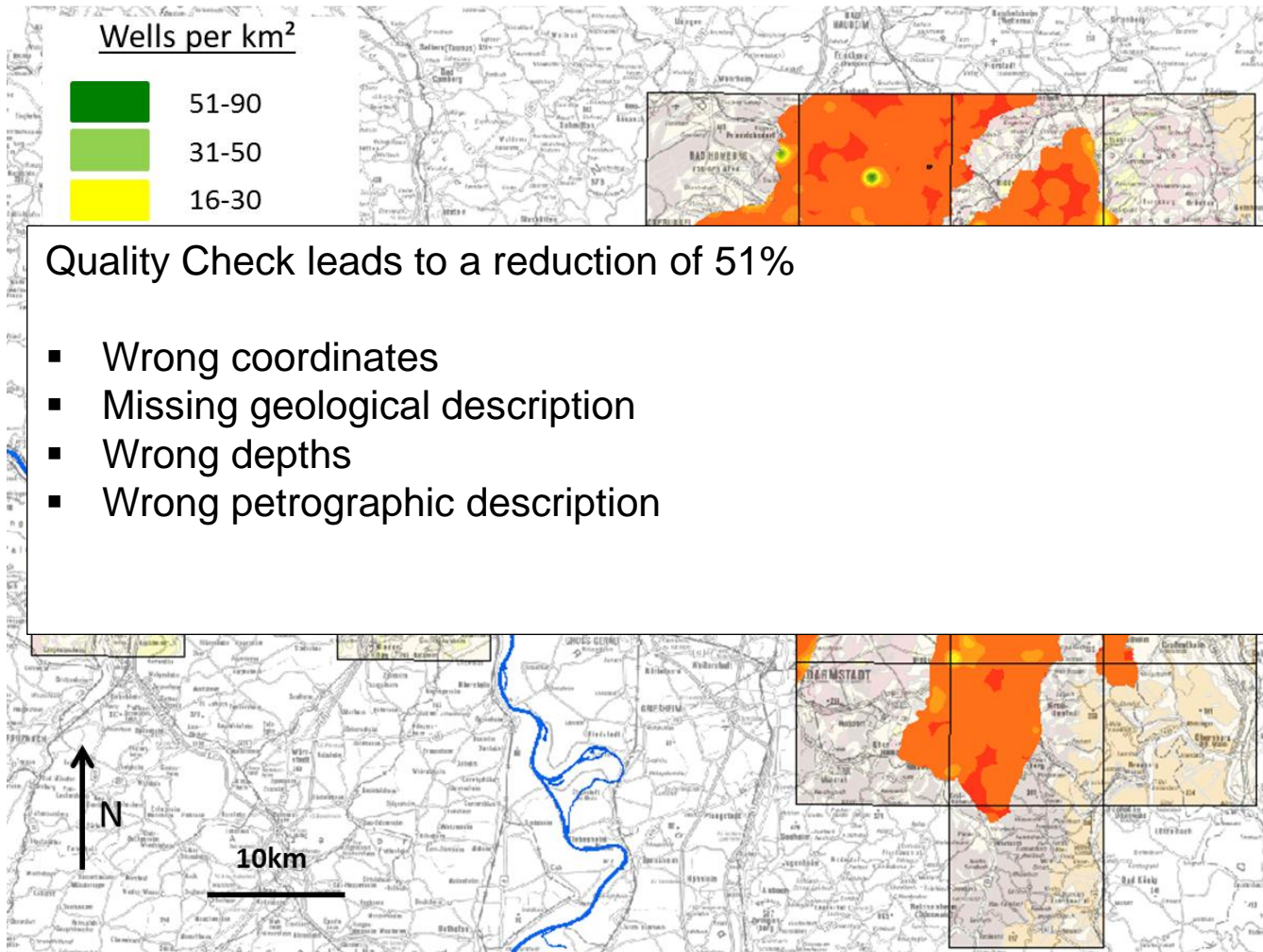
Target horizons



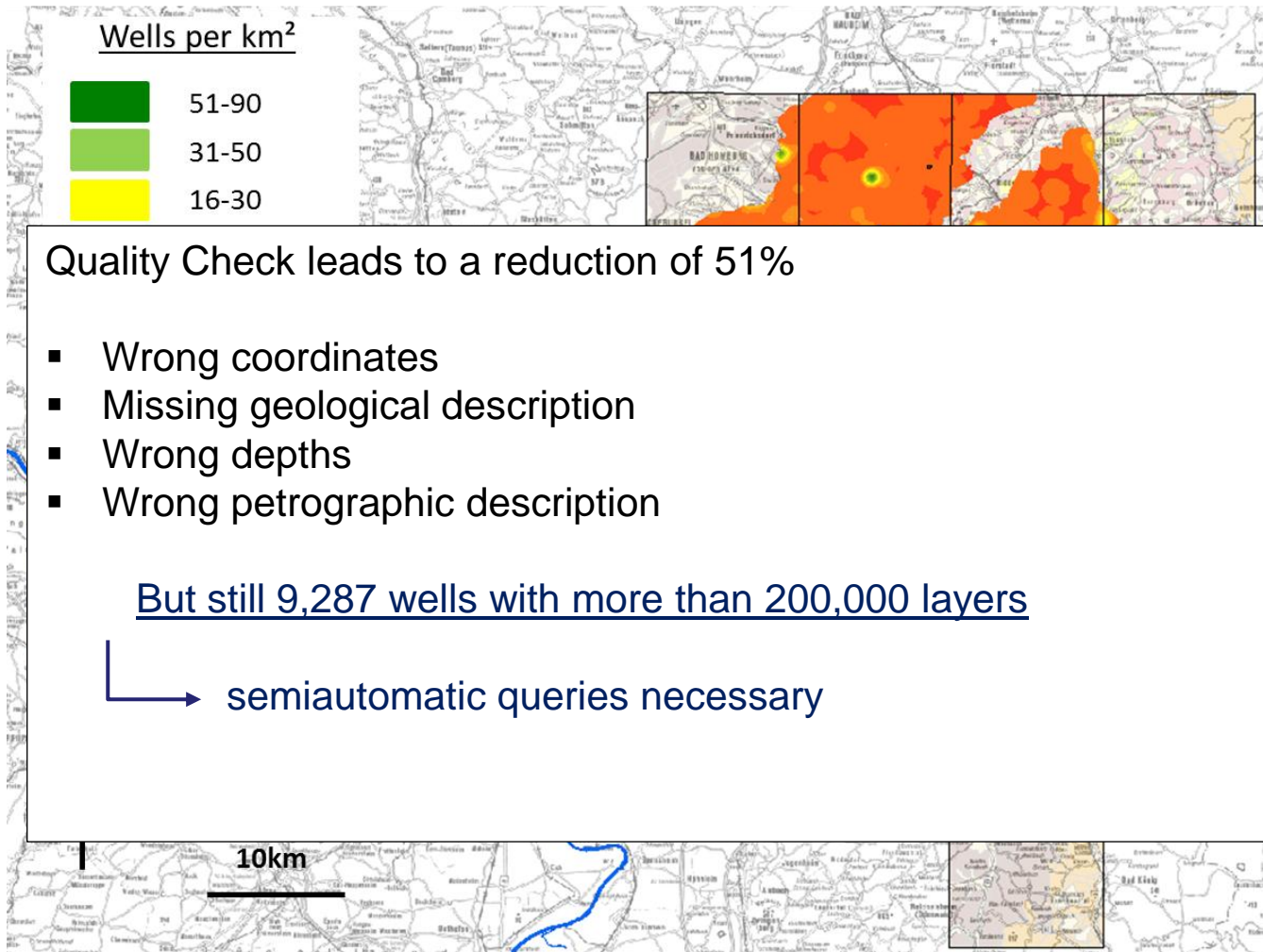
Challenges regarding Well Data



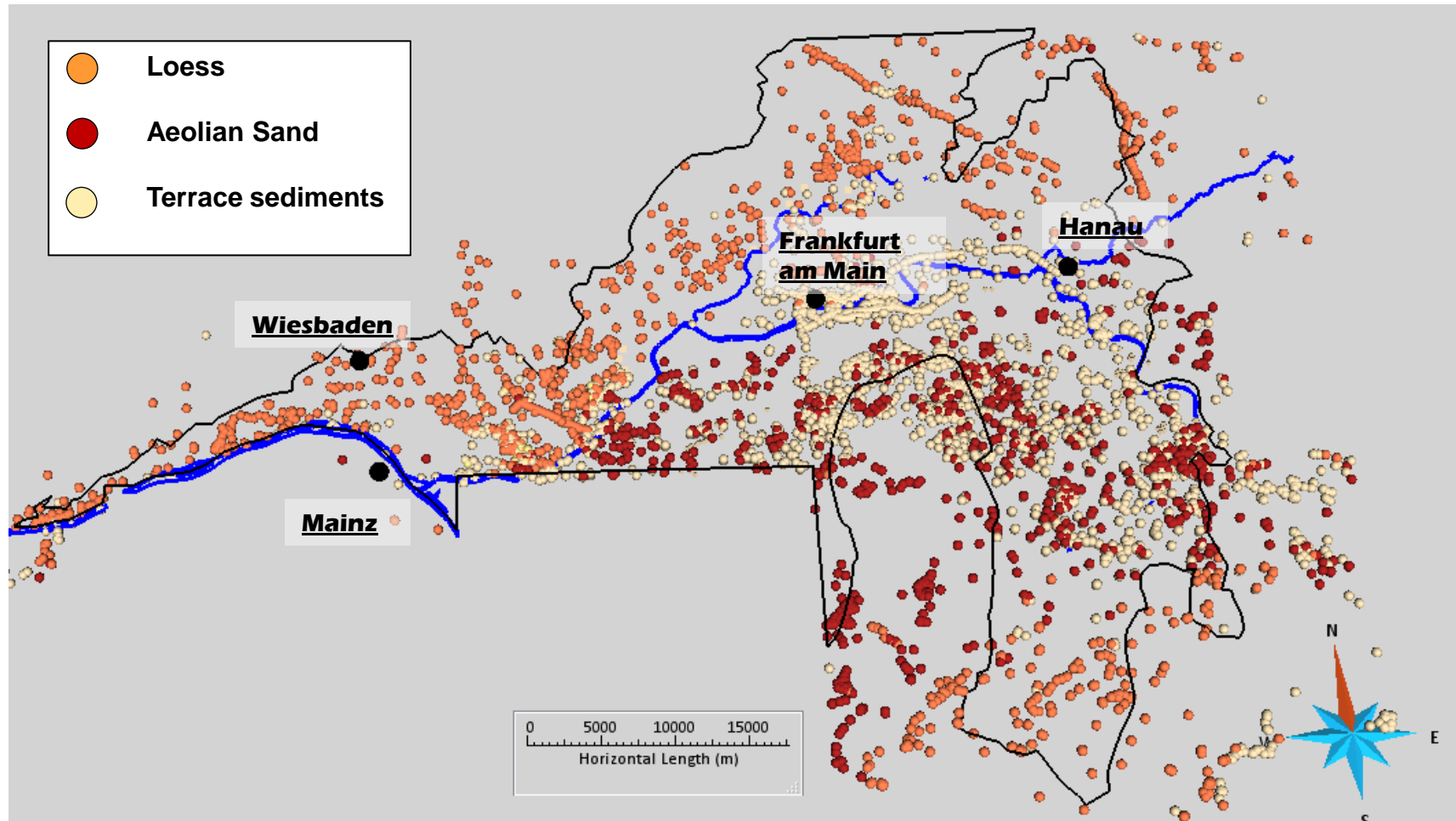
Challenges regarding Well Data



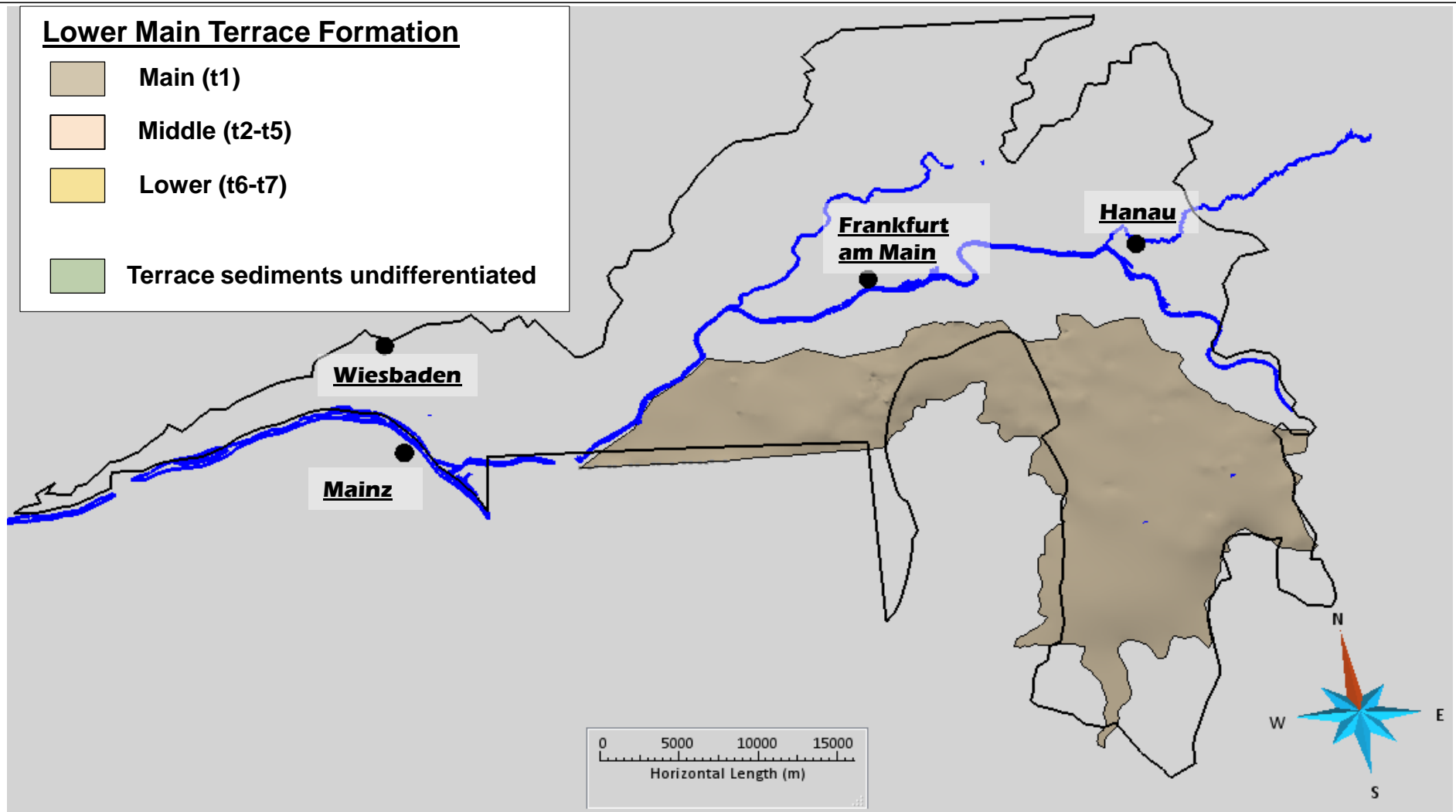
Challenges regarding Well Data



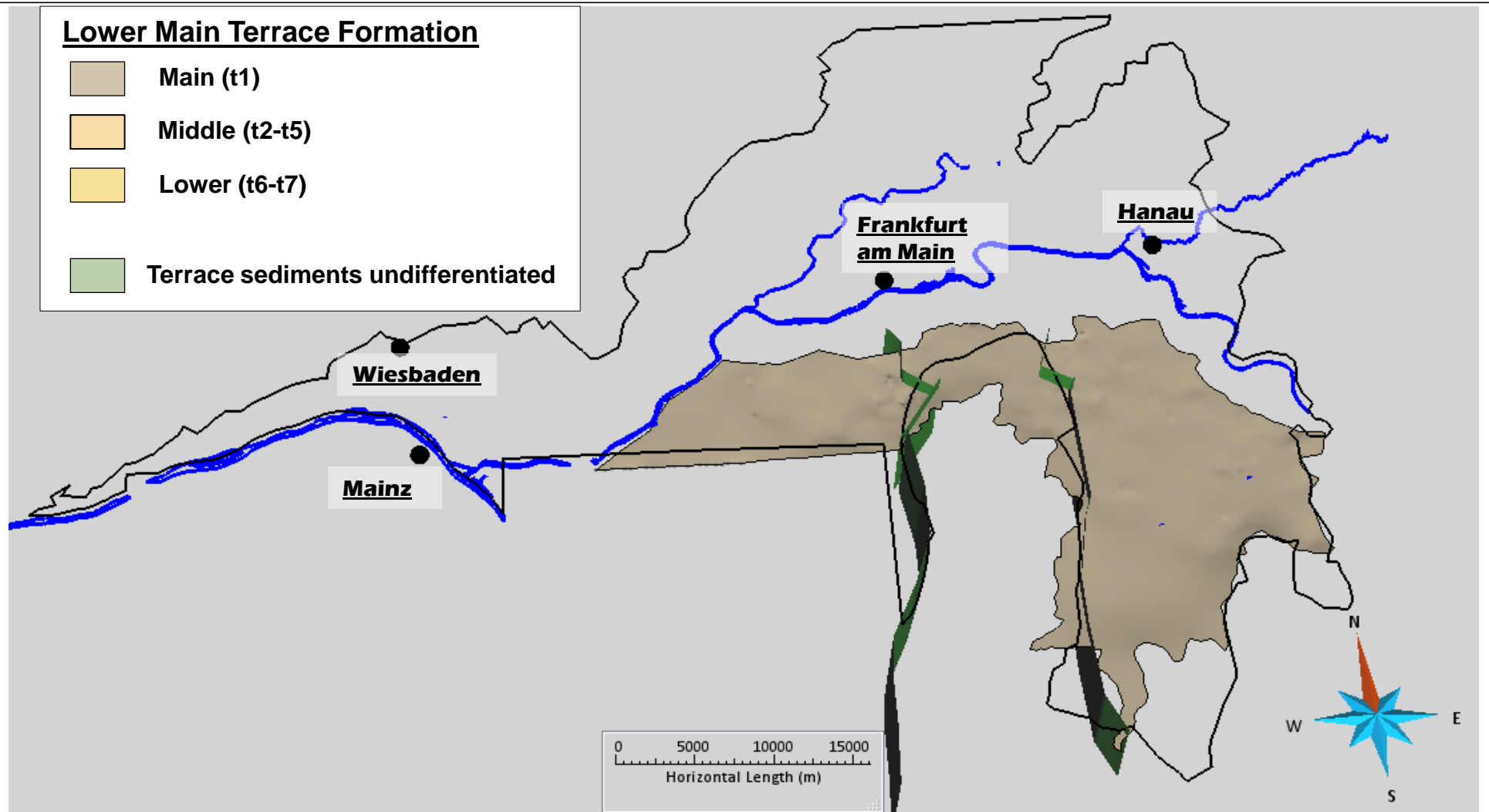
Differentiation Well Data



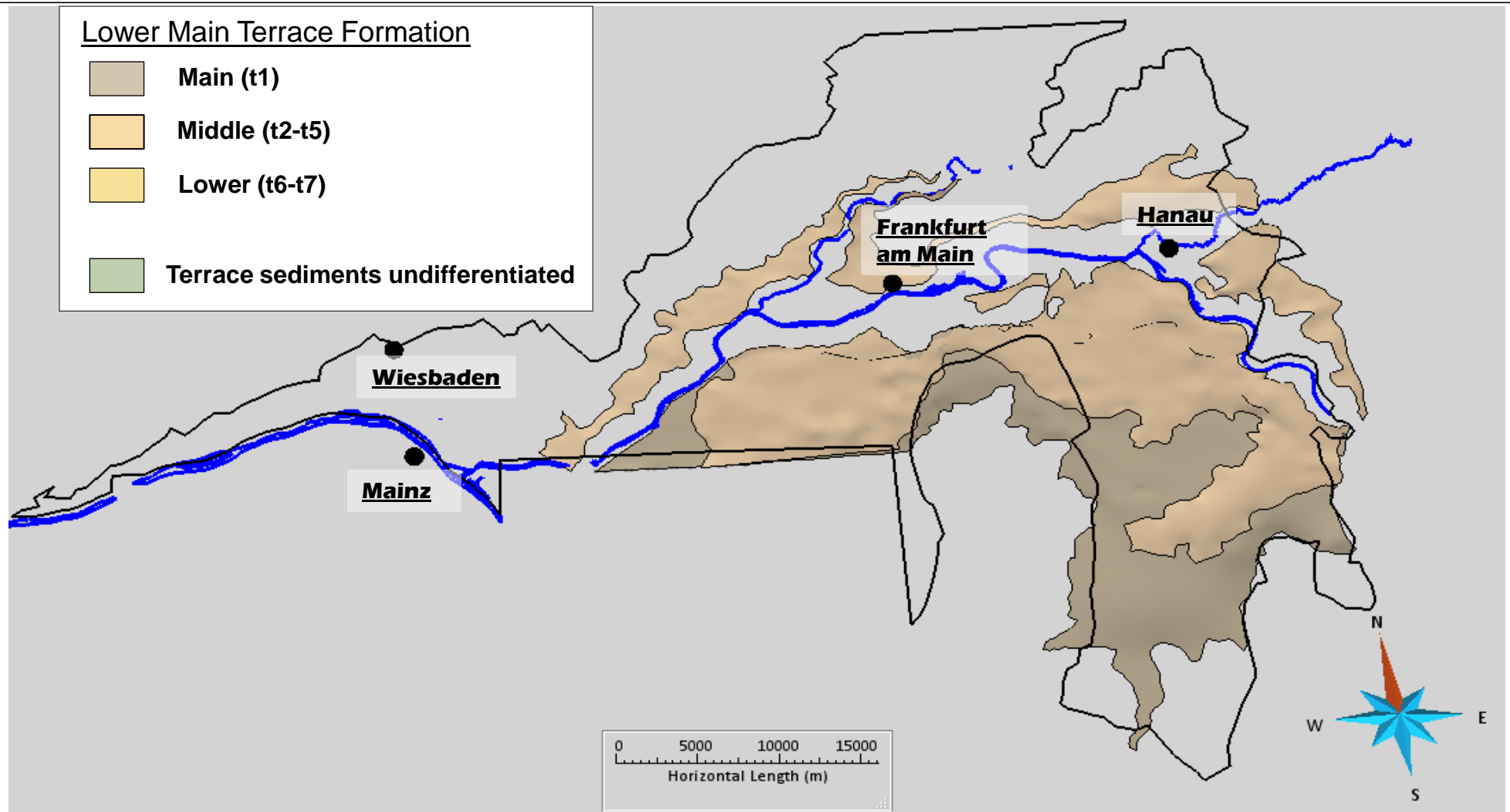
Structural Model - Quaternary



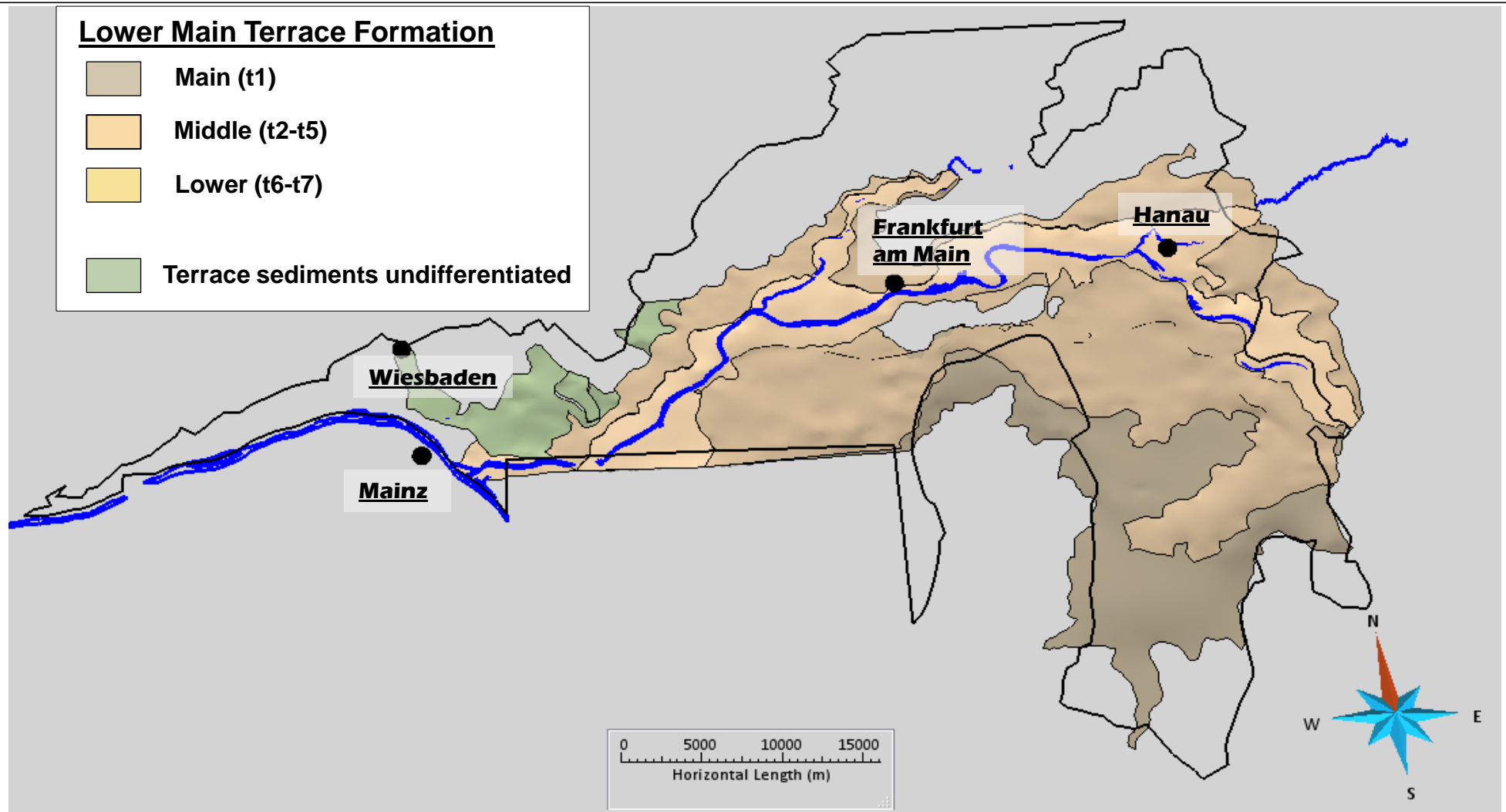
Structural Model - Quaternary



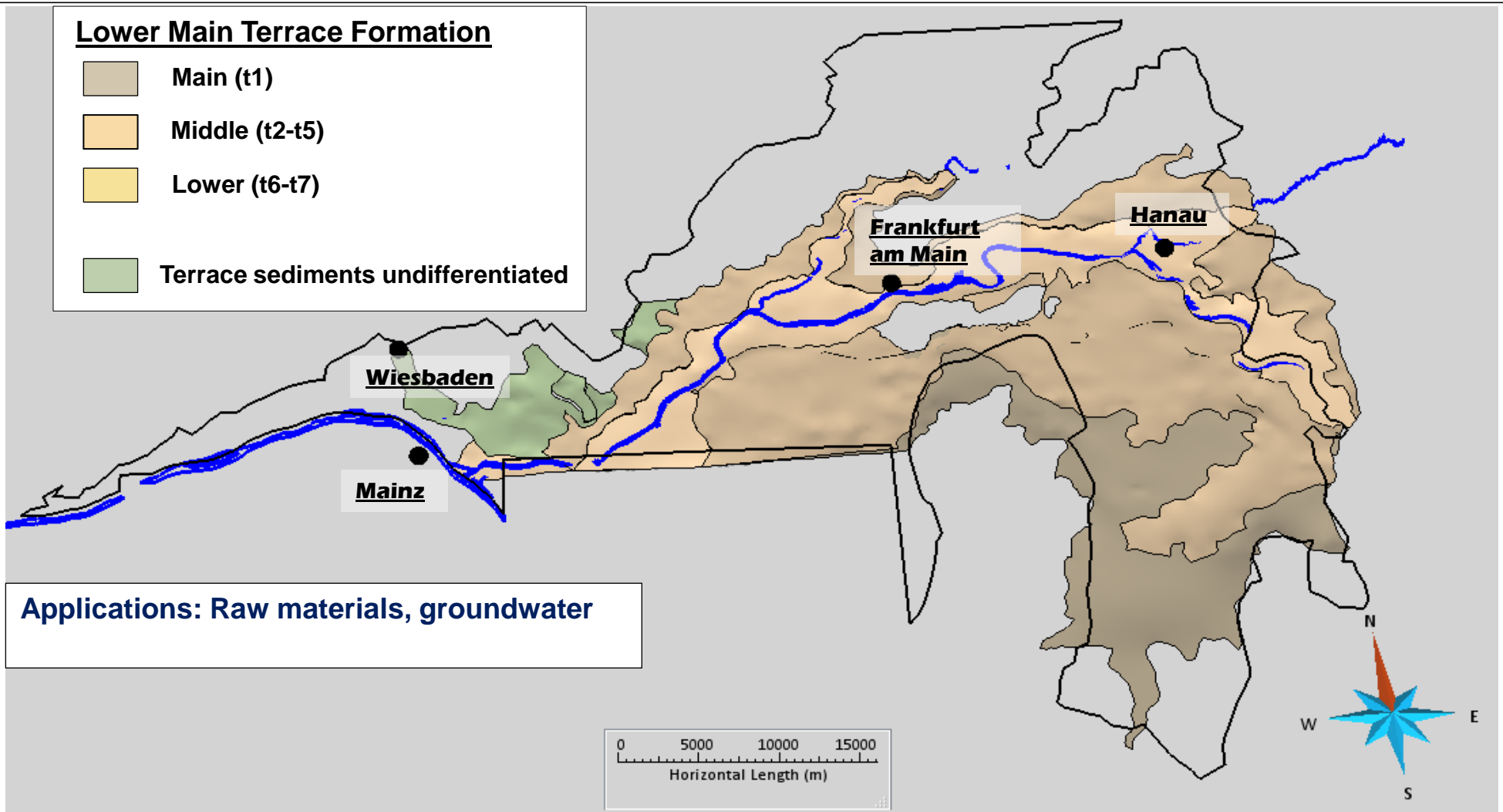
Structural Model - Quaternary



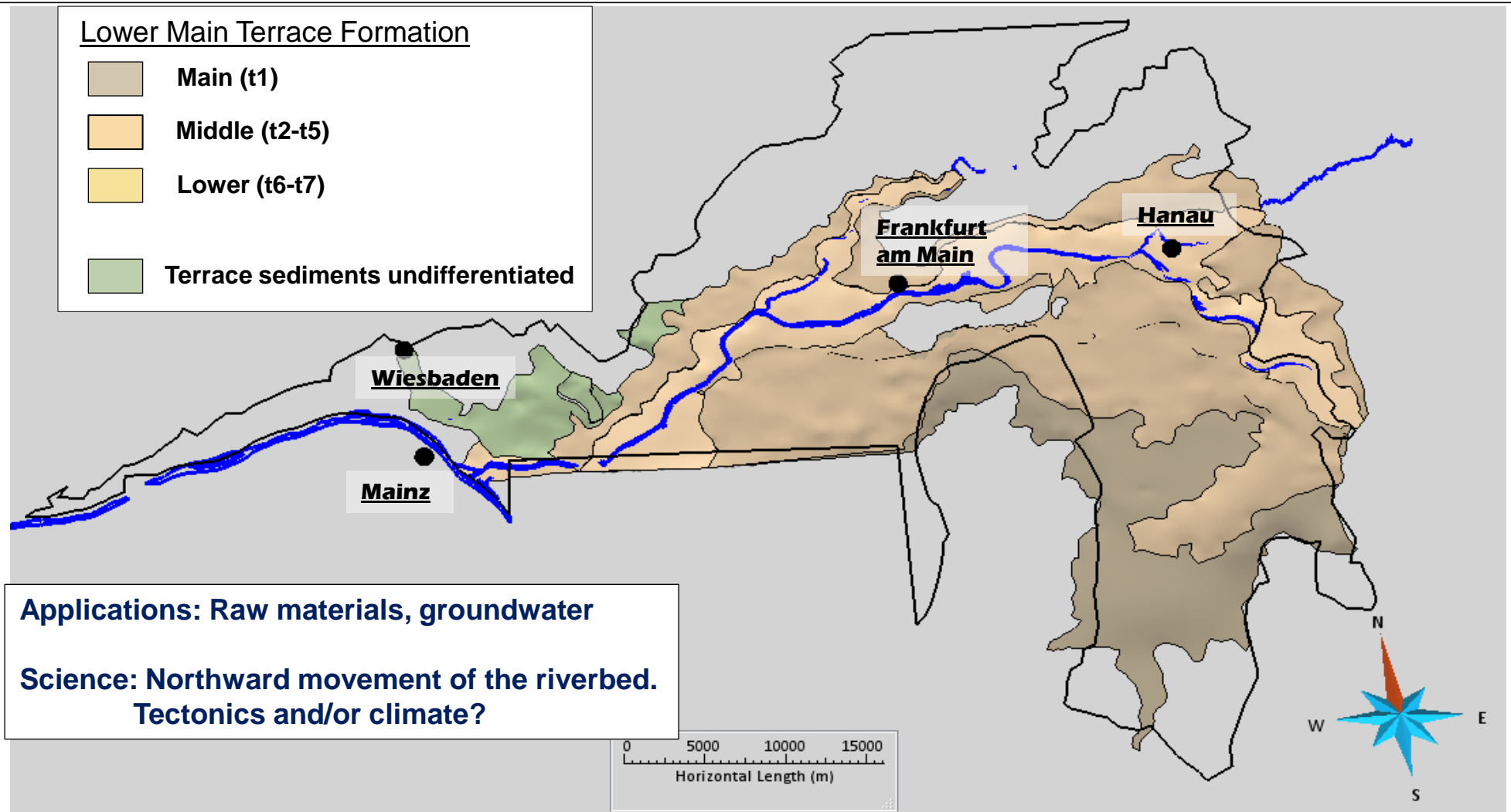
Structural Model - Quaternary



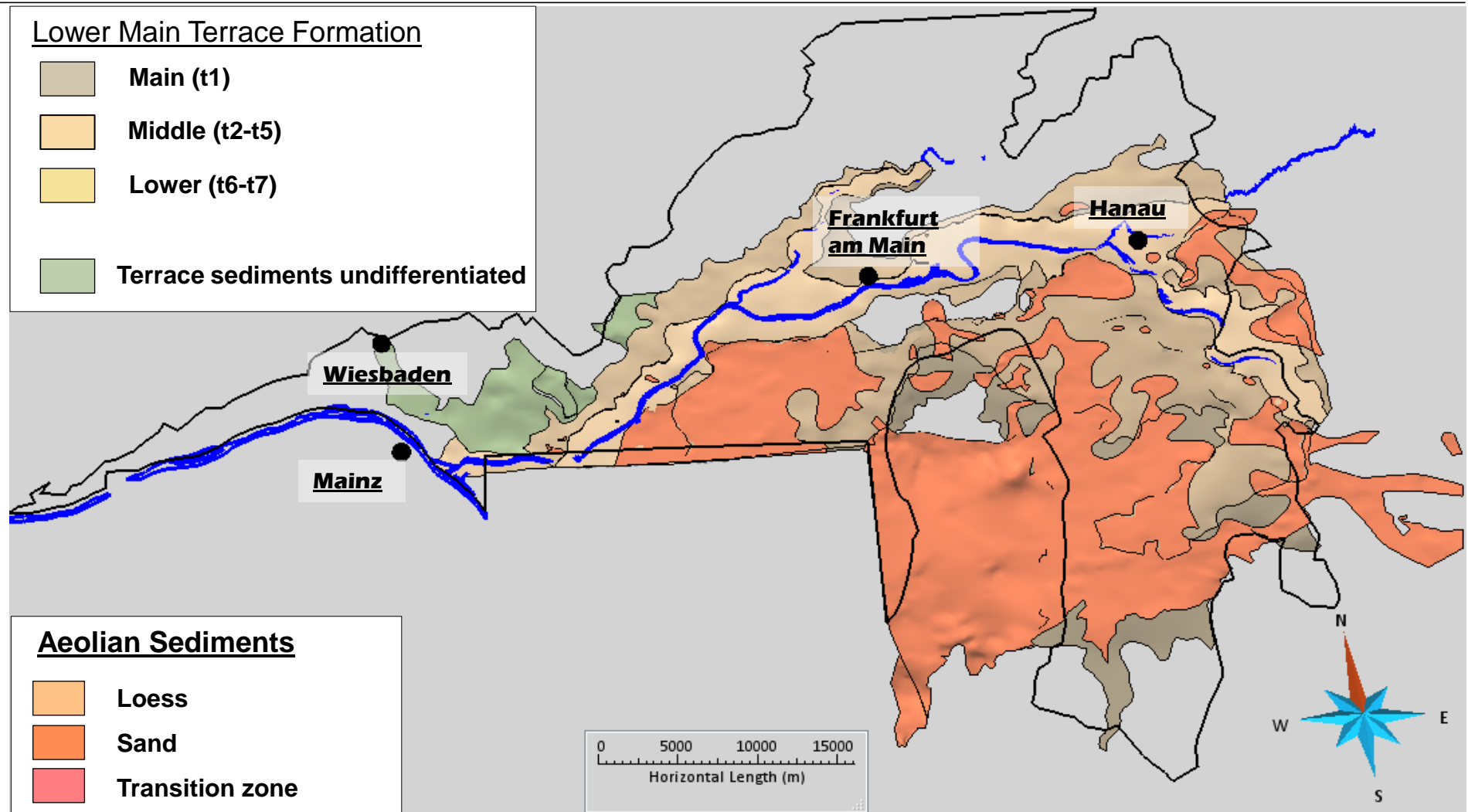
Structural Model - Quaternary



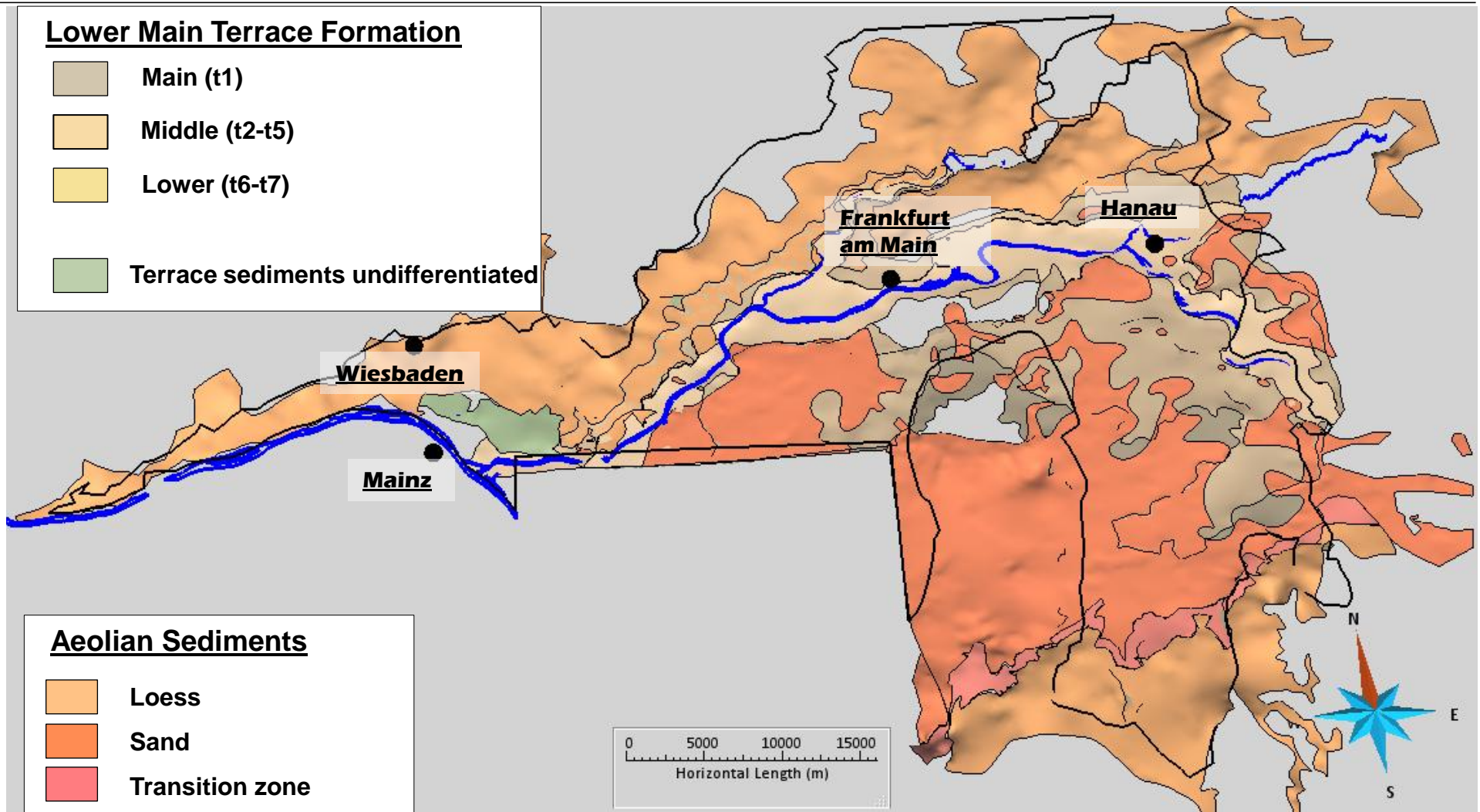
Structural Model - Quaternary



Structural Model - Quaternary

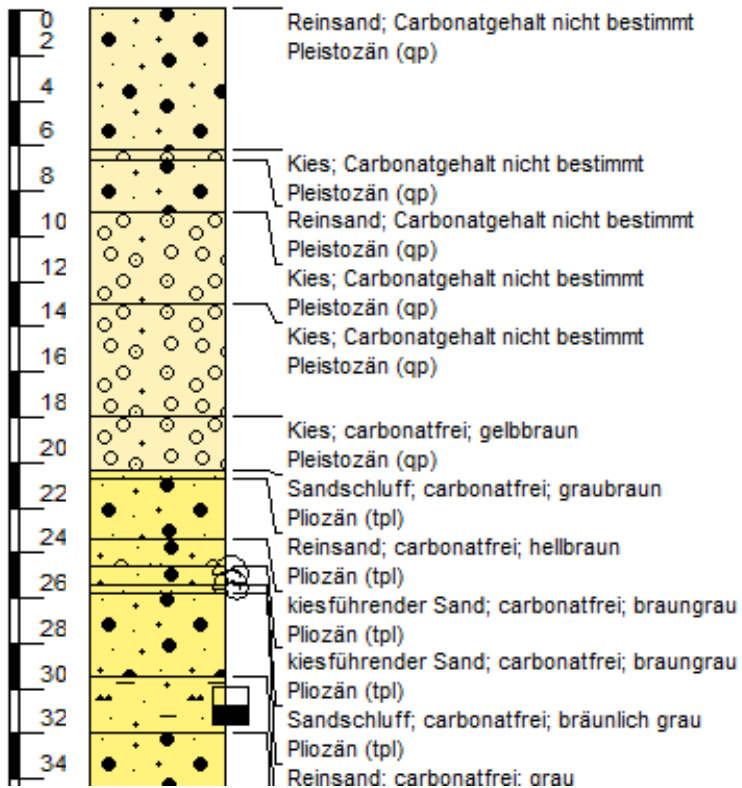


Structural Model - Quaternary

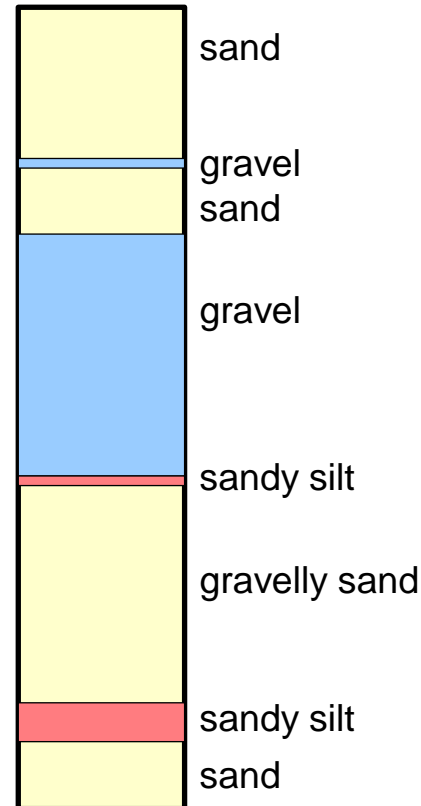


Volume Model – Data Preparation

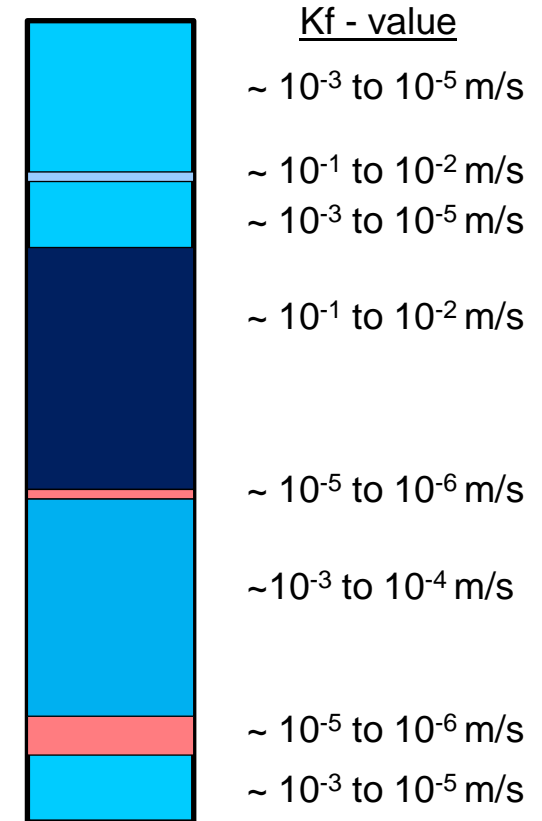
Original Well Data



Lithology



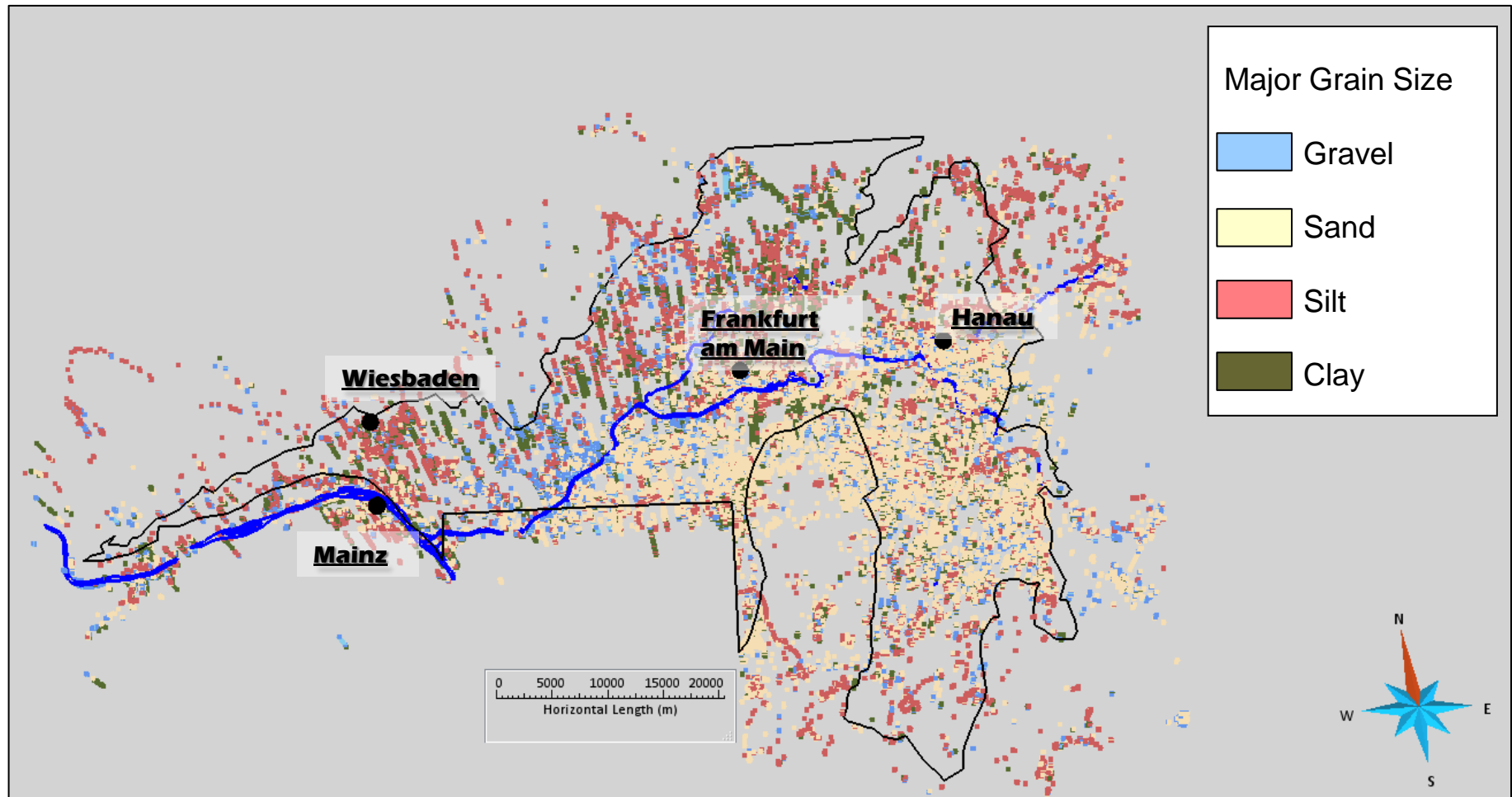
e.g. Permeability



Generalization

Parametrization

Generalized Data



Conclusions

Questions:

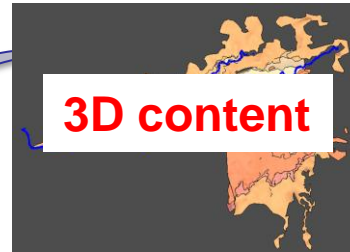
- geodynamics
- paleoenvironmental reconstruction
-

Research

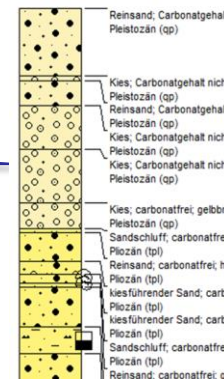
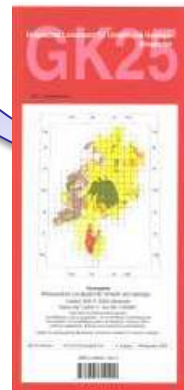
Opportunities for young scientists:

- PhD
- B.Sc. /M.Sc
- Publications

scientific benefit



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scientific benefit

visualization
internal /external

daily business
work

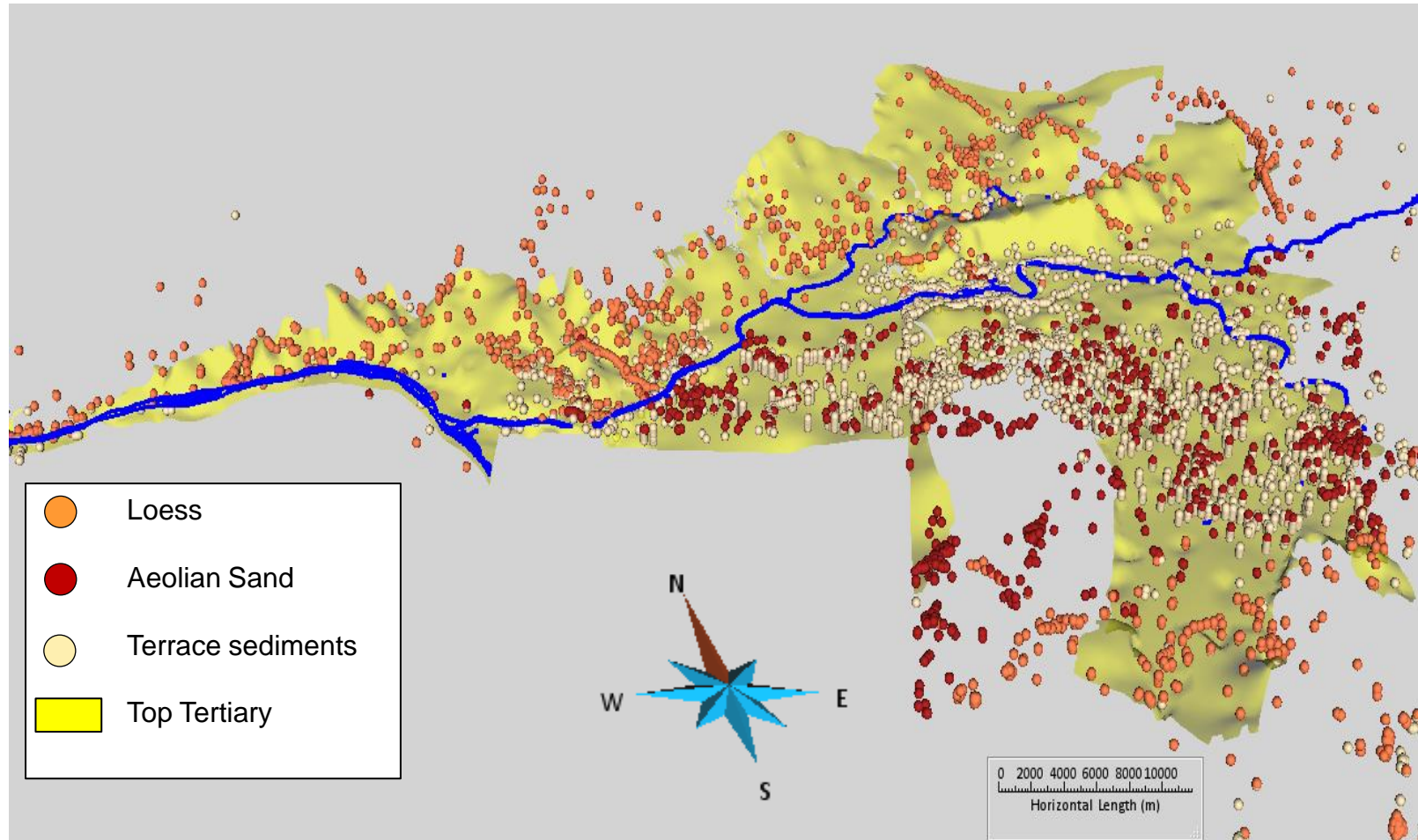
Task fields:

- groundwater
- shallow geothermal energy
- raw materials
- construction ground
- ...

Thank You



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Herleitung Workflow

Petrographic description:

- Layer depth
- Grain size

Optional:

- Carbonate content
- Colour
- Fossils
- Organic content
-

Stratigraphic Interpretation

Quality depends on:

- Editor
- Drilling method
- Sample rate
- ...

Quality Check

Unit specific evaluation matrix

LayerID	W01_01	W01_02	W01_03
Parameter 1	1	0	1
Parameter 2	0	1	0
Parameter 3	0	0	1
...
Total%	33%	33%	66%

Classification & Weighting

Structural model

Volume Grid
(attributes)

Other input data:

- 26 geologic maps
1:25.000
- Publications
- (seismic data)
- Expert knowledge

Workflow



HLUG Borehole Database

Petrographic description:

- Layer depth
- Grain size

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Quality Check

Conclusions and Outlook



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Stratigraphic concepts



	SANDBERGER 1858-1863	LEPSIUS 1883	MORDZIOL 1911	WENZ 1921	WAGNER 1938	FALKE 1960	ROTHAUSEN & SONNE 1984	K. GRIMM & M. GRIMM 2003	SCHÄFER 2012		
PLIOZÄN						Weißes Oberpliozän / Hechtsheimer Sande arvernensis-Schotter	„Weißes Oberpliozän“ arvernensis-Schotter	„Ältere Weisenauer Sande“ „arvernensis-Schotter“	Ältere Weisenauer Sande Arvernensis-Schotter	PLIOZÄN	
						Bohnerzton	Bohnerzton Dorn-Dürkheim-Formation	Weißes Mio-Pliozän Dorn-Dürkheim-Formation	Kriegsheimer Sande Dorn-Dürkheim-Formation		
	Dinotherien-Sand	Dinotherium-Sand	Hipparion-Sande	Dinotheriensande	Dinotherien-sand Bohnerzton	Dinotheriensande	Dinotheriensand	Dinotherien-Sande / Lautersheim-Formation	Eppelsheim-Formation / Lautersheim-Formation	Bohnerzton	
MIOZÄN	Litorinellenkalk	Litorinellenton	Hydrobien-kalk-stufe	Obere Hydrobienschichten	Hydrobienschichten	Hydrobienschichten	Hydrobienschichten	Obere Hydrobienschichten	Frankfurt-Formation	MIOZÄN	
	Corbicula-Schichten	Corbicula-Kalk	Untere Hydrobienschichten	Corbicula-Schichten	Corbicula-Schichten	Inflata-Schichten	Corbicula-Schichten	Wiesbaden-Formation	Schulberg-Formation / Wiesbaden-Formation		
	Cerithienkalk und Landschneckenkalk	Cerithienkalk	Cerithien-kalk-stufe	Obere Cerithienschichten	Cerithienschichten	Cerithienschichten	Cerithien-Schichten	Rüssigen-Formation	Rüssigen-Formation		
			Untere Cerithienschichten				Obere Cerithienschichten	Oberrad-Formation	Oberrad-Formation	Mainz-Gruppe	
							Mittlere Cerithien-schichten / Land-schneckenkalk	Oppenheim-Formation	Oppenheim-Formation		
							Untere Cerithienschichten	Mittlere Cerithien-schichten / Land-schneckenkalk	Hochheim-Formation	Mainz-Gruppe	
OLIGOZÄN	Cyrenenmergel	Cyrenenmergel-gruppe Elsheimer Meeres-schichten	Cyrenenmergel-gruppe	„Echter“ Cyrenenmergel	Süßwasser-mergel / Land-schneckenkalk	Land-schnecken-kalk / Süßwasserzone mit Milchquarz-schotter	Süßwasser-schichten / Land-schnecken-kalk	Untere Cerithienschichten / Süßwasserschichten	Sulzheim-Formation	Weisenau-Formation	OLIGOZÄN
					Cyrenenmergel	Cyrenenmergel	Cyrenenmergel	Cyrenenmergel	Jakobsberg-Formation	Jakobsberg-Formation	
					Schleissand	Schleissand	Schleissand	Schleissand	Stadecken-Formation	Sulzheim-Formation	
	Septarienton	Septarienton	o Septarienton	o Rupelton	o Rupelton	o Rupelton	o Rupelton	o Rupelton	Bodenheim-Formation	Stadecken-Formation	
	Meeressand	Meeressand	u Aleyer Meeressand	u Meeressand	u Meeressand	u Meeressand	u Meeressand	u Meeressand	Alzey-Formation	Bodenheim-Formation	
										Alzey-Formation	
					Brackwasserbildung	Pechelbronner-Schichten	Mittlere Pechelbron-Schichten	„Prämitteloligozäne“ Quarzkiese Obere Pechelbron-Schichten	Ebertsheim-Formation	Pechelbron-Gruppe	
								Mittlere Pechelbron-Schichten	Obere Pechelbron-Schichten Mittlere Pechelbron-Schichten		
									Eisenberger		

Borehole database HLOG

Ca. 20.000 project related wells



more than 200.000 single layers

→ (Semi-) automatic approach necessary !

Challenges regarding well data:

- Heterogeneity of wells in spatial distribution and total Depth
- Heterogeneity in well quality, depending mainly on:
 - Drilling method
 - Sample rate
 - Accuracy in core description
- Heterogeneity in stratigraphic Interpretation, depending mainly on:
 - editor
 - Varying stratigraphic concepts

Stratigraphic concepts



Chronostratigraphy Berggren et al. 1995			Upper Rhine Graben		Mainz Basin			German Stratigr. Comm. 2002		Wetterau & Hanau Basin			
Ma	Epochs	Stages	DoebI & Malz 1962	Prelt-Müssig 1965	DoebI et al. 1972	Rothausen & Sonne 1988	Reichenbacher 2000	Upper Rhine Gr.	Mainz Basin	Wiesner 1970, 1971 (in Kadolsky 1988)	Gebhardt 2003		
20	Miocene	Lower	Burd.							?	?		
21				OHS	Corbicula-Sch.					Wiesbaden Fm. (UHS)			
22		UHS		Corbicula-Sch.					Rüssingen Fm. (inf. S.)				
23		CoS		Ce4					Oberrad Fm. (OCeS)		4+5	Corbicula-Sch.	
24		CeS		Ce3							3	CeK	
25	Oligocene	Upper	Chattian							2			
26				Bunte Niederröden Schichten	Ce2					UCeS		1	CeS
27				Cyrenenmergel	Ce1								VIK
28				Cyrenenmergel	SwS								GIS
29				Meletta-Sch.	CyM								
30	Lower	Rupelian	Meletta-Sch.	Cyrenenmergel	UCeS	Schleichsand	Schleichsand	Meletta-S.	Stadecken Fm.	Weisenauer-S.	?		