Resources and perspectives for Switzerland

geo form Geological Consulting and Studies Ltd.

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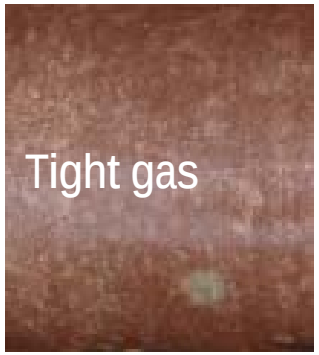
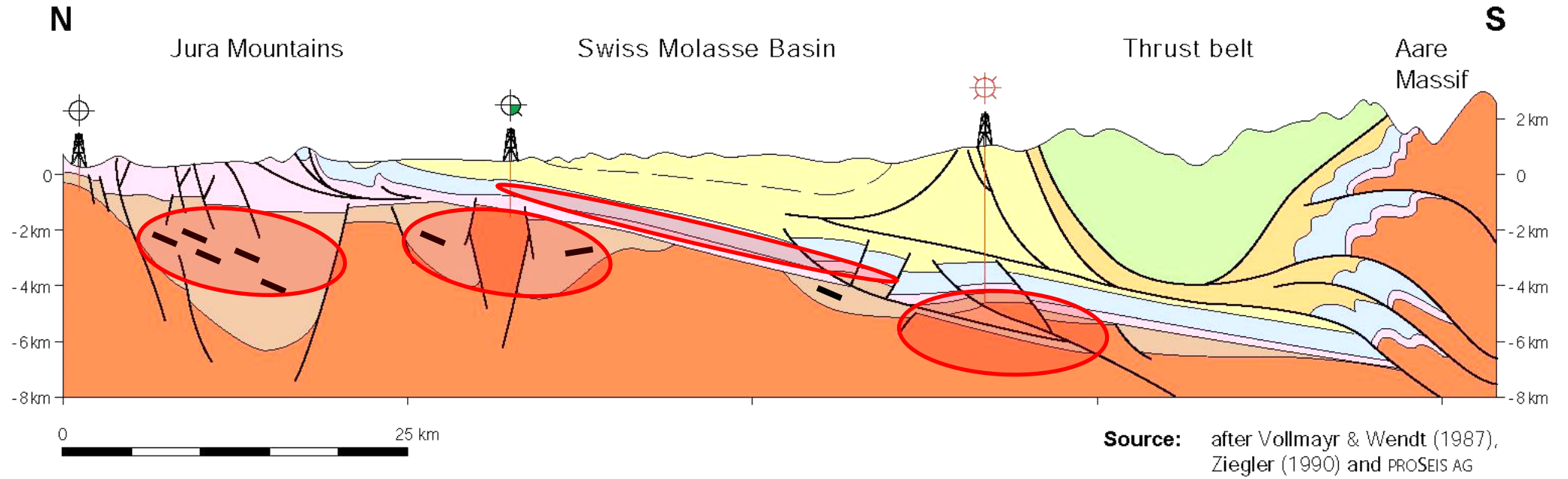
Presentation

- Unconventional exploration activities of the past in Switzerland
- Potential shale gas formations of Switzerland
- Data base and resource assessment
- Regulatory constraints
- The way forward

Exploration results to date

Unconventional plays Switzerland





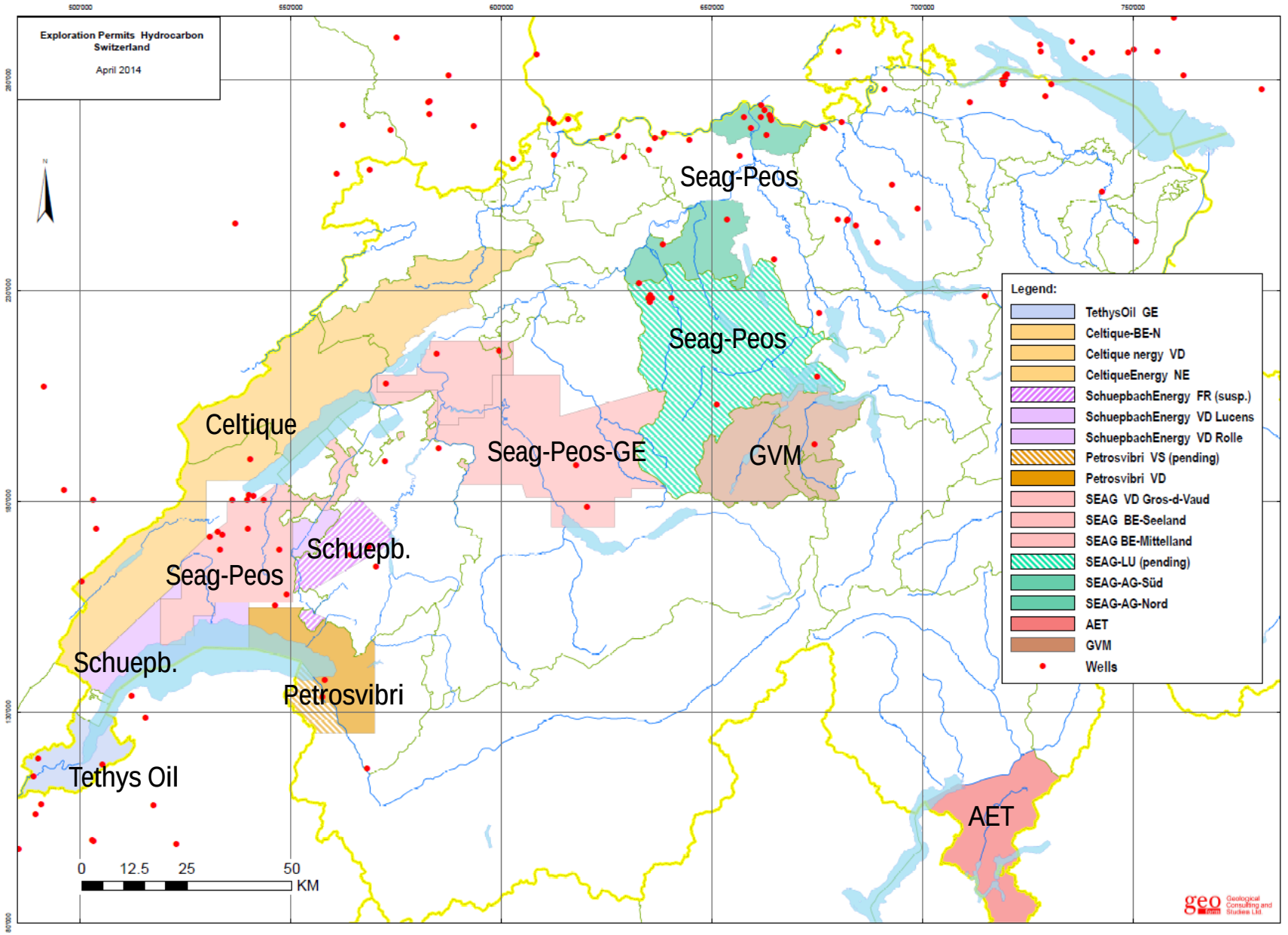
Source: after Vollmayr & Wendt (1987), Ziegler (1990) and PROSEIS AG

Unconventional gas projects in Switzerland since 1992

- Weiach (Nagra well):
  - Coal seams in Carboniferous
  - SEAG & Partners evaluate CBM potential
  - Concerns on economics (depth, water disposal, data)

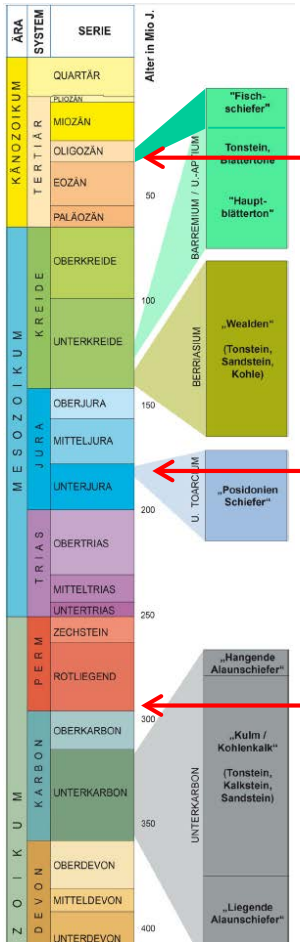
- Weiach-2 (SEAG/ForestOil/Peos):
  - Basin centered gas play (tight sandstones in Permian/Carboniferous)
  - Planned and simulated 3 hydraulic fracs
  - Project is abandoned after initial neg. Data Frac
  - Questions on well location

Exploration activities 2014



Shale gas activities Germany (BGR 2012)

Formation	Erdgas (GIP) gesamt (Bill. m³)			Norm-Menge Erdgas (m³/t Gestein)	
	Minimum	Median	Maximum	Min	Max
Unterkarbon	2,5	8,3	17,7	3,3	5,9
Posidonienschiefer	0,9	2	3,8	2,8	14,5
Wealden	1,1	2,4	4,4	2,8	10,5



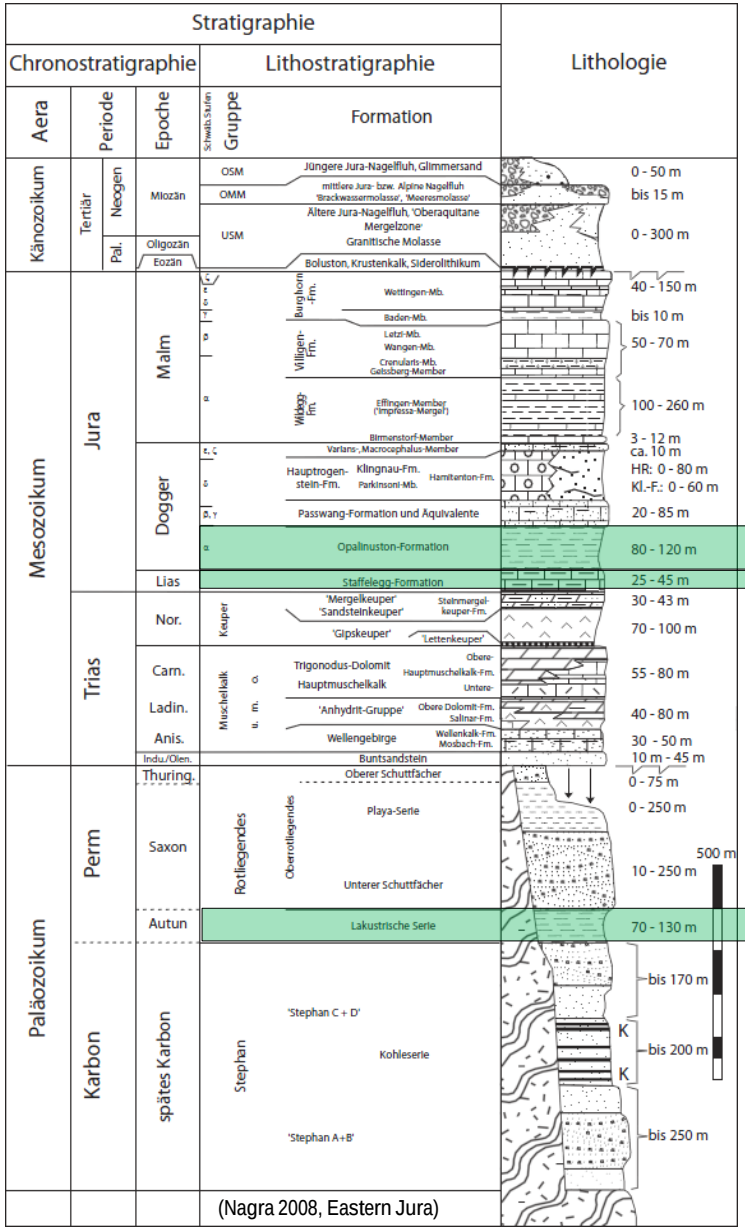
Fish Shale (Tertiary)

Posidonian Shale (Lias)

Autunian Shale (Permian)

Southern Germany:

Potential shale gas formations Switzerland



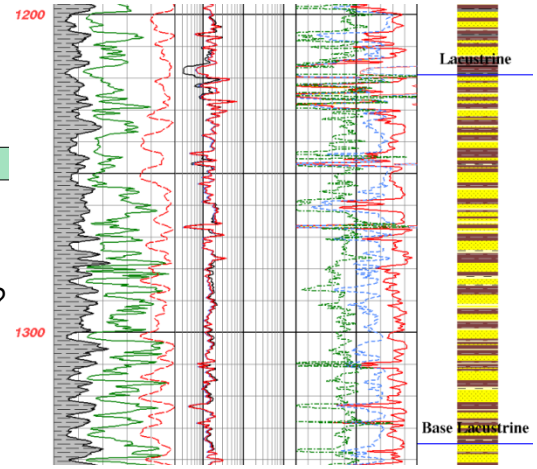
(Nagra 2008, Eastern Jura)

Aalenian (Opalinus Clay)

Toarcian (Posidonia Shale) ??

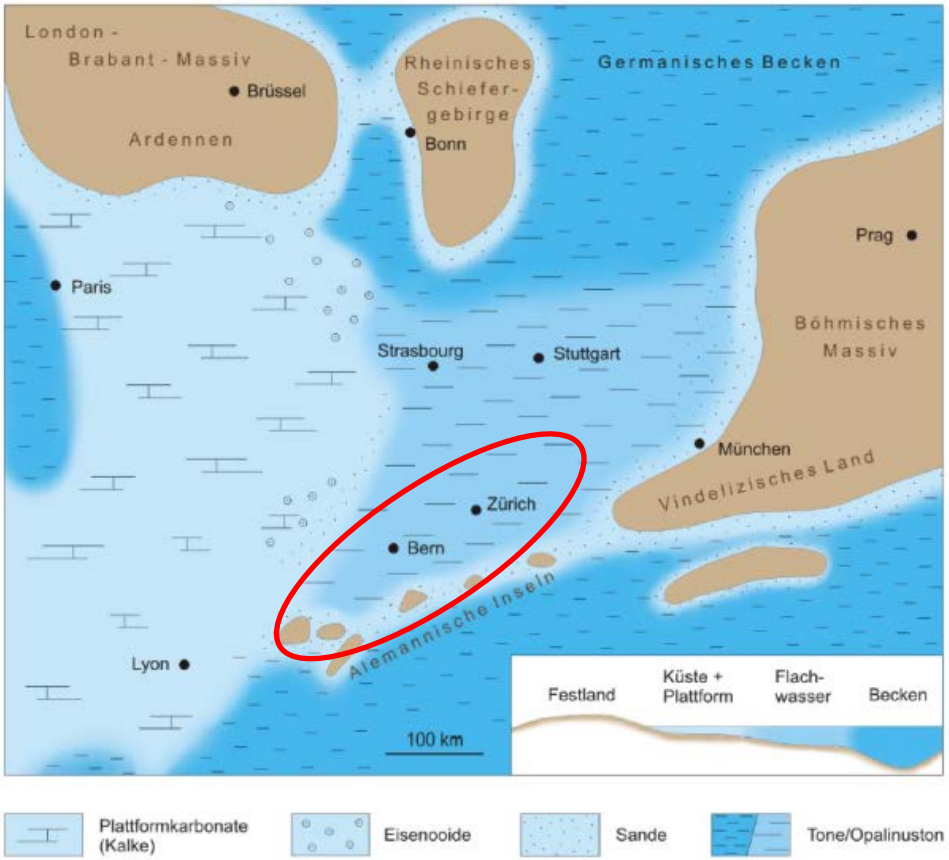
Autunian (Permian, lakustrine shales) ??

- thickness shales?
- lateral extent?
- PC grabens, where?
- well control ?



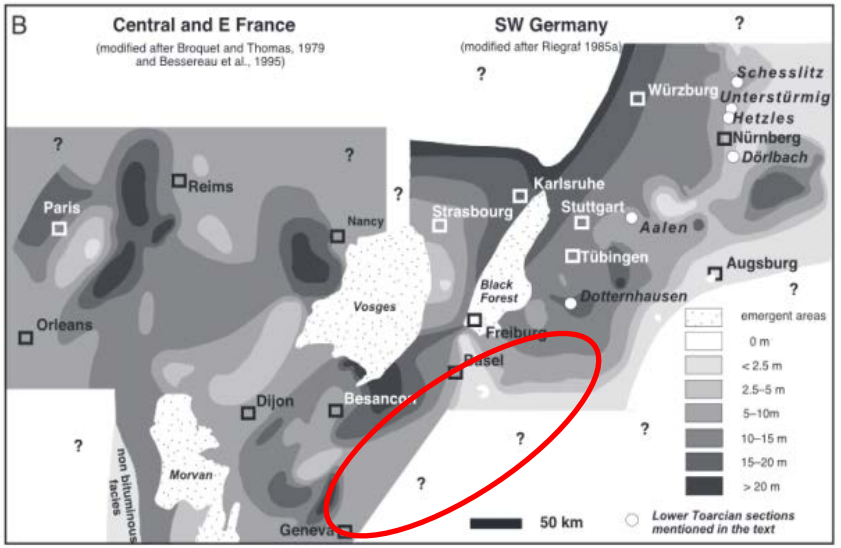
Potential shale gas formations Switzerland

Aalenian (Opalinus Clay) Facies



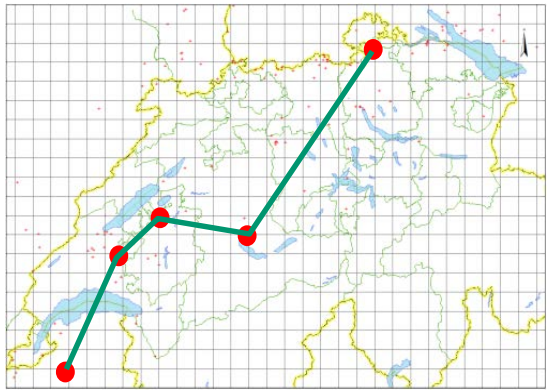
(Nagra 2008)

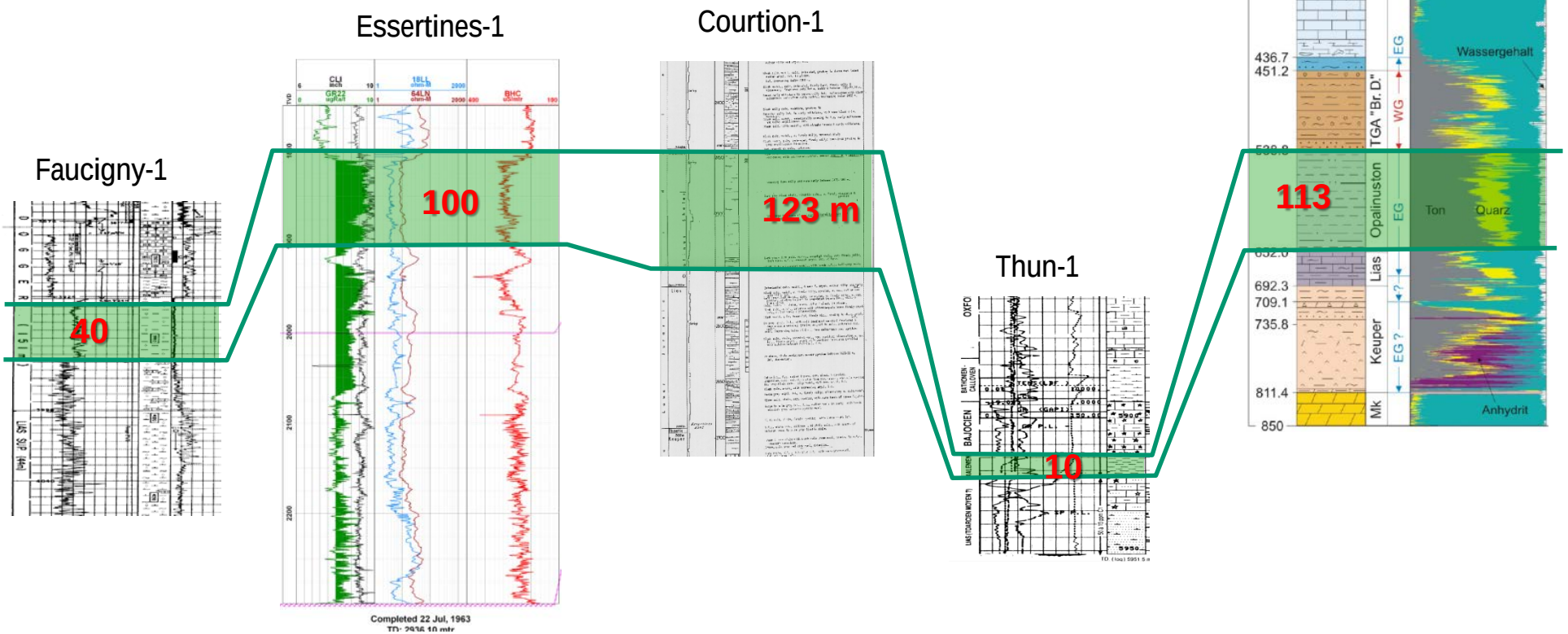
Toarcian isopach



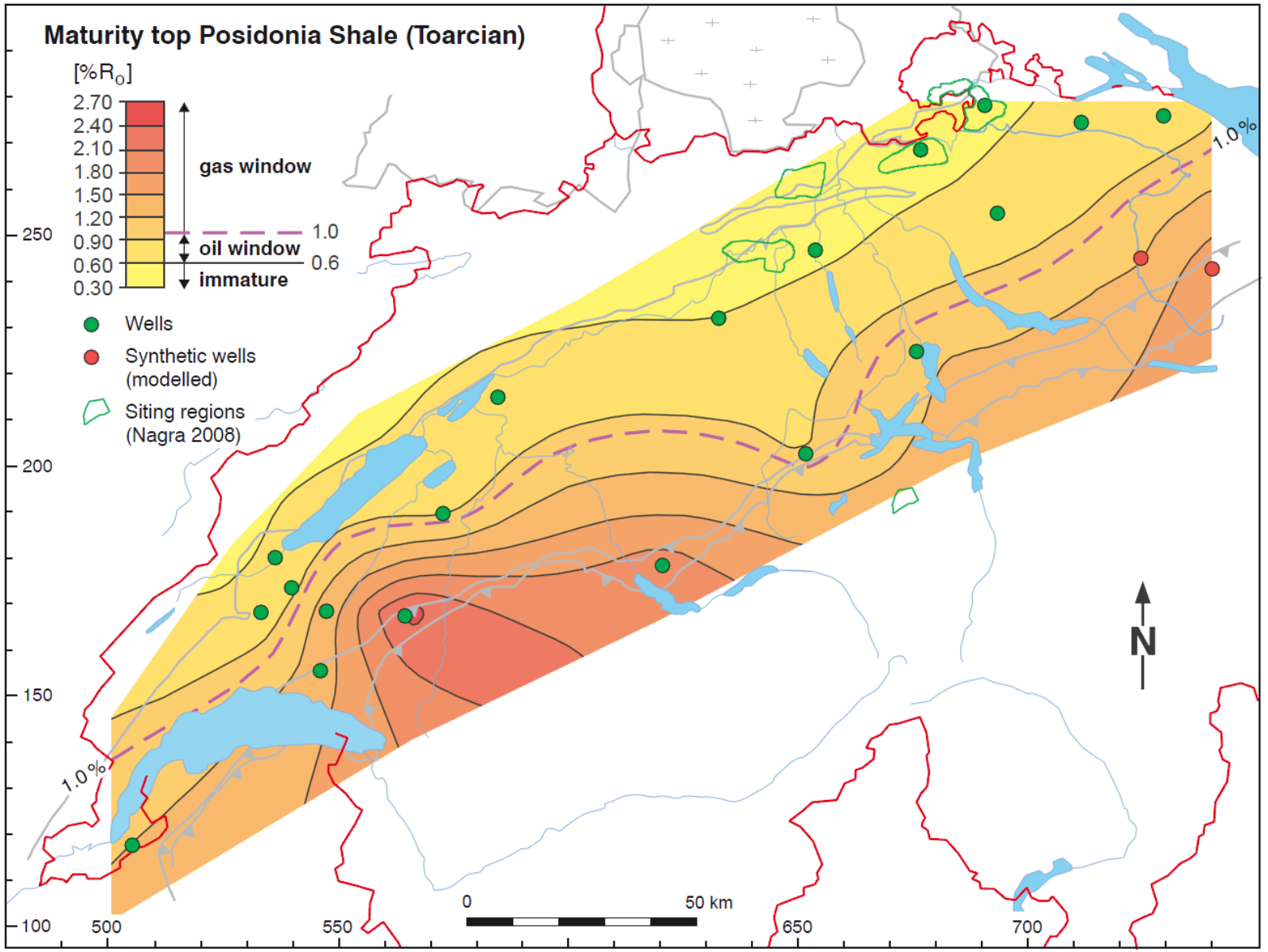
(Röhl & Schmidt-Röhl 2005)

Potential shale gas formations: Thickness Aalenian (m)

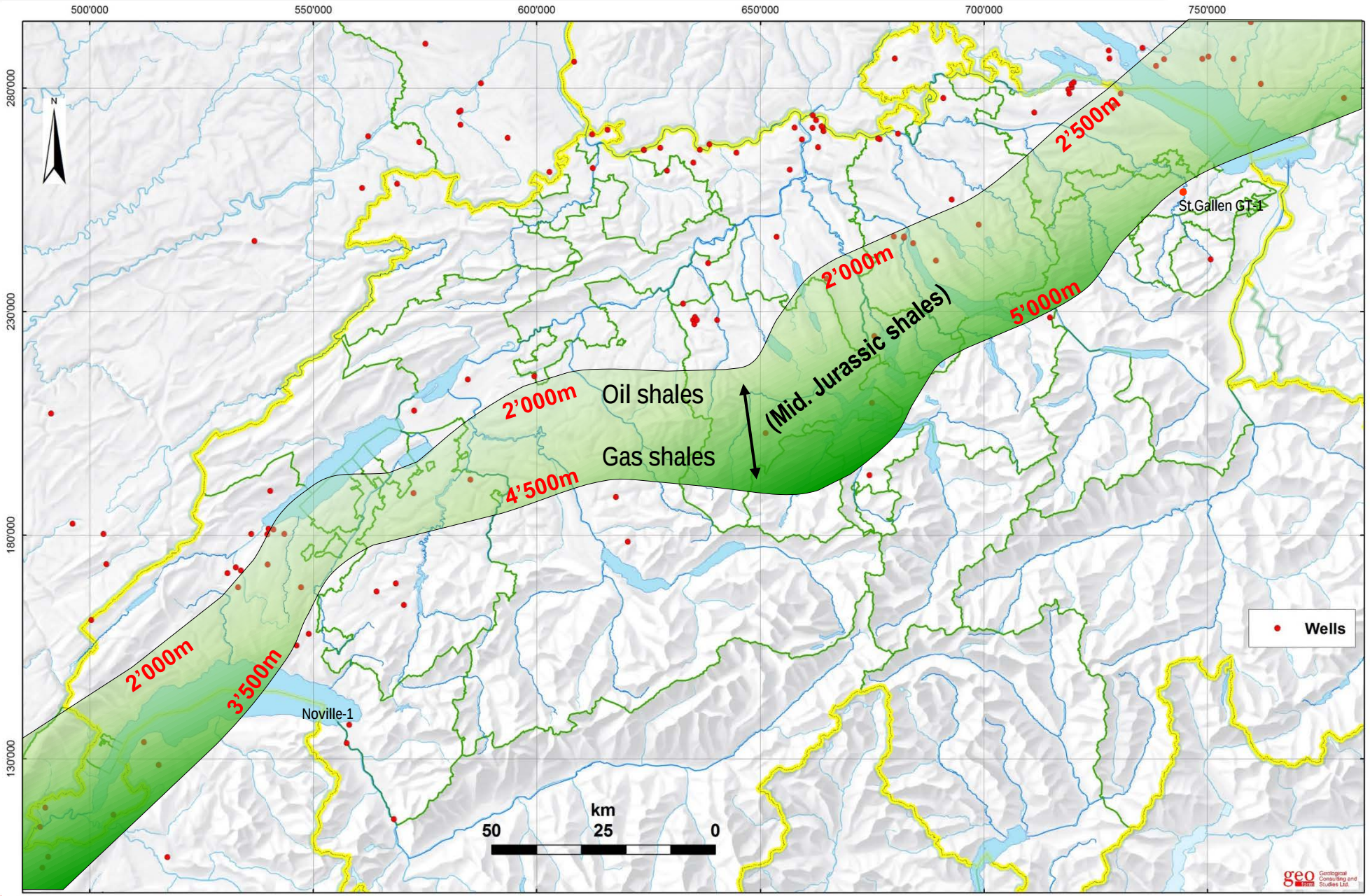




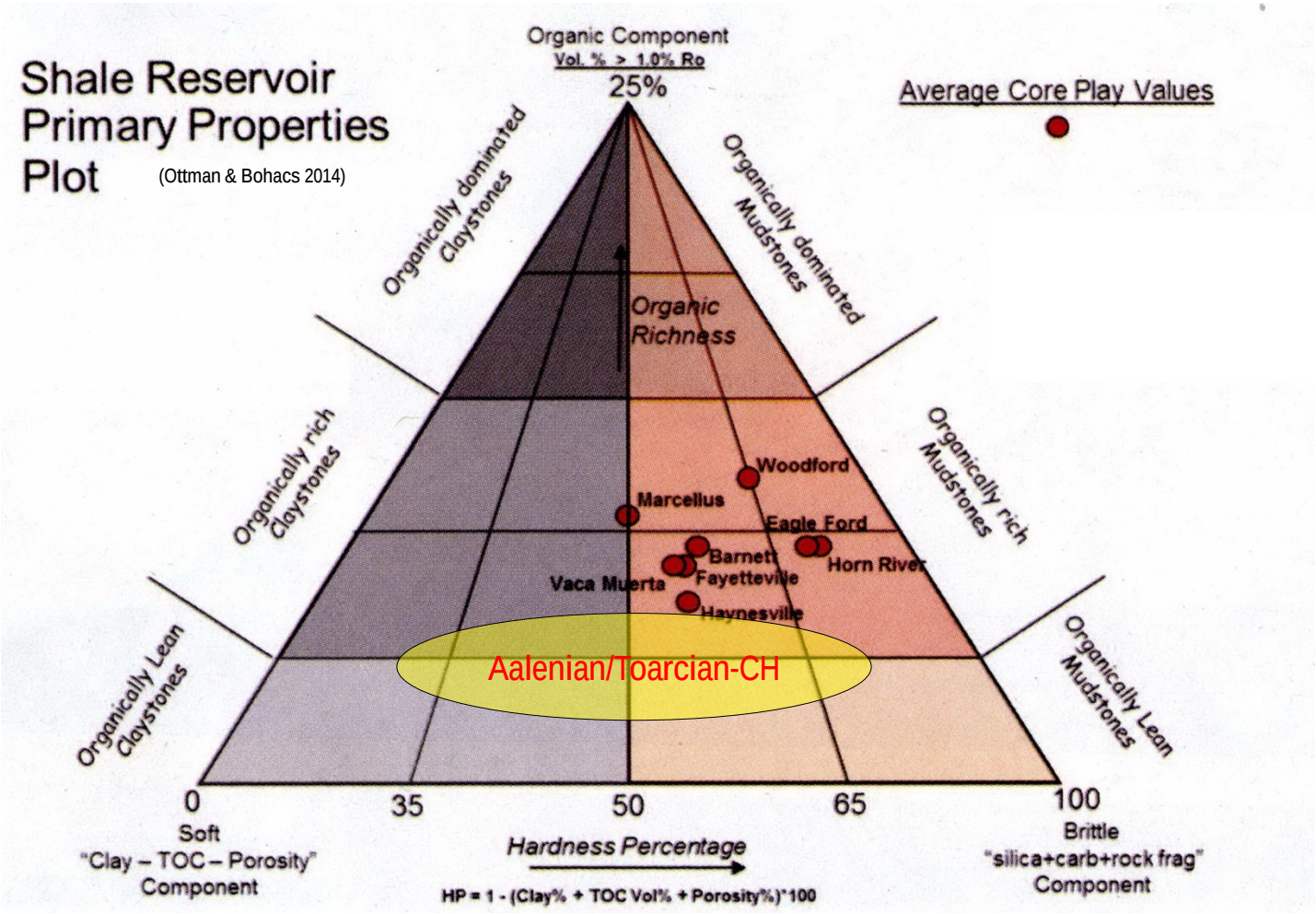
Data base Aalenian Shale: Thermal maturity



Jurassic shale (Aalenian): Potential resource trend



Shale properties



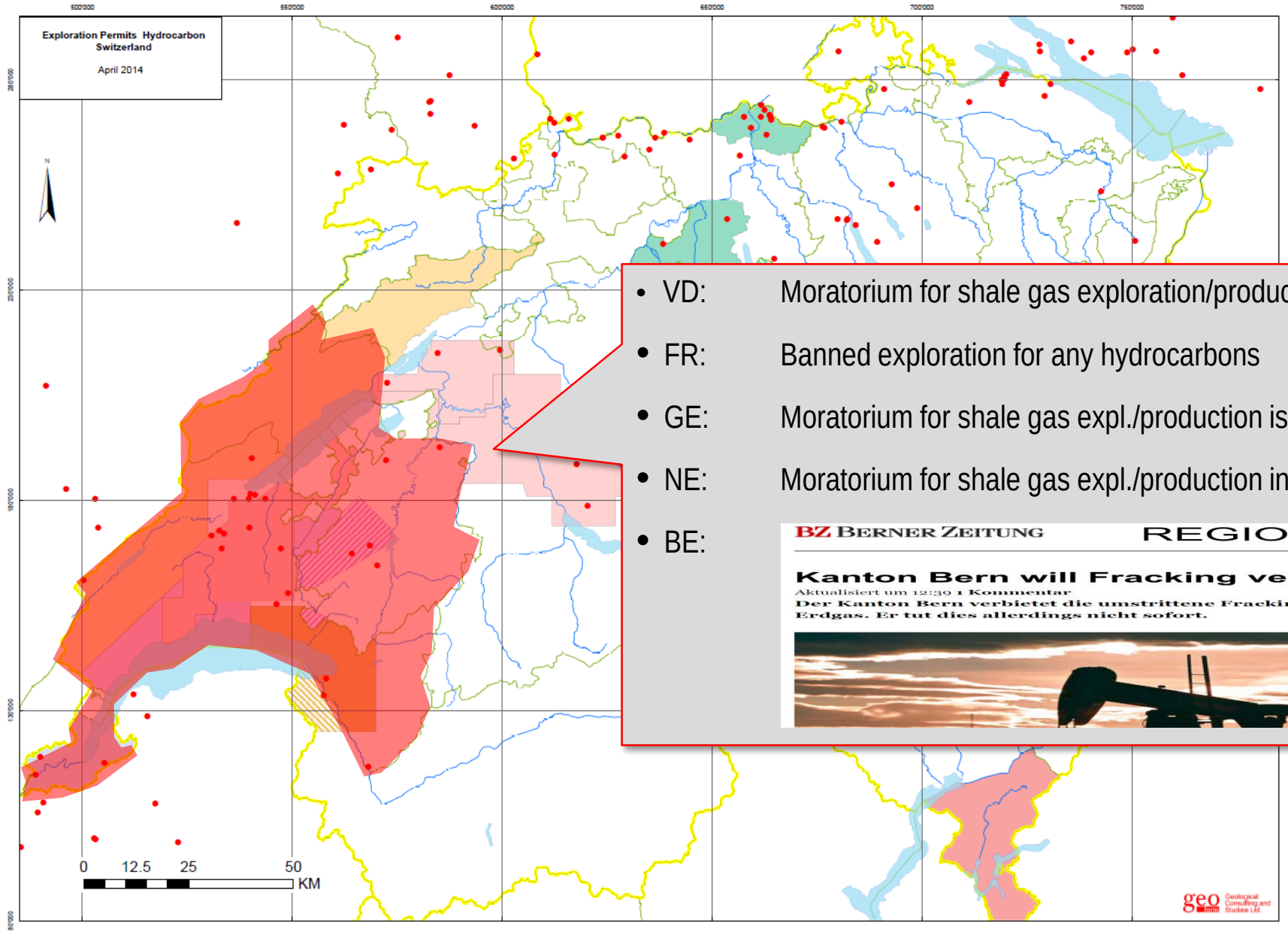
Shale gas resource estimate (Aalenian/Toarcian - Switzerland)

		lowest	mid/likely	highest
GIP/unit	(m^3/m^3)	7	10	30
Thickness	(m)	20	40	100
Area	(km^2)	1'000	3'000	5'000
Recovery factor	(%)	5	10	20
Gas recoverable	**(Mrd. m^3)**	**7**	**120**	**3'000**
	(tcf)	0.3	4	107

- Data base for this estimate is small (shale properties/gas content)
- But these are estimates, that cannot be speculated away
- ……and you need to stimulate

Jahresverbrauch (Mrd. m^3)	
100	Deutschland
3.5	Schweiz

Regulatory constraints - fracking climate



- VD: Moratorium for shale gas exploration/production
- FR: Banned exploration for any hydrocarbons
- GE: Moratorium for shale gas expl./production is discussed
- NE: Moratorium for shale gas expl./production in evaluation
- BE:

BZ BERNER ZEITUNG REGION

Kanton Bern will Fracking verbieten

Aktualisiert um 12:39 1 Kommentar

Der Kanton Bern verbietet die umstrittene Fracking-Methode z
Erdgas. Er tut dies allerdings nicht sofort.

Conclusions - Message

- After almost 100 years of disappointing exploration results, also Switzerland is facing the unconventional gas resource revolution.
- First estimates indicate that the Aalenian Shales could hold substantial recoverable gas volumes of ~100 Mrd. m^3 (mid/likely case). Focus on Central-Western Switzerland.
- There are many geological uncertainties related to the small data base. Proper evaluation of existing data (petrophysical well logs, core samples, geochemistry etc.).
- Before banning technologies to test and produce (fracking) it would be reasonable to check if the resource is really below our feet.

Resources and perspectives for Switzerland

Thank you

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