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Supplement of

A note on the duration of claystone exploration programs

Thomas Mann et al.

Correspondence to: Thomas Mann (thomas.mann@bgr.de)

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A note on the duration of claystone exploration programs

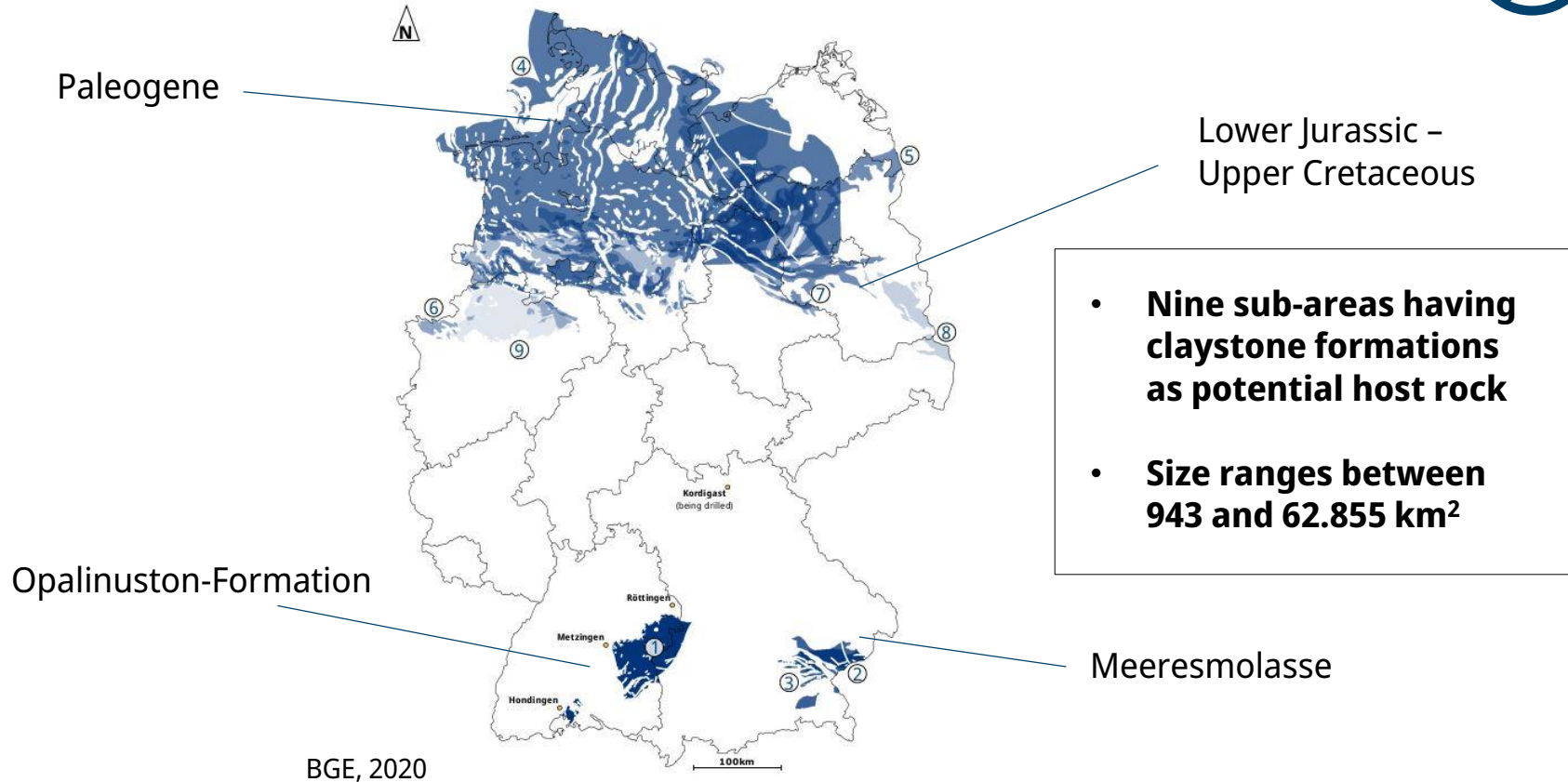
SafeND 2023 | Berlin 13 -15 September 2023

Thomas Mann, Bernhard Schuck, Tilo Kneuker,
Lukas Pollok, André Bornemann, and Jochen Erbacher



14.09.2023

Claystone sub-areas in Germany



Probable duration of the site selection procedure



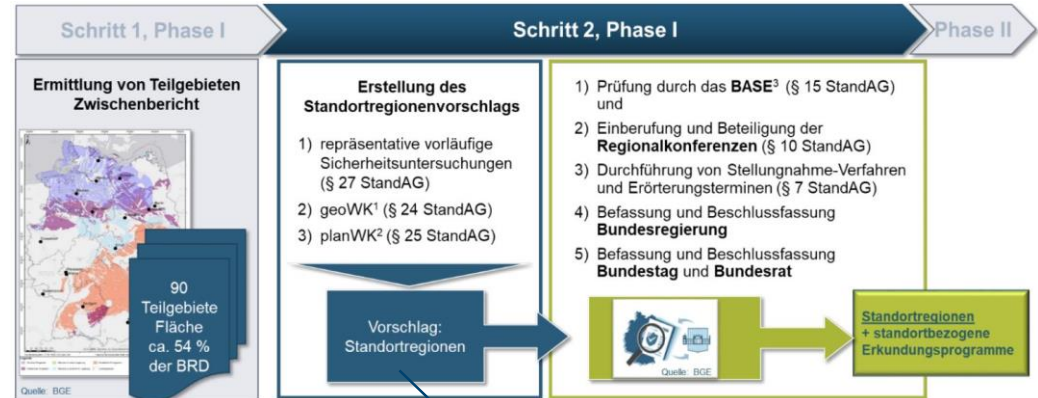
BUNDESGESELLSCHAFT
FÜR ENDLAGERUNG

Zeitliche Betrachtung des
Standortauswahlverfahrens aus Sicht der BGE
Rahmenterminplanung für Schritt 2 der Phase I bis zum
Vorschlag der Standortregionen und zeitliche
Abschätzungen für Phase II und III

Stand 16.12.2022

BGE, 2022a

Identification of siting regions for surface exploration



BGE, 2022b

Planned for 2027

Estimated duration of surface exploration activities within each siting region

Table 3 in BGE, 2022a

Arbeitsschritt
3D-Seismik: Auswertung <ul style="list-style-type: none">• Zeitprocessing• Interpretation• Ermittlung von Bohransatzpunkt(en)
Vorbereitung und Durchführung von Bohrungen inkl. Genehmigungen in den Standortregionen <ul style="list-style-type: none">• Bergrechtliche Genehmigung und Permitting• Bohrung A, Bohrung B, Bohrung C jeweils mit Bohrplatzeinrichtung, Drilling, Bohrlochgeophysik, Bohrkernansprache, lithologische und stratigraphische Auswertung, VSP-Messung, Gebirgsmechanische und hydraulische Tests, Einrichtung des Langzeitmonitorings, Rückbau und Renaturierung
Laboruntersuchungen im Rahmen der Bohrungen <ul style="list-style-type: none">• Gesteinsmechanische Untersuchungen• Hydraulische Untersuchungen• Mineralogische Untersuchungen• Geochemische Untersuchungen

Field / Lab work

- Permissions
- Preparation of drill sites
- Three drillings (each 1000 m)
- Lithological and stratigraphical analyses

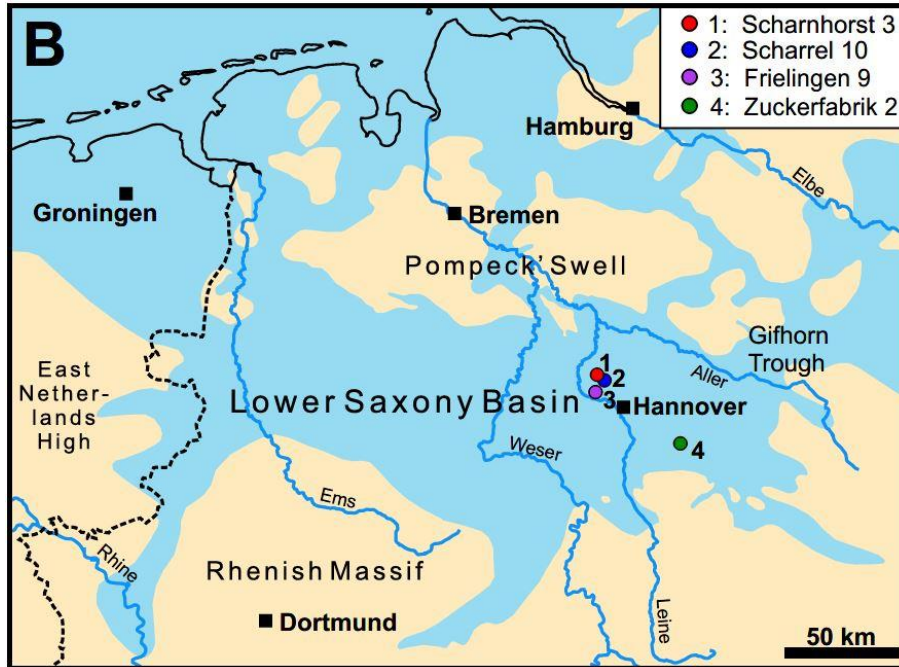
31 months

Lab work

- Geomechanical & hydraulical rock properties
- Geochemical-mineralogical characterization

11 months

Characterization of claystone successions



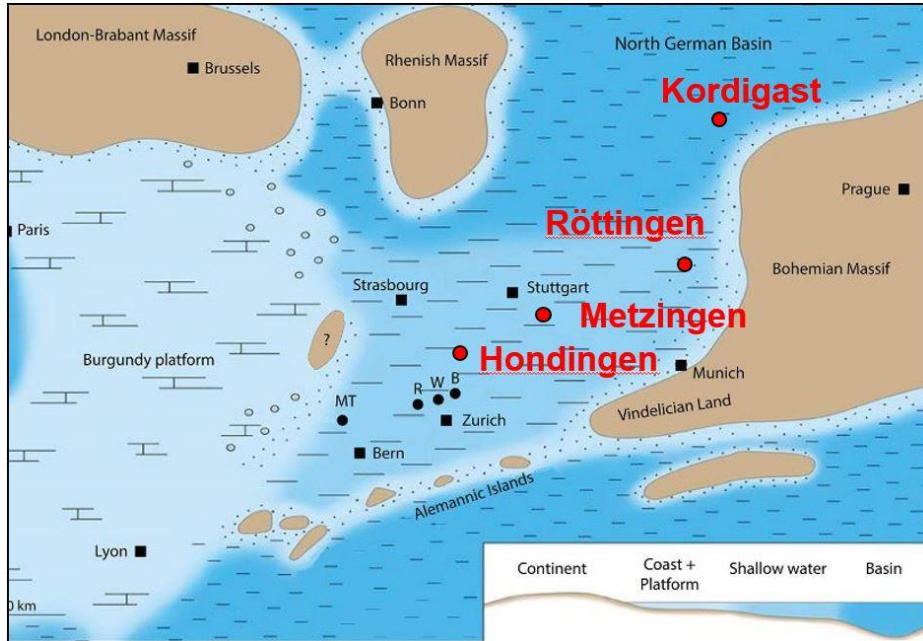
Thöle et al. 2020

Experiences from two recent case studies that developed sequence stratigraphic frameworks

1. Lower Cretaceous in northern Germany

- Four drill cores (Scharnhorst, Scharrel, Frielingen, Zuckerfabrik) with a **total length of 660 m**

Characterization of claystone successions



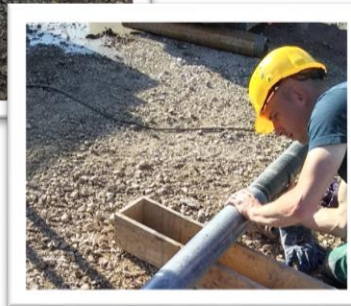
Lauper et al. 2021

Experiences from two recent case studies that developed sequence stratigraphic frameworks

2. Middle Jurassic in southern Germany

- Four drill cores (Metzingen, Röttingen, Hondingen, Kordigast) with a **total length of 930 m**

Temporal commitment



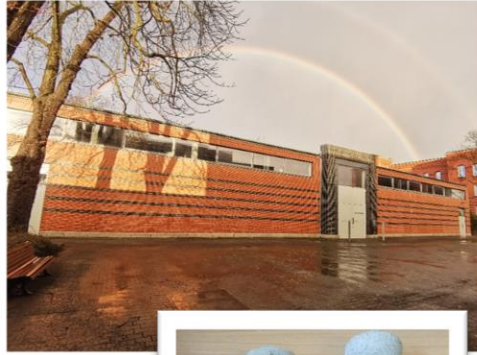
Drilling

- Preparation of drill site
- Retrieval of 1.5 m / 3 m core sections
- Tentative lithological and lithostratigraphic description
- Hydraulical tests
- Sampling for noble gas analyses
- Logging

4-6
months

42 months

Temporal commitment



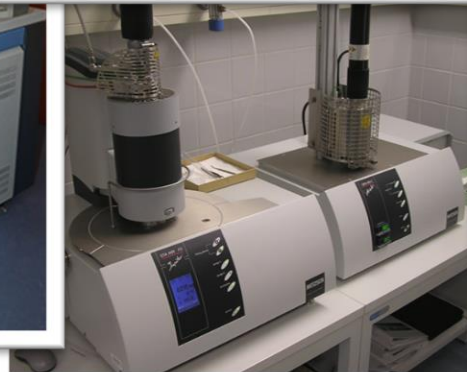
Core related works

- Detailed lithological and lithostratigraphic description
- Scanning (Multi-Sensor Core Logger & X-ray Fluorescence Core Scanner)
- Sampling for lithological and stratigraphical analyses

8-12
months

42 months

Temporal commitment



Laboratory works

- Geochemistry and mineralogy
- Grain size
- Porosity
- CEC
- Thin & polished sections

24
months

42 months

Discussion



Drilling	Core works	Lab work
6 months	12 months	24 months

Field / Lab work

- Permissions
- Preparation of drill sites
- Three drillings (each 1000 m)
- Lithological and stratigraphical analyses

31
months

Lab work

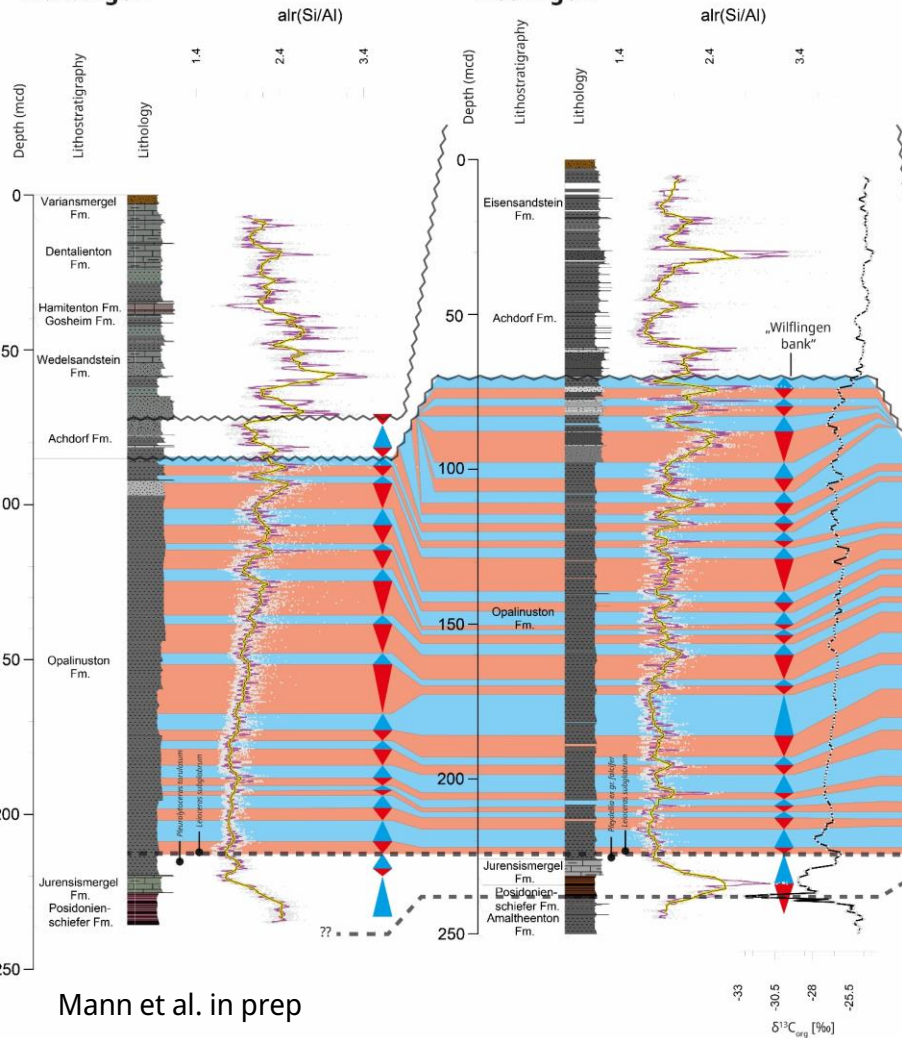
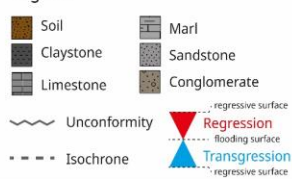
- Geomechanical & hydraulical rock properties
- Geochemical-mineralogical characterization

11
months

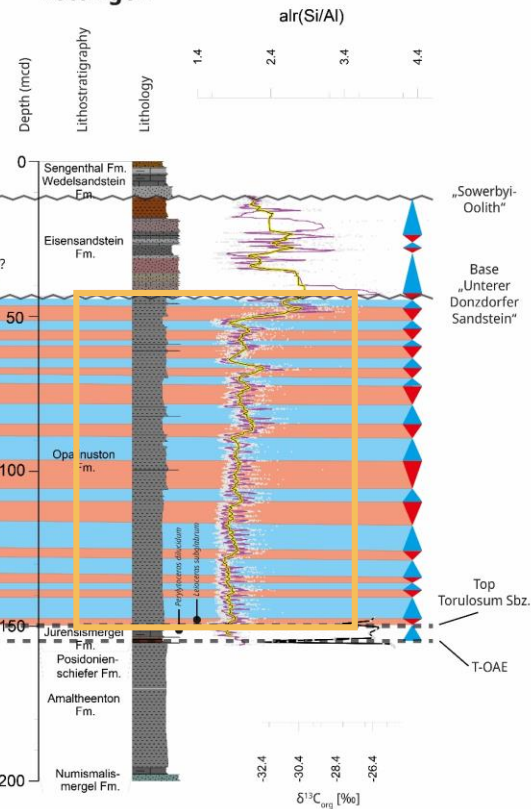
Hondingen

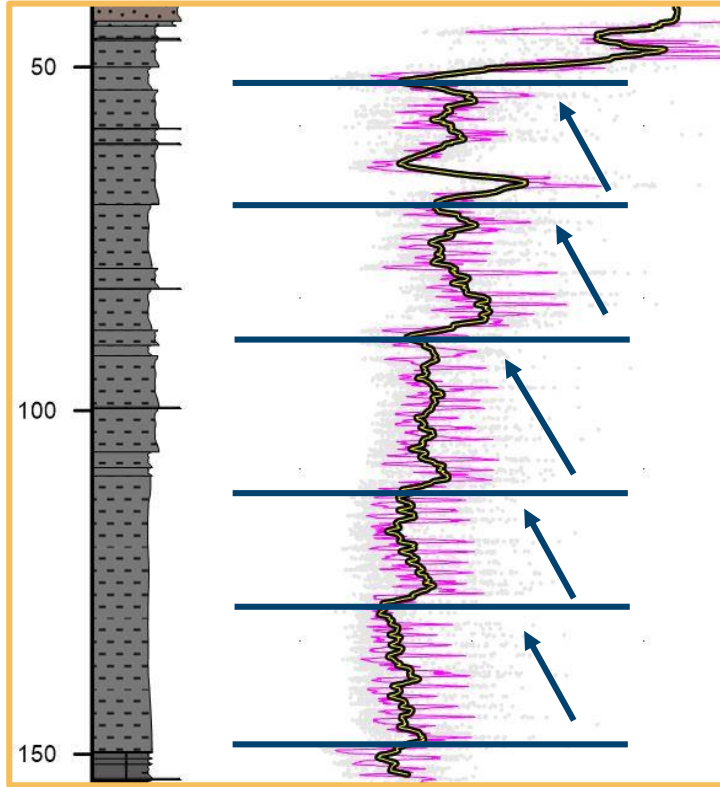
Metzingen

Legend



Röttingen

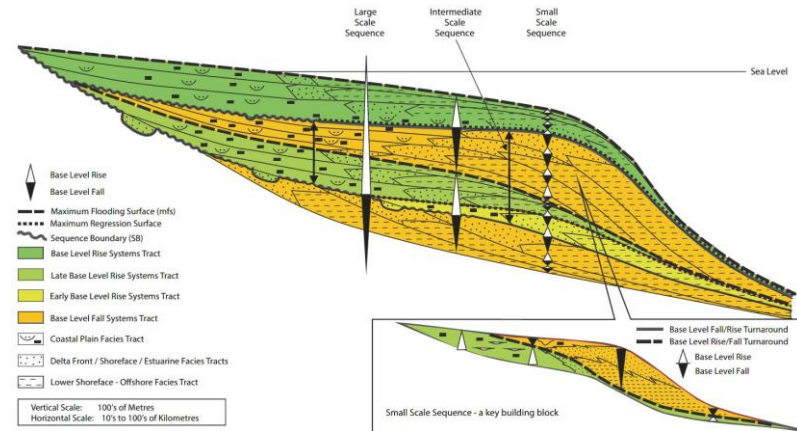




Mann et al. in prep

Distinct cyclicity in XRF Si/Al ratio

- Five fining-upward cycles with sharp boundaries
- Probably related to the variability of orbital parameters
- Effect on the **quality of the barrier?**



Schäfer 2019

Summary & conclusions



- BGE estimates that the **duration of surface exploration activities within each siting region takes ~ 42 months**
 - Proposed sites for underground exploration
- **In accordance to the field and analytical workload from two recent BGR research projects, however:**
 - **Only realistic if sampling resolution is lowered**
 - **Not finished with data interpretation** (i.e. „derivation of the exploration and research requirements“ according to § 12 EndlSiUntV)
 - A **solid understanding of the depositional system** enables:
 - **Predictability of facies variations**
 - **Focussed exploration**
 - **Accelerated identification of appropriate sites for underground exploration**



Thanks for the attention!

Thomas Mann, Bernhard Schuck, Tilo Kneuker,
Lukas Pollok, André Bornemann, and Jochen Erbacher

Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), Hannover, Germany