

Elements for the quantification of uncertainties in geomodels: seismic input for the GeoBlocks project

¹ Chair of Geology and Sedimentary Systems, RWTH Aachen University

² University of Aberdeen

³ Bundesanstalt für Geowissenschaften und Rohstoffe - BGR

⁴ Fraunhofer Research Institution for Energy Infrastructures and Geotechnologies IEG-Aachen

⁵ Chair of Computational Geoscience, Geothermics and Reservoir Geophysics, RWTH Aachen University

Marlise Cassel¹, Francisca Robledo², Frithjof Bense³, Heidrun Stück³, Michael Kettermann⁴, Carlos Colombo⁵, Clare Bond², Peter A. Kukla¹, Stefan Back¹, Florian Wellmann⁵

Subsurface Geophysical Data & Repository Site Selection

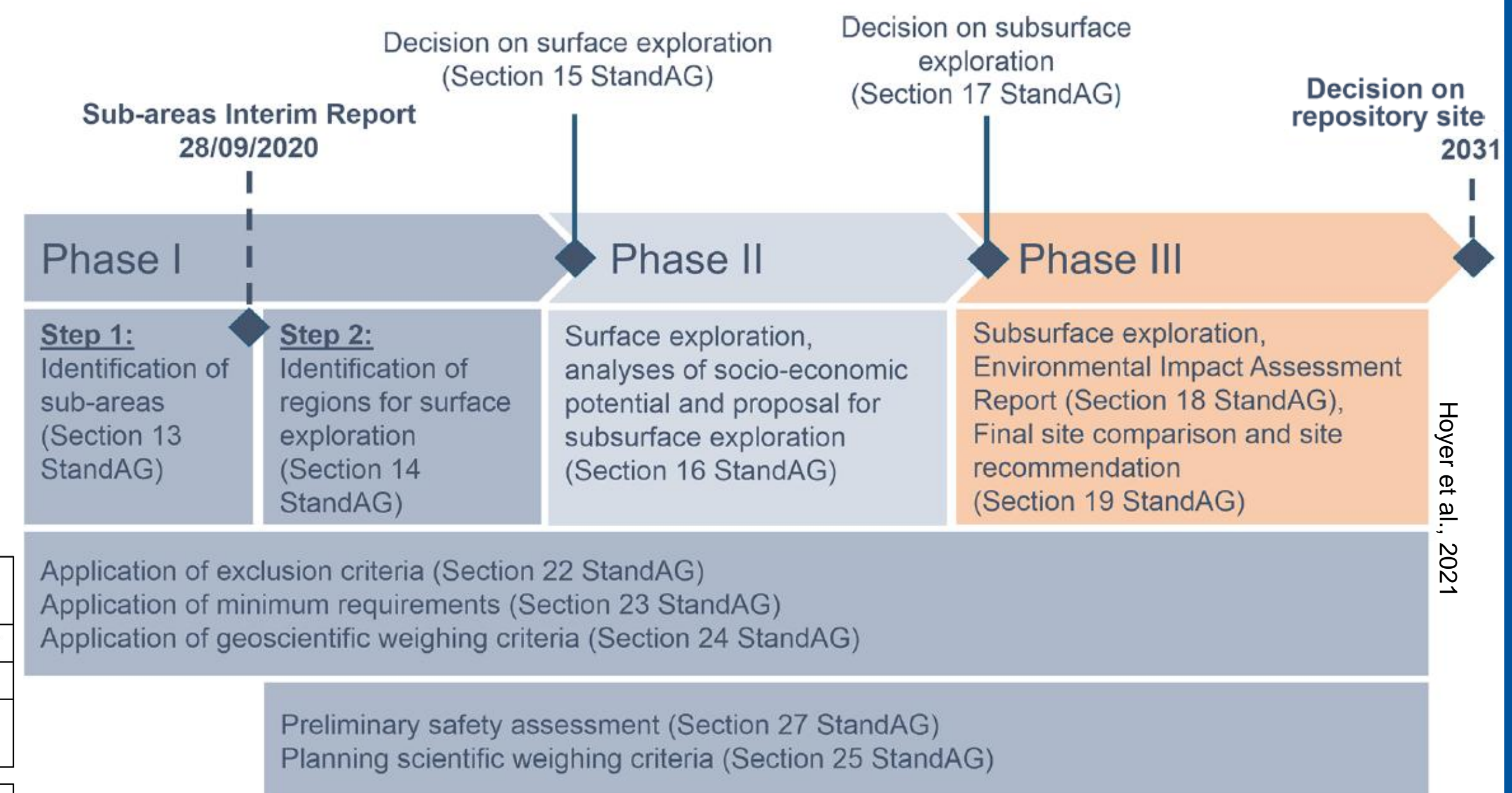
The characterisation of the subsurface is essential when assessing a site for a geological disposal facility. This study aims to evaluate German reflection seismic datasets with a focus on uncertainties in the processing and in interpretation routines. This will significantly improve subsurface models, contributing to a quantification of the site selection process for geological disposal facilities.

Aim:

- Provide data for case studies.
- Systematic identification & analysis of uncertainties in input data of geological models.
- Analysis of the influence of subjectivity in the interpretation of geophysical data.

Focus:

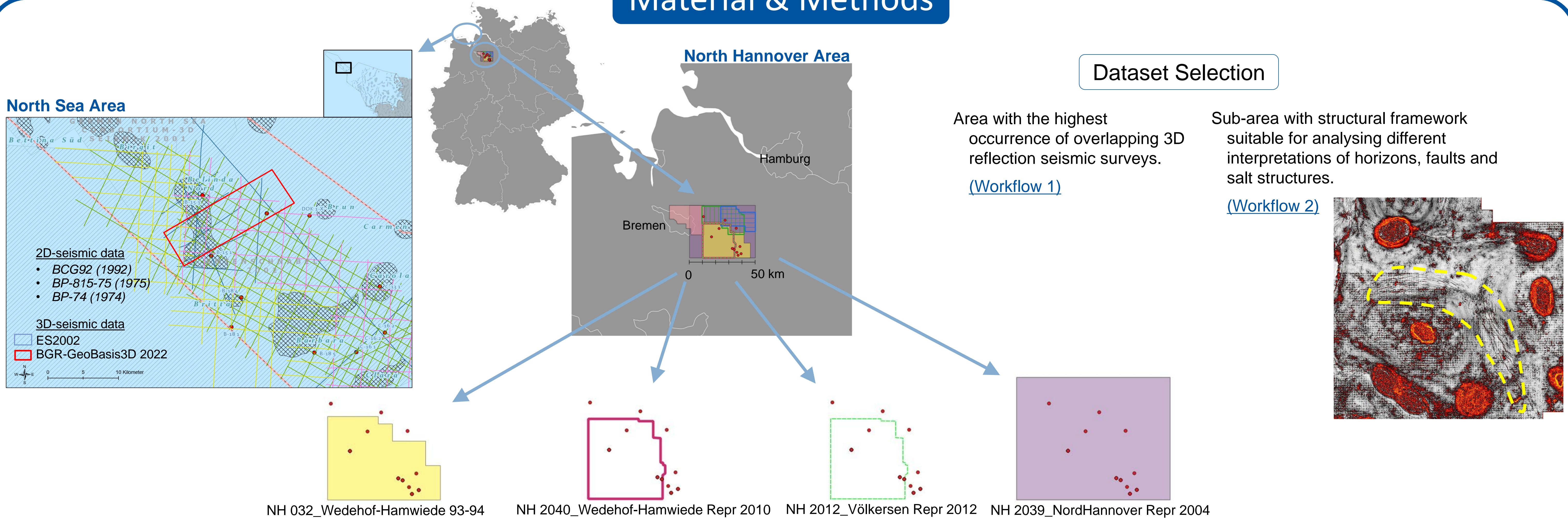
- Uncertainties of input data (well & seismic data).
- Uncertainties in interpretation (interpreters bias, structural/geometric ambiguity):
 - geometric complexity of the geological context/structure
 - Heterogeneous data situation (quanti and qualitatively)



MS	WP 3	WP 6	MS
3.1	Relevant data types identified	Probability distributions and bias	6.1
3.2	Uncertainties on input data types quantified	Reduction of uncertainties	6.2
3.3	Interpretation errors in seismic data evaluated		6.3
3.4	Overview of general qualitative irreducible uncertainties		6.4
4.1	Quantitative comparison of interpolation methods for structural model	Spatial variability	5.1
4.2	Applied to test data sets	Comparison between regions	5.2
4.3	Hierarchical model construction implemented		5.3
4.4	Quantitative comparison of common modelling methods		5.4

WP 4 Kurgys et al., 2024 | WP 5

Material & Methods



Workflow 1

Uncertainties in Seismic Processing

- Quality control of data received from Landesamt für Bergbau, Energie und Geologie and contributed by BGR.
- Database set-up in Petrel.

- Amplitude scaling to create comparable amplitude volumes from different reprocessings.
- Calculate differences between comparable amplitude volumes using trace calculator (different amplitudes and extracted attributes as frequency, reflectivity, coherence)
- Compare different depth-conversion results/approaches/techniques

- Delivery of the data to be input into the uncertainty analysis workflow (September 2025).

Workflow 2

Uncertainties in Seismic Interpretation

- Multi-interpreter experiment of seismic profiles and volumes (3D and 2D)
- Seismic Interpreters with different levels of expertise: BGR and Fraunhofer IEG, Bachelor and Master students from University of Aberdeen, RWTH Aachen University, Leibniz University, Conference attendees (EGU).

Next Steps

Considering a timeline until 2026

- Replication of these workflows in other locations.
- Replication of these workflows looking at other specific targets (lithologies, structural and stratigraphic features).
- Comparison of results between onshore and offshore surveys (e.g. North Sea x North Hannover).

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