

# Smart Data Hub : A Data-Centric Approach for Integrated Simulation Workflow Management in Radioactive Waste Disposal

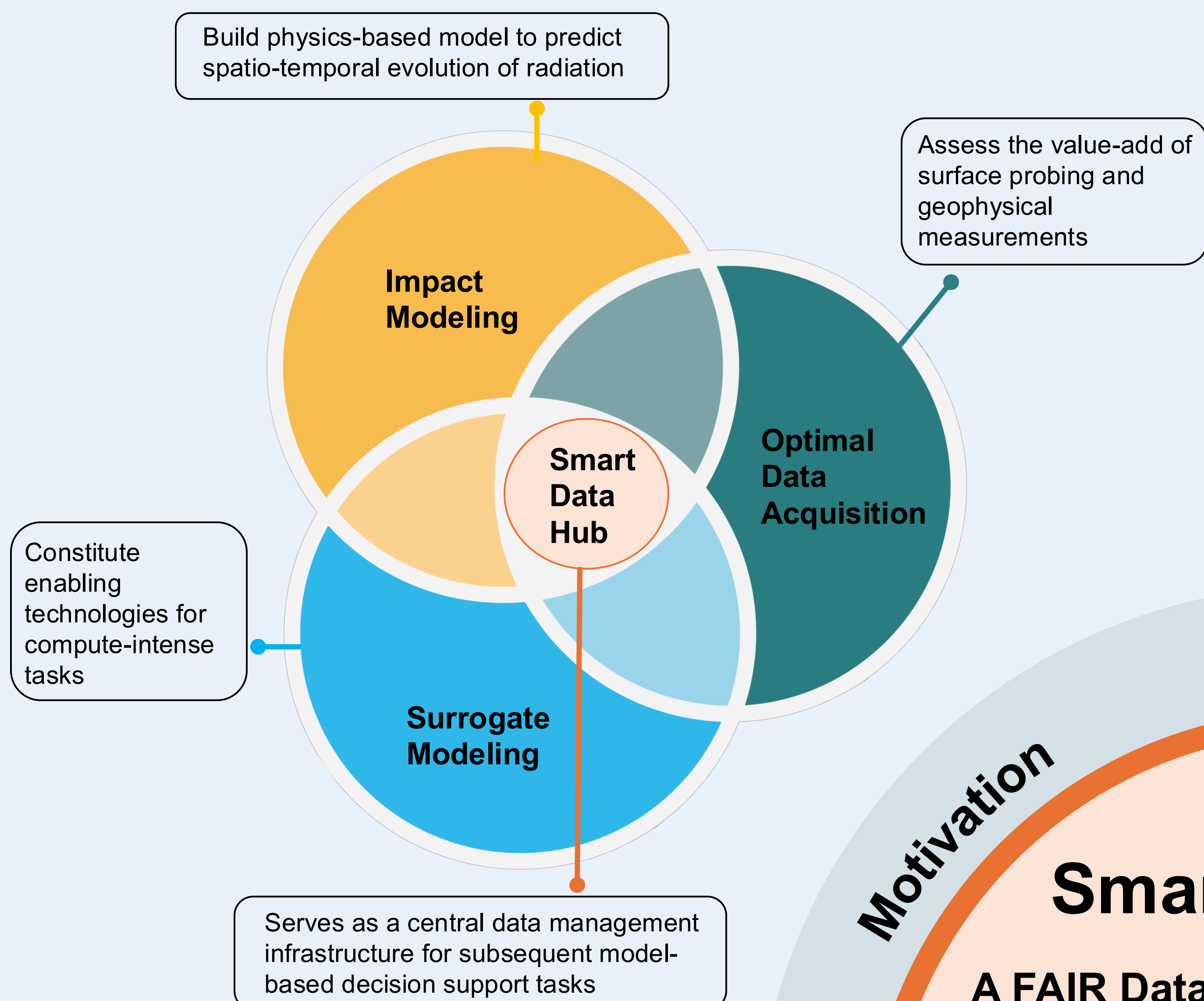
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1) Methods for Model-based Development in Computational Engineering, RWTH Aachen University

2) Geophysical Imaging and Monitoring, RWTH Aachen University

## Smart Monitoring and Intelligent Data Acquisition in Nuclear Waste Storage Site Selection

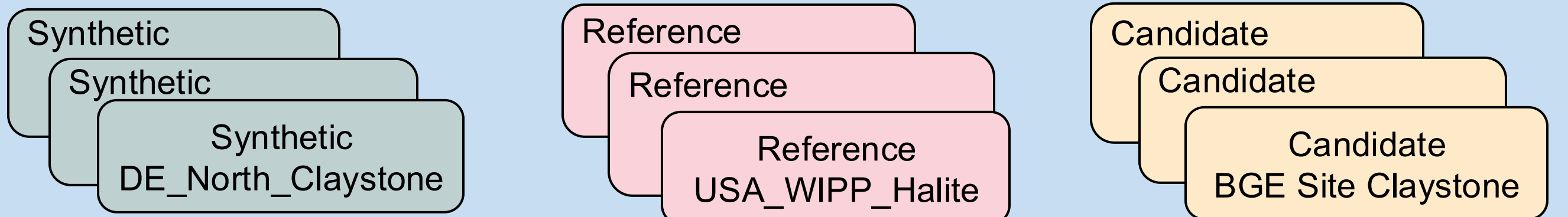
Managing reliability for monitoring radioactive waste repository requires a carefully orchestrated complex computational workflow:



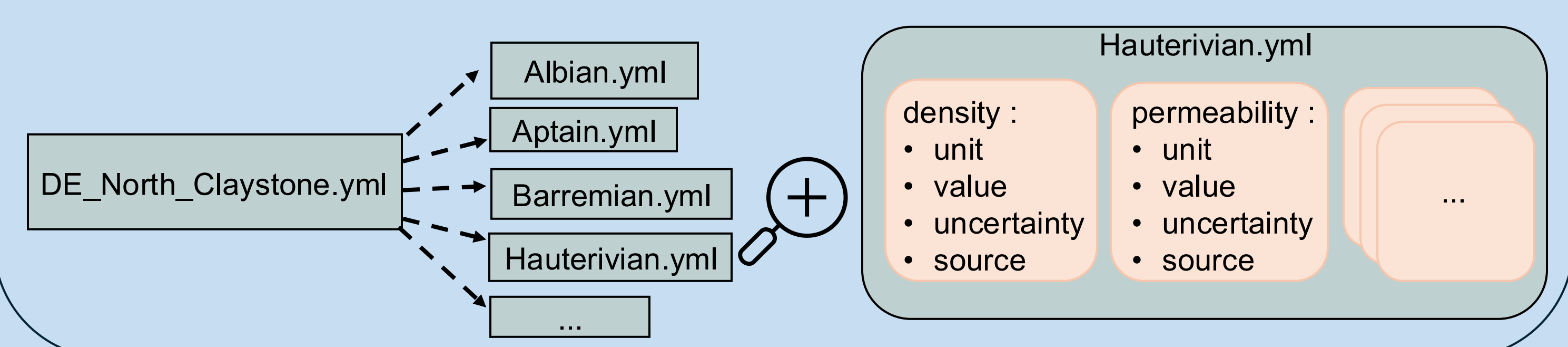
## Data Management Paradigms

Smart Data Hub provides central instances using YAML framework to collect information on:

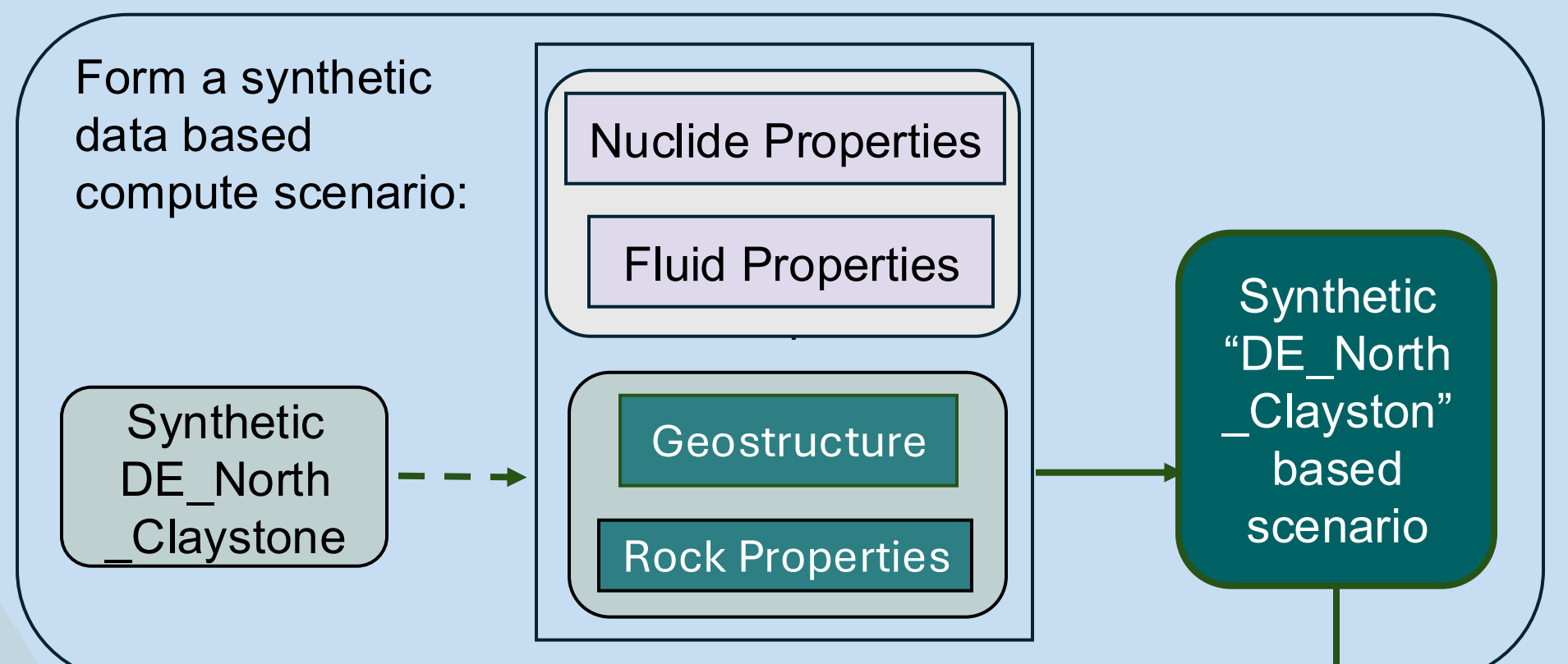
i) Geological Sites & Structures



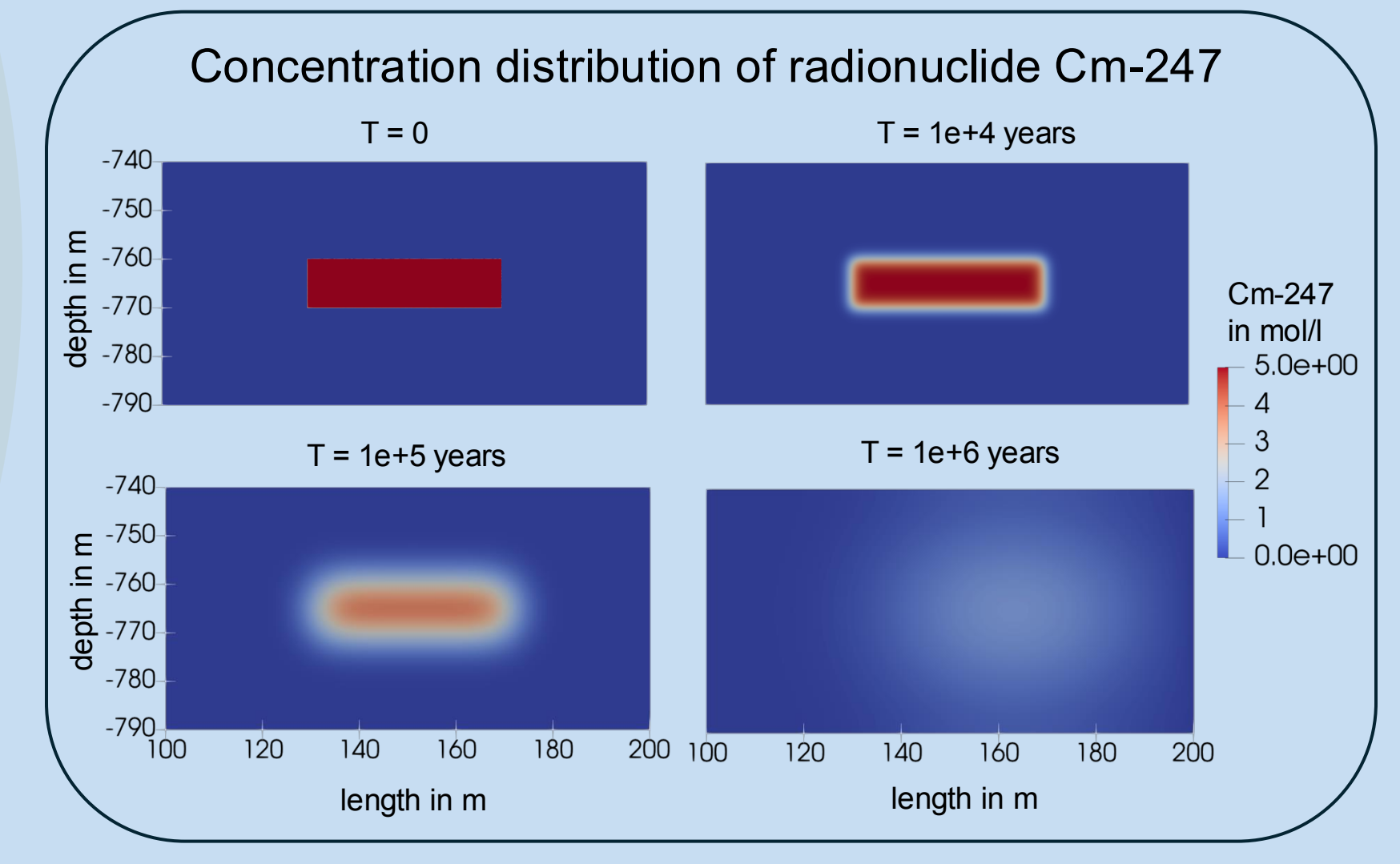
ii) Rock Properties with Uncertainties



Smart Data Hub enables assembling customizable scenarios:▼



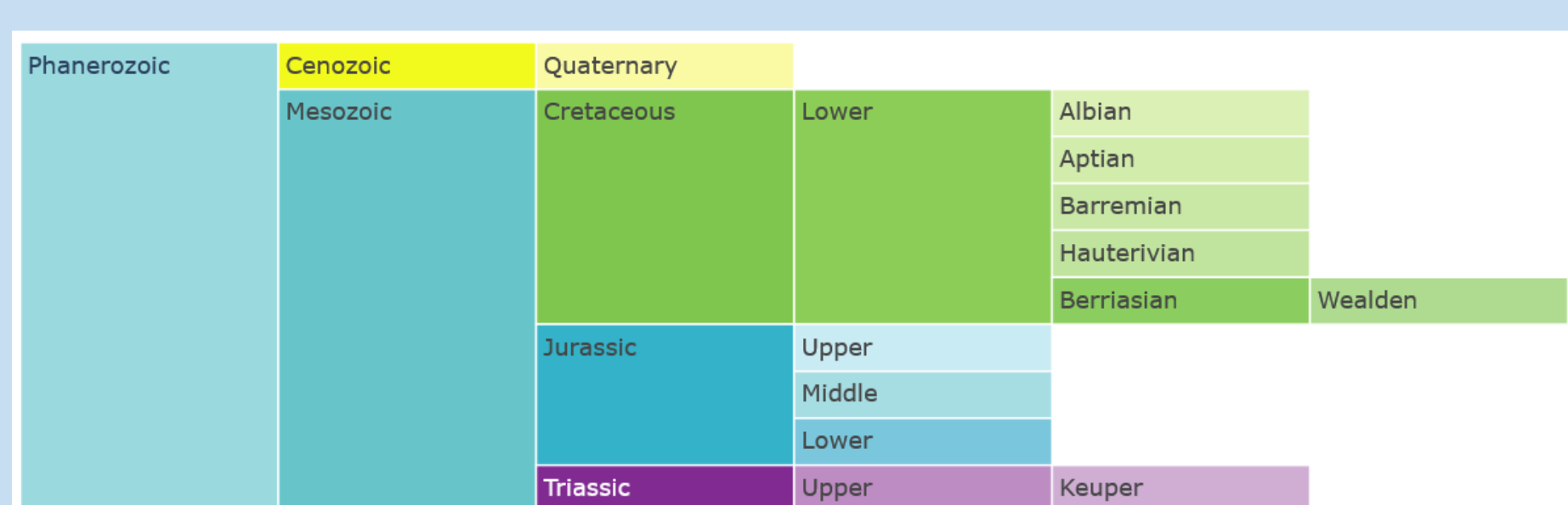
Process model coupling with advection, diffusion and decay process: ▼



## Graphical User Interface

Displays the geological information by sending a "flag"

Chronostratigraphic chart provides the geological time when the layer was formed



## Site selection with 3D structural geological modeling and properties

Select site: DE\_North\_Claystone

**lithostratigraphy**

Phanerozoic	Mesozoic	Cretaceous	Lower	Albian
				Aptian
				Barremian
				Hauterivian
				Berriasian
				Wealden
		Jurassic	Upper	
			Middle	
			Lower	
		Triassic	Upper	Keuper

**3D Structural Geomodel**

Rock properties along with their uncertainty margins. The dark brown highlighted blocks are the feed-in data from default

3D structural geological model built with GemPy<sup>[1]</sup>, the layer highlighted with non-grey color displays the layer with the corresponding rock properties from the table on the left

Motivation

Data Management

Dashboard

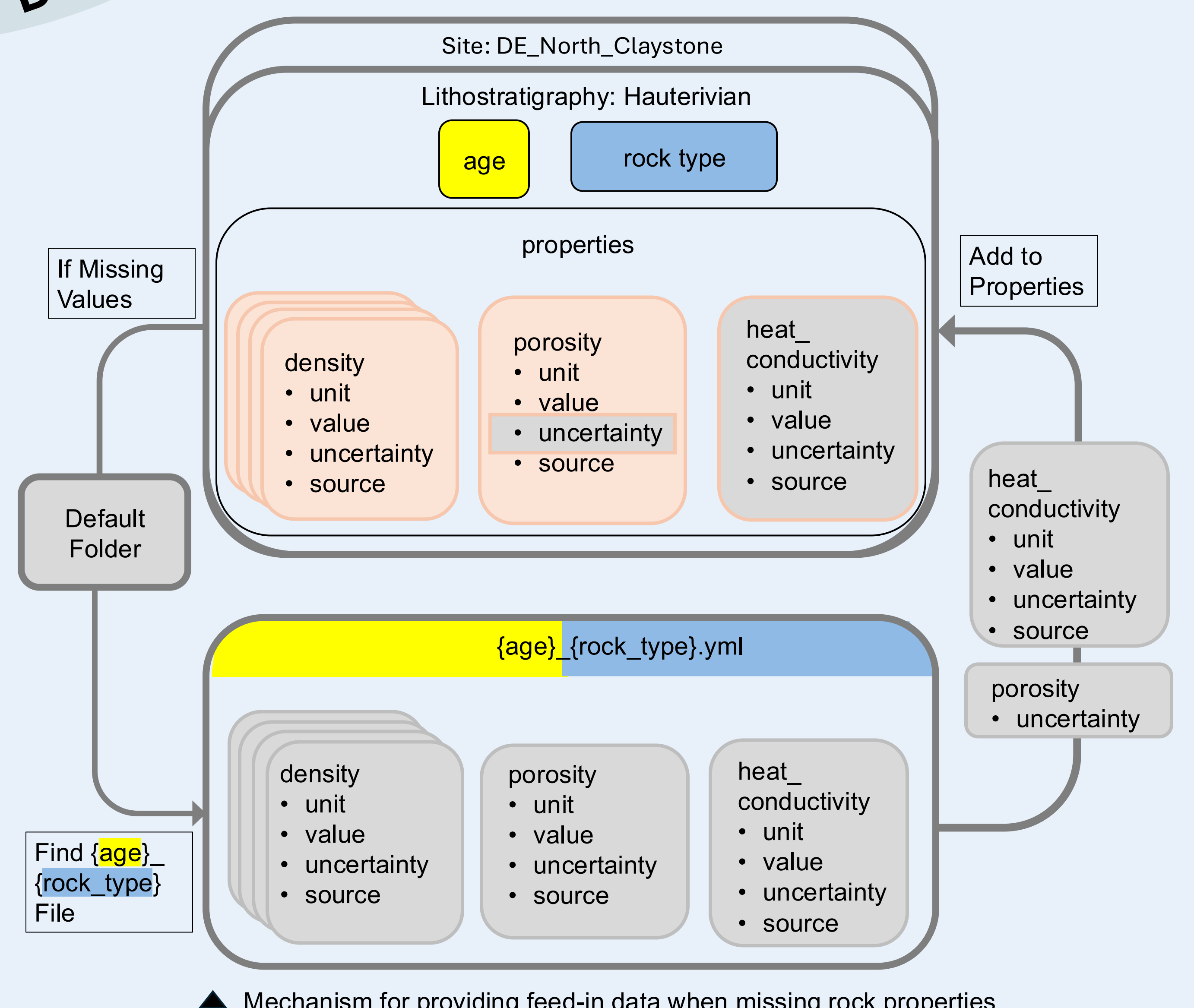
DefaultPro

## Smart Data Hub

### A FAIR Data Management Approach For Radioactive Waste Disposal:

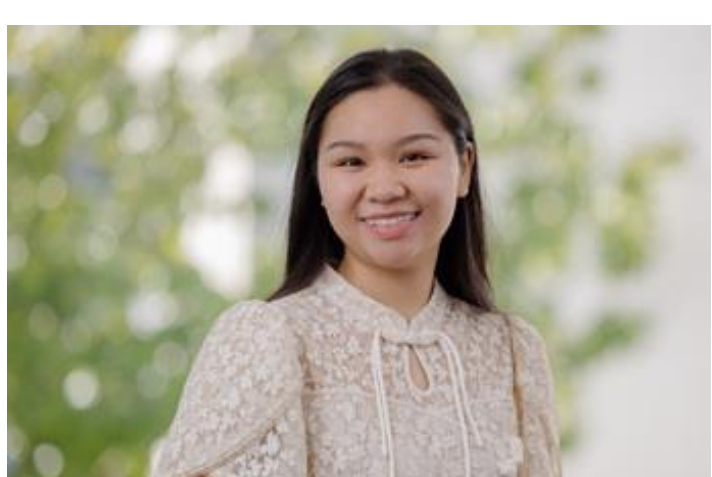
- Starting point for data-integrated white-box impact model
- Provides uncertainty information as input for uncertainty management
- Facilitates traceability and reproducibility

## Sensible Defaults for Analysis Readiness of Simulation Models



▲ Mechanism for providing feed-in data when missing rock properties

[1] de la Varga, M., Schaaf, A., & Wellmann, F. (2019). GemPy 1.0: open-source stochastic geological modeling and inversion. Geoscientific Model Development, 12(1), 1-32.



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