The importance of site characterisation

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Objectives of site characterisation

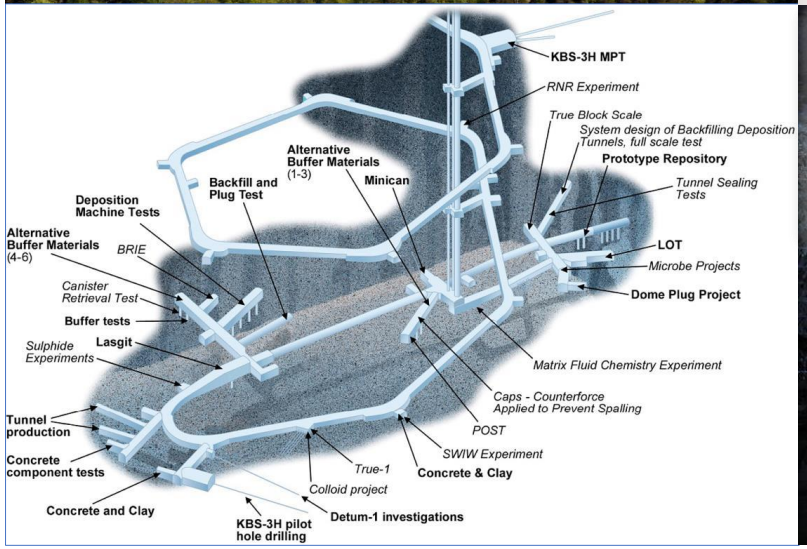
- Understanding of the geo-scientific features and properties of the Äspö Hard Rock Laboratory (Äspö HRL)
- Provides geoscientific guide for external users of the Äspö HRL
- Support for marketing, project planning/execution, business, and innovation development

Underground Laboratories in Baltic Sea Region

- ❑ Callio Lab, Pyhäsalmi mine, Finland
- ❑ Äspö Hard Rock Laboratory, Oskarshamn, Sweden
- ❑ TU-Freiberg's Research and Education mine "Reiche Zeche", Germany
- ❑ Conceptual Lab development co-ordinated by KGHM Cuprum R&D centre, Poland
- ❑ Ruskeala Mining Park, Russia
- ❑ Underground Laboratory of Khlopin Radium Institute, Russia

Äspö Hard Rock Laboratory, Sweden

Äspö Hard Rock Laboratory is a centre for research on Sweden's final repository for spent nuclear fuel. It is also an open research facility that welcomes a wide range of projects.



Support at site and available database

- Hire the Äspö HRL including equipment and skilled staff as an area for experiments and tests
- The geoscientific data in the SKB database SICADA (>400 milj. observations) are available for researchers using the Äspö HRL site for ongoing or planned research activities

Bedrock geology data (>16 km mapped core boreholes, 5 km tunnel mapping)

Borehole data

- geological core mapping (>16 km).
- Borehole images for structural orientation, drill core photography
- geophysical data are available for half of the mapped boreholes

Tunnel data

- Geological tunnel mapping (5 km of underground openings)
- Digitised 2D drawings including rock types, rock quality, fractures, deformation zones and water.
- 3D models of the tunnel geometries

Hydrogeological data (campaigns >51 thousand, objects >5 thousand)

Borehole data

- Time series of groundwater level and pressure
- Steady state and transient hydraulic tests at different scales providing transmissivity, storability, flow regime, and borehole skin
- Flow logging provides volumetric fracture inflow and transmissivity
- Test data from dilution, sorption, and tracer in-situ and from laboratory tests

Tunnel data

- Time series of volumetric inflow and electrical conductivity
- Qualitative inflow assessment of leakage on the tunnel wall
- Data on the temperature, humidity, and pressure of the tunnel air is also available

Hydrogeological data cont.

Surface data

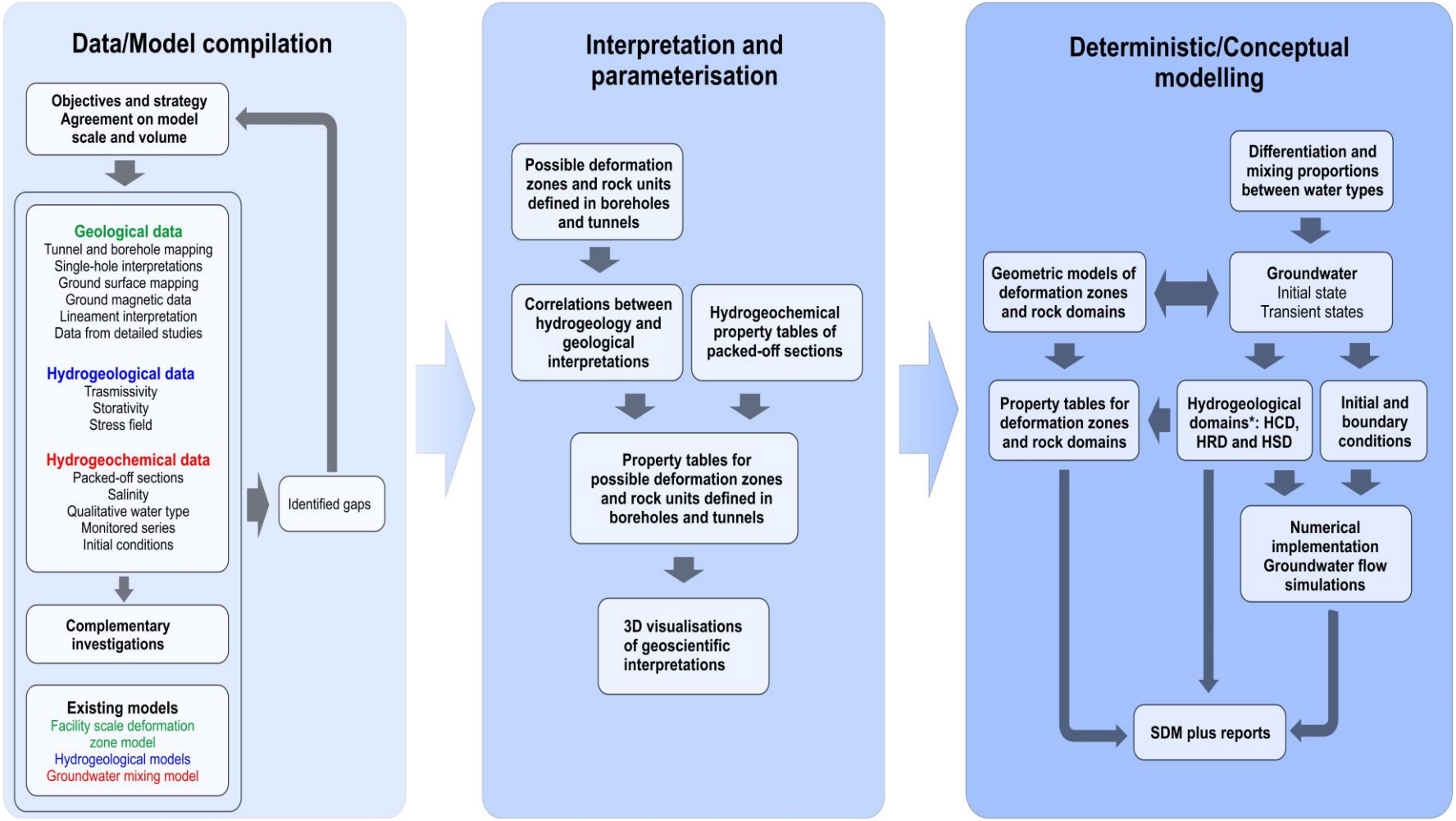
- Monitoring of the Baltic sea water level
- Discharge, temperature, and electrical conductivity of river and lake water
- Meteorological variables include precipitation, barometric pressure, air temperature, relative humidity, wind speed and direction
- Global radiation, and calculated evapotranspiration

Hydrogeochemical data (samples >11 thousand, sites >800)

- Groundwater sampled in different surface and tunnel boreholes
- shallow drill holes (soil tubes), streams, the Baltic Sea, and precipitation.
- Sampling programme include main components (e.g. pH, EC, alkalinity, anions, cations, nitrogen compounds, DOC, HS-) and several isotopes (e.g. 18O, 3H, 34S, 87Sr, 14C)

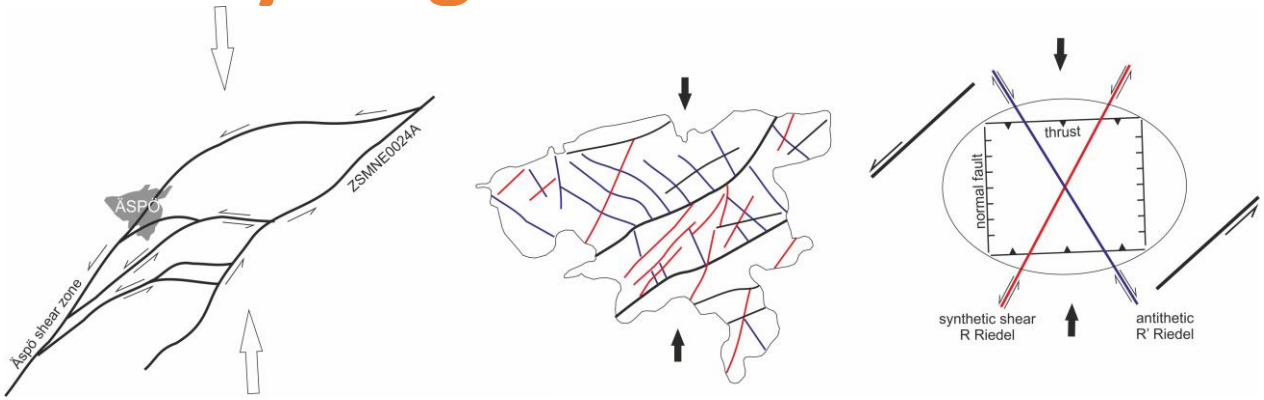
SDM

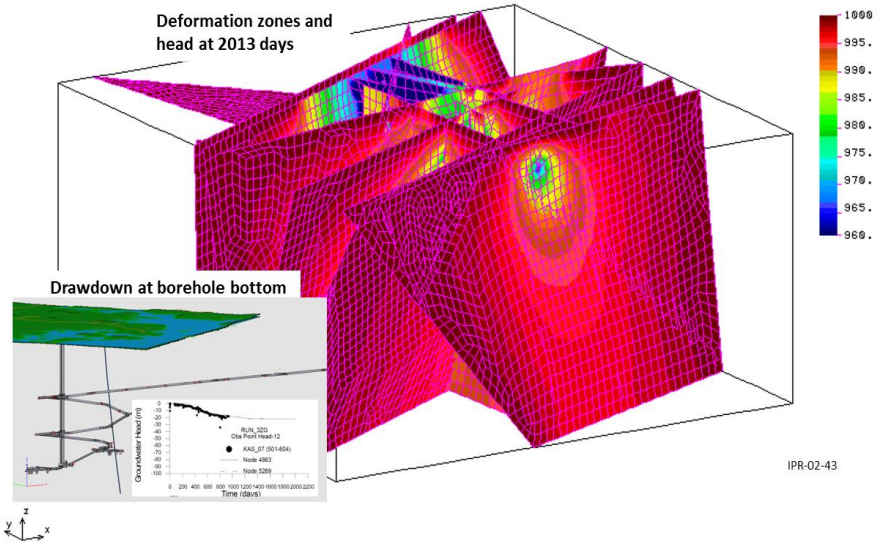
SKB method for Äspö Site Descriptive Modelling (SDM)

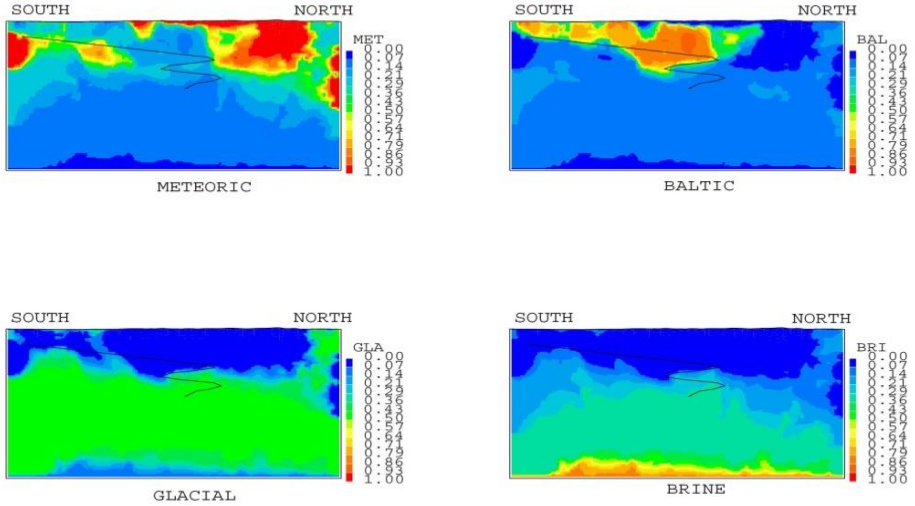


*HCD = Hydraulic Conductor Domain
HDR = Hydraulic Rock Domain
HSD = Hydraulic Soil Domain

Examples of geological, hydrogeological and hydrogeochemical models







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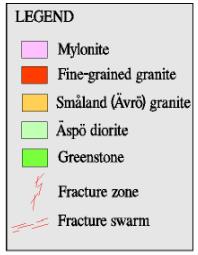
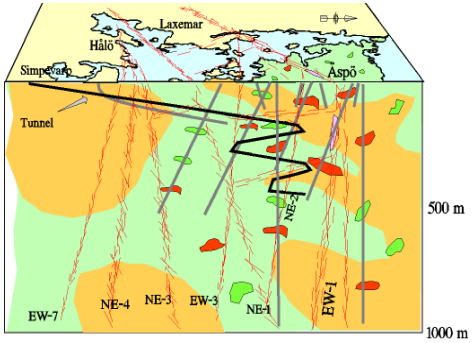
Resulting Site Descriptive Models

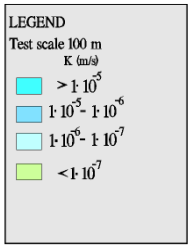
GEOLOGY



a)



HYDROGEOLOGY



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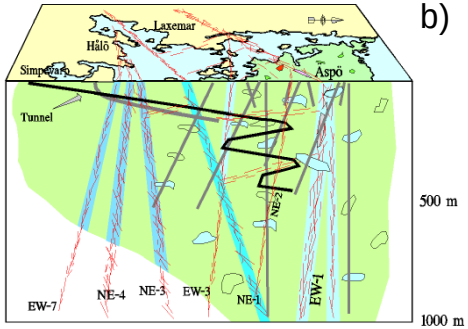
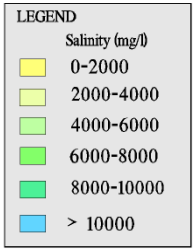
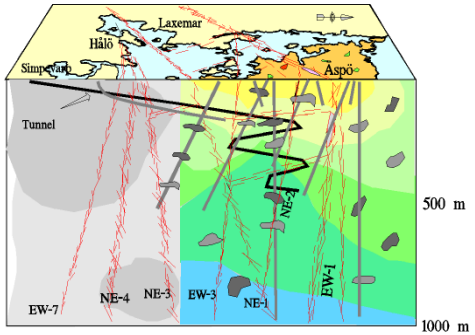


c)

CHEMISTRY





SDM supports research and innovation

- SDM presents a geoscientific guide for external users
- Supports marketing, project planning/execution, business, innovation development and education

Reference to the BSUIN Report: *"Äspö Hard Rock Laboratory - Site Properties, Data and Models" By: Marcus Laaksoharju (Editor), Mats Ohlsson, Jesper Petersson, Mansueto Morosini, Linda Alakangas and Peter Hultgren*

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http://bsuin.eu