

DISCRETE FRACTURE NETWORK MODELING FROM SITE INVESTIGATIONS – FORSMARK SITE, SWEDEN

Purpose(s): Discrete Fracture Network modeling of a candidate site for an underground nuclear waste repository

Client: SKB

Date: Jan – Dec 2005

Location: Forsmark site, Sweden

Partners: Géosciences Rennes Research Lab, France

Project executive manager: Caroline DARCEL

Code(s) used: 3Flo and numerical tools from Géosciences Rennes

Prior to construction of an **underground radioactive waste repository** site in Sweden, SKB currently is leading investigations of candidate sites, which are located in crystalline fractured media.

Within this geological context, the hydrogeological and geomechanical properties of the site are linked closely to the underlying properties of the **multiscale fracture network**.

We have derived a **geometrical statistical model of 3D Discrete Fracture Network (DFN)**, associated with the **Forsmark site**. In this framework, we have developed and used a global method to analyze fracturing from data gathered at boreholes, outcrops and lineament maps and we have tested the consistency of the model with respect to various scales.

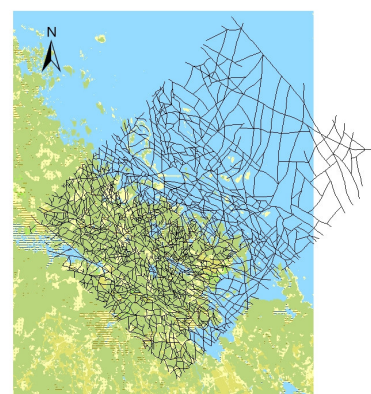
Data relative to fracturing at several scales of observation:



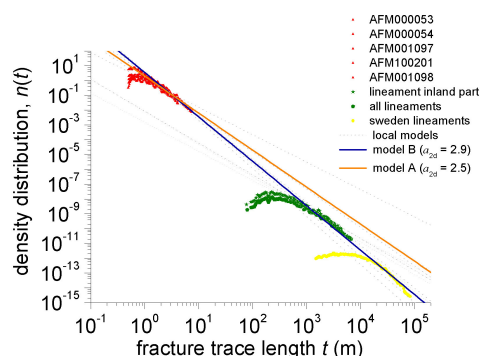
Borehole - cm scale



Outcrop – meter scale



Lineament – km scale



KEYWORDS:

- Discrete Fracture Network
- Scaling Model
- Crystalline rock
- Borehole, outcrop, lineament

⇒ **RESULTS:**

- With regard to the Forsmark site, two distinct mean statistical DFN models, characterized by a power-law model for the fracture_size density distribution, are derived from the outcrop data. However, only one of them is consistent with the kilometric scale. At the opposite scale, which is smaller than, or equivalent to, the borehole diameter, the best model is in accordance with the lower limit of the size-distribution model.
- Sub-horizontal fracturing is more pronounced close to surface.
- Strong variations are observed around the DFN mean statistical parameters. DFN analysis and site modeling will be continued with the objective of integrating full variability into the modeling process.

REFERENCES:

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- Darcel C., Davy. P., Bour O., de Dreuzy J. R. , Discrete fracture network model of the Forsmark site, 2006, SKB R-06-79, Svensk Kärnbränslehantering AB, 2006.