

Solid Earth Discuss., referee comment RC2
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Comment on se-2021-109

Pär Grahm (Referee)

Referee comment on "Multi-disciplinary characterizations of the BedrettoLab – a new underground geoscience research facility" by Xiaodong Ma et al., Solid Earth Discuss.,
<https://doi.org/10.5194/se-2021-109-RC2>, 2021

Section	Regarding	Comment or question
In general	The paper	Well written, interesting and well referenced description of the performed rock characterizations. In addition, a good summary of the Bedretto Lab establishment
In general	Orientation system	It becomes evident that the text is written by many authors when it comes to which orientation system that is used. Sometimes N #°W are used, other times NW-SE striking, and sometimes strike/dip, and even trend for fracture/zones. Different disciplines do use different systems as standard, but try to minimize the use of systems in the same paper.

In general	Uncertainty	For the stress measurements there is some uncertainty span provided, but what about all other parameters; have you done any uncertainty evaluation of magnitudes and orientations? Multiple measurements are needed to get a good picture of the values interpreted. The only text where it is stated that multiple test have been performed is at row 312-313
Title	A unique underground geoscience research facility	Not obvious that a reader absorbs what is the uniqueness of the facility. Few external comparisons are made with international URLs and just a brief benchmark with Grimsel regarding permeability of the granite, see also comment section 500-502. Instead of using "unique" in the title I suggest Bedretto should be presented as "a new underground geoscience research facility"
68	Äspö	Äspö HRL
137	of more than 100 earthquakes within the region	Time interval?
144	Medium to large-scale fracture	Consider introducing the definition Full Perimeter Intersection "FPI" as used by SKB and other repository engineering companies, e.g. SKB R-06-05 "Using observations in deposition

tunnels to avoid intersections
with critical fractures in
deposition holes"

228

Three distinct lithological units are present in the characterized rock volume (Figure 5)

Figure 5 is a not an interpretation of the rock volume but core descriptions from three boreholes?

322-324

Therefore, it is expected that "it is expected" and "indeed the transmissivity values of the case" in the same CB1 and CB3 are at least as high as the largest transmissivity observed within the intervals of CB2, which is indeed the case

410-415

Risk of undersampling

The configuration of the lab (orientations of tunnel + boreholes) may underestimate intensity of fractures and structure that have pole trend/plunge around 45/45 (strike/dip 135/45) It would therefore be of great interest to drill a hole with azimuth 45 and inclination -45 (from horizontal plane)

440

wavelengths

Maybe use higher frequency?

441-442

"As already shown, strong stress variations are evident along the CB boreholes, particularly around the fault zones."

Where is this already shown?

500-502

The Bedretto Lab represents the state-of-the art for conducting meso-scale experiments on the crystalline rock masses and offers opportunities for international collaborations

"State-of-the-art" methods have indeed been used for the characterization of the local rock volume. However, as a novel laboratory this is too much of an exaggeration at this stage. There are several underground research laboratories in the crystalline rock with many decades of experience and solid scientific results, e.g. Äspö HRL in Sweden where site investigations began 1986.

Other aspects that appear to be missing for the Bedretto Lab to be a "state-of-the-art" test bed are an open database with access to e.g. various data from continuous hydro monitoring and water chemistry development over time, a 3D-modelled interdisciplinary site description to e.g. assist in deciding on new survey sites as well as a customized service organisation at the site.

518-519

The rock volume will be

Possibly, it can be presented

further characterized and densely instrumented with tailored sensors. It will allow for in-depth studies of the hydro-seismo-mechanical response of fractured rock masses.

with even greater clarity what the Bedretto Lab can offer the future research customers, see comment 500-502.

Table 4

units

I guess that the unit for the p and s waves should be m/s and not km/s, or the numbers should be divided by 1000?

Figure 2

reference

The caption reference to the “lower row of figure 6”. I guess it should reference to figure 7.

Figure 8

Labelling

The text reference e.g. Figure 8a, 8b etc, but there is no such labels in Figure 8.