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Discussions

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Interactive comment

Interactive comment on "Structural geology and geophysics as a key to build a hydrogeologic model of granite rock to support a mine" *by* L. Martinez Landa et al.

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This paper nicely illustrates a methodology to characterize and model groundwater flow in a fractured granitic rock. The overall approach is to characterize the hydraulically important structural features (such as faults, dykes, etc.) in the "near" or "inner" region (for example, in the vicinity of a mine) using a combination of geology, geophysical, geochemical and hydrologic methods. These features are explicitly built into a numerical model of the groundwater flow system. For the "far" or "outer" region, equivalent hydraulic properties are used to include structural features that are unknown or not characterized. This is certainly a reasonable approach, and this paper shows that the approach can work quite well. This paper is suitable for publication in Solid Earth after

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Discussion paper

minor revisions.

Comments:

1. I am confused by the column headings “transmissivity” and “storativity” in Table 1. I assume these terms apply only to 2D features. For 3D features, these terms should be “hydraulic conductivity” and “specific storage”. For 1D features, there are no standard terminologies in groundwater hydrology. It would be helpful to show the flow law that is being used in the model. Also, the meaning of the storativity of a 1D feature (borehole) is unclear to me. Does this have to do with simulating the effect of wellbore storage during hydraulic test?

2. Please provide some measure of uncertainty for the parameters in Table 1. These could be in the form of linearized confidence intervals that are usually calculated by optimization programs. Also, were some of the parameter values assumed a priori and held fixed (not changed) during the calibration?

3. I would like to see a bit more information about the model set-up for the blind prediction. On page 10, the text noted that fractures not affected by any tests were assigned the hydraulic properties of fractures of the same family in the calibrated model. Which are these “uncalibrated fractures”? The fractures shown in Figure 11 (blind prediction) appear to be the same as the features shown in Figure 9 (calibration). How would the predictions be affected if the “uncalibrated fractures” were given different hydraulic properties? Also, how are the hydraulic properties of the “external matrix” determined?

4. I find the discussion of the scale effect (section 4) rather confusing. Looking at Figure 10, one might ask why there are no higher K values (for example, 1E-5 m/s) measured by pulse tests? The answer likely lies in the fact that the pulse would decay so quickly in a high K test interval that the pressure data would be impossible to analyze. Conversely, why are there no low K values (for example, 1E-11 m/s) measured by constant head tests? The answer likely lies in the fact that the flow rate would be too low to measure. Thus, I think Figure 10 can readily be explained as illustrating the

limitation that the testing equipment and resources impose on the range of K that can be practically measured. To call this a "scale effect" seems to obfuscate rather than clarify.

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