

Interactive comment on “Accelerated gravity testing of aquitard core permeability and implications at formation and regional scale” by W. A. Timms et al.

Anonymous Referee #1

Received and published: 11 April 2015

Comments on “Accelerated gravity testing of aquitard core permeability and implications at formation and regional scale” by Timm et al.

As I understand from the manuscript entitled by “Accelerated gravity testing of aquitard core permeability and implications at formation and regional scale”, the authors employed a centrifuge permeameter (CP) test methodology and developed a new test equipment in order to estimate hydraulic conductivities of low K samples in the lab environment rather than in-situ testing with some limitations under the assumptions of no consolidation and geochemical reactions during the centrifuge. I am confused with the motivation of this research. If the aim of this research is to show the use of new CP-

[Full Screen / Esc](#)

[Printer-friendly Version](#)

[Interactive Discussion](#)

[Discussion Paper](#)



based testing method for steady-state condition, the test results, which are somehow acceptable (I think they are questionable), verify that this method can be evaluated as an alternative to the existing ones when the further improvements as mentioned in the last paragraph of Section 5.2 are done. Yet, if the aim of this study is to discuss the effects of local heterogeneity, mechanism of vertical leakage under centrifugal forces or uncertainty factors which eventually affects the estimations obtained from any test method, the focus of this work does not fit and the text does not contribute the new insights to the literature. The authors stated that there were no available aquifer tests which go in line with CP. If the aquifer test had been conducted on the site investigated, the result would have been more interesting and reliable when compared with the existing ones. In my opinion, based on the test cases studied, it is hard to generalize the results provided by the authors. The following comments may improve the quality of text: 1. The core samples were taken from the well-documented sites and studied by various researchers. Although the author stated as “This paper focuses on a 2-D tomograph model from the CL site for comparison with in situ and laboratory permeability methods” in Page 2808, line 7 to 9, I could not see any comparison of the K values between CP-based estimations and K values obtained from the other methods in the text. Readers see the phrase as “the unpublished data” in the text. Why do not the authors share the data with their colleagues? Are these confidential or is the use of those data restricted? 2. In the preparation of cores section, there are several factors which may affect the test results such as time, moisture content, degree of saturation, vacuum pressure (stated as 100 kPa is standard in the lab environment.), etc. I think those parameters deserve more attention since samples taken from the site in a real field application may involve more uncertainty factors. The performance of the CP test can be checked with these parameter to draw the limitations. At least a sensitivity analysis could have been conducted to evaluate the effects of selected parameters on CP test or to comprehend effects of the uncertainty if possible. 3. Related to the above comment, the authors used N=14 test data which is considerably low in order to generalize or understand the effect low K on the aquitard. 4. Is there any correlation among

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)

the sample depth, g-level used in the test and Kv? Why were the different g-level used during the tests as shown in Table 3. To satisfy the steady flow? Or is it related with pore water pressure? In any case, this needs an explanation. 5. In Page 2812, “Steady state flow was defined as ± 10 % change in discharge over subsequent measurements in time, provided that influent flow rate was within ± 10 % of the effluent flow rate”. Why? Why not 5% or 20 %? Does this change depend on the order of magnitude of discharge? The key point of CP test is to satisfy the steady-state condition. I think it is better to show here a brief discussion on the measurement uncertainty rather than explaining only in the supplement S4. 6. How can we be sure to obtain unique Nmid? 7. The presentations of Eqs.9 and 10 are problematic. Use different dummy variable different than r. 8. I think Figure 6 is unnecessary. It can be removed from the text without resulting in any loss of the clarity. As similarly, I think that Figure 4 does not make any contribution to the discussions in the text.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 2799, 2015.

HESSD

12, C965–C967, 2015

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

