Interactive comment on "The usefulness of outcrop analogue air permeameter measurements for analysing aquifer heterogeneity: testing outcrop hydrogeological parameters with independent borehole data" *by* B. Rogiers et al.

Anonymous Referee #2

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This manuscript presents an investigation to use outcrop analogue air permeameter measurements for analyzing aquifer heterogeneity. The authors compared the air permeameter based equivalent conductivity (K) using outcropping sediments with the constant head measured K values using borehole sediments from five sediment formations (including clayey and sandy sediments) of the Neogene aquifer in Belgium, and also compared with the K values resulted from pumping tests. All outcrop samples display higher mean K values than the borehole sediment based K values due to the weathering of the clay layers at the surface and the potential compaction and consolidation

in the subsurface (which were partially verified through the differences of sediment grain size and porosity). A linear scaling relationship was derived with r2 = 0.7, which permits rescaling of outcrop K values to their subsurface equivalents. In addition, the authors also discussed the scale effect, vertical anisotropy and spatial variability. The manuscript has a sound theoretical basis and provides practically useful results.

The manuscript is well written, but certain informations should be added in the "Materials and methods" section. This section is over simplified. The readers have to go to the reference papers for methods in order to understand the data processing. The authors should give a brief description on the air permeameter measurement, conversion to saturated K, and upscaling technique from multi grids measurement to outcrop scale (equivalent K). Since the manuscript is discussing K heterogeneity with geostatistics, clear information on the sample collection should be provided, such as grid density, the size of outcrops, the borehole depth and sample amounts in each formations, as well as the related K measurements etc. This information will help readers to more easily follow the manuscript. For example, the K distribution for Sandy part Diest Fm (shown in Figure 3e) shows a quite narrow peak compared to other formations, and the authors mentioned that the Diest Fm is not penetrated fully by the cored borehole (Page 9695, line 16). Does this imply less amount of K samples collected from a single borehole for the K distribution calculation thus leading to a narrow peak? A separated paragraph is suggested to describe the above mention sample information, the study area, and the tested five aquifer formations.

Some minor corrections suggested below: 1) Page 9692, line 9: the "Teutsch et al., 1998" paper is not included in the reference list. 2) Page 9693, line 12-13: "the amounts of silt and clay present throughout the Neogene aquifer sediments might initiate such dilation properties." The Neogene" could be removed from this sentence since no related information was provided in the former text. 3) Delete the cone penetration test (CPT) in both text and Figure 1 since the CPT is not related to this manuscript. 4) Page 9696, line 5: "the first method" indicates "suspension cylinder method"? The current

writing is confusing.