Author's comments according to anonymous reviewer #1

The authors would like to thank the reviewer for the constructive review of the manuscript. We will try to address every of your points in the following comment sections.

Referring to point no.1, objective: clear research question

We agree with your comment, that the research question needs specification. In reference to point no.2 (design of experiments) we will strengthen the explanation.

Referring to point no.2, design of experiments

The tested bentonite suspensions vary with regard to the raw material (Ca- and Na-bentonite) and the solid content. These provide diverse rheological behavior under aspect of flow and filtration tendency in terms of separation of the solid and fluid phase of the suspension within or at the entrance of the porous medium. We agree with your comment that the influence of the parameters to the penetration behavior need a more detailed explanation.

The water absorbency and the swelling rate of natural bentonites differ greatly in respect to the embedded cations Ca or Na. In general, Na-bentonite shows a higher swelling rate than Ca-bentonite with consequences for the experimental layout: Ca-bentonites provide the possibility to generate high values of solid content. For a comparable rheology of the suspension, Na-bentonites require lower solid contents. The separation effect of bentonite particles and water out of the suspension arises in all tests using Na-bentonite suspensions. Due to the lower solid content and slightly larger particle size of the particles, the Na-suspension creates the filtering process at the entrance of the pore space of the porous media and performs the thick layer of bentonite particles (filter cake). As a result, the penetration depth of the Na-suspension is very small. In contrast, Ca-suspension create a larger penetration depth due to the smaller particles size. It is evident for all experiments, that the separation process of solid and fluid phase requires a certain penetration depth and inner shape of the pore structure. We will revise this part carefully.

Referring to point no.2, contact angle measurements

We agree with your comment, that this chapter is some kind of "stand alone" chapter, without being directly implemented to the analysis. The idea behind these measurements was to investigate the wetting behavior of the different types of suspensions depending on the formation of a water film (caused by "filtration" of the suspension during imbibition) in front of the suspension. At the time of submission, this part was still under investigation. Unfortunately, the staff working on this has changed its affiliation and working area, hence we cannot improve this part extensively and as needed. We would like to remove this chapter from the manuscript for an overall increased consistency.

Referring to point no.3, style

We will revise the abstract to be more a concise summary of the experiments and results.

Referring to point no.3, colored figures like fig.6, 14, etc…

Well, these images have been implemented just o give an impression about the overall pore space as well as of the individual “pores”. Of course, they are not of utmost importance and can be easily shifted into the Appendix of they can be added as supplementary material. The partitioning of the pore space has been performed to assess the “quality” of the representativeness of the investigated “CT-volume” referred to the experimental volume (table 3 and the related part of the text). We can rephrase this part to be more distinctive.

Referring to point no.4, Pore Size Distribution

- The pore size distribution has been determined by watershed partitioning of the pore network. We will add this information.
- For clarification: a histogram is a graphical representation of a frequency distribution of a metrical scaled quantity. Hence, the profile is a 2D or so called line histogram of the frequency distribution of grayscales along the individual profiles. Accordingly, for the entire image this would be a 3D or volume histogram. Hence, we will keep using “histogram” as notation.
- The measurement module is a numerical “toolbox”, which features different algorithms for image quantification. Since this knowledge is not essential for the manuscript, we will remove these phrases consequently from the document.