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Interactive comment on "X-ray Computed Tomography Investigation of Structures in Opalinus Clay from Large Scale to Small Scale after Mechanical Testing" *by* Annette Kaufhold et al.

Anonymous Referee #2

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Title: X-ray Computed Tomography Investigation of Structures in Opalinus Clay from Large Scale to Small Scale after Mechanical Testing

General comments Thank you very much for this paper. It match's perfect into the scope of the special issue in Solid Earth. This paper should be a welcome addition to the technical literature in the field, and its scientific content is quite good. I am interested in "Mirco-structural Investigation" on line 313 in page 14 because the both result supplemented lost data each other. These results will be able to lead the idea to progress the discussion for micro-macro issue on material deformation/failure. Mean-

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while, still some modification should be required. Please check some questions and comments like below.

Specific comments Line 23 in page 2 To-down approach will give wrong direction about this paper's concept. It should be scale down approach.

Line 45-47 in page 2 Probably, the authors' background is rock engineering or geological engineering? This is partially correct but not exactly. This sentence could be sandy soil, sandstone or other rocks. This part is more rather general topic so it may be good to include more general material like soil as well.

Line 62 in page 2 This reference seems to be conference paper. Probably, this reference paper has been upgrade as Toshifumi Mukunoki, Takahiro Nakano, Jun Otani and Jean-Pierre Gourc (2014), Study of cracking process of clay cap barrier in landfill using X-ray CT, Applied Clay Science, Vol. 101, pp. 558-566, DOI 10.1016/j.clay.2014.09.019

Line 94 in page 4 What are these (file 13001, drilling BLT-A6) information?

Line 101 in page 4 How authors did conduct this work? How can you keep the failure condition after testing? It is better to explain more because this approach is important but not so easy, I imagine.

Line 108 in page 5 Do you mean "triaxial compression testing"? it is better to show the picture of testing scene. If you did triaxial compression test, how much the confining pressure? Was the samples saturated? The information of this session is very little. Authors should add more testing condition.

Line 126 in page 5 Is this hydrogen chloride "solution"? Is there any information about concentration? It is necessary to explain the concentration.

Line 166 in page 6 which is a factor of 10 better compared to..... What do you mean "10" here?

Line 193 in page 7 “The aim of the present study was to investigate crack formation which could be related to microstructural features or mineralogical heterogeneities (as fine bedding, fossil shells, etc.).” This sentence should be appeared in the beginning of this section to clarify the authors concept.

Line 243 in page 10 “Segmentation” How do you segment the image? It is necessary for authors to discuss threshold value here.

Line 256 in page 11 “achieve” “achieve ”replace other verb. How do you achieve higher image resolution? If authors have special idea, please explain the meaning of “achieve higher image resolution.

Line 277 in page 12 Please add the some reference which authors referred.

Line 288 in page 12 this seems to be the first reported CT data set of such a zone This sentence is not clear about author’s point. Please explain more.

Line 299-301 in page 13 Hence, the total number of cracks detected increased by a factor of almost 36. If the result is up-scaled to the large core size, this would be a 100 to 150. We are not sure the mean of these values. What are they? Please explain more.

Line 313 in page 14 Mircostructural Investigation Your title is "X-ray Computed Tomography Investigation of Structures in Opalinus Clay from Large Scale to Small Scale after Mechanical Testing". The main tool of this paper is CT so it would be better to summarize this chapter by the observation obtained from CT in the last paragraph. Maybe I am wrong because authors described the aim of this study is the visualization of the shear failure in various scales to get more information about the deformation process on line 81-83 in page 3; however, I am concerned about the structure of last chapter. It may be better if authors summarize the conclusion with more CT data.

Line 356-357 in page 16 What do you mean 3D? You are showing 2D image only here (see Figure 10, 11 and 12)

Line 374 in page 16 This paper did not mention about any water contents

Technical correction about text Line 68 in page 2 facies “is”, this could be “are”?

Line 98 in page 4 The “sample has” should be “samples have”?

Line 119 in page 5 X-ray fluorescence(XRF) spectrometer

Line 127 in page 5 What is TIC? This may be TC?

Line 128 in page 5 What is TOC?

Line 129 in page 5 CO2 should be CO2.

Line 131 in page 5 The CEC should be “The Cation Exchange Capacity (CEC)” .

Line 147 in page 6 “X-Ray Computed Tomography” should be “X-ray Computed Tomography (CT)”.

Line 159, 169 in page 6 140KV and 270KV should be 140 kV and 270 kV.

Line 180in page 7 Opalinus Clay should be Opalinus (OPA) clay

Line 212 in page 8 some words may be missed here after "from".

Line 214 in page 8 It is better to use other conjunction because you used same conjunction in same paragraph already.

Line 262 in page 11 smaller than what?

Line 286 in page 12 Top-down should be Scale done?

Line 315 in page 14 Put (SEM) after “For the scanning electron microscope”

Technical correction about Figures and Tables Figure 1 in page 3 What is the point of red part in Figure 1? Explanation is very few so some more explanation should be added.

Figure 2 Probably, this is because of PDF conversion? Anyway, the quality of Figure 2

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is not great.

Figure 4 Put "(a), (b)" to each image. Do you need image on the right lane?

Figure 5 What is authors' point for Figure 5?

Figure 6 Is Figure 6 a part of Figure 5? This should be explained more. Put a scale in the right Figure.

Figure 7 Scale is not clear in left image. Caliper and scale are not clear on right image.

Figure 8 Where did authors measure in Figure 8. It is not clear about Distance 1:3.7 ïĄm. The scale in Figure 8 is not clear.

Figure 9 Same comment as Figure 8 in the above. Put red line in left image like Figure7 and 8. What do authors want readers to focus?

Figure 10 Use not red square but red circle in left image to compare the essential part.

Figure 11 Same comment as Figure 9.

Table 1 Delete first and last line in the table 1.

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