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Interactive comment on "On the path to the digital rock physics of gas hydrate bearing sediments – processing of in-situ synchrotron-tomography data" *by* Kathleen Sell et al.

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The authors describe pore scale imaging of gas hydrates in sediments and the processing of the obtained data and their use for numerical modelling. Especially the detailed explanation of image processing to yield a 3D segmentation of the sample components is of great value for future imaging studies of rock samples with and without gas hydrates. Further, it is a great addition to other publications of this dataset which focus more on the experimental setup (Chaouachi et al., 2015). Some questions remain about the numerical modeling section: Your images indicate that the hydrate does not cement the grains however your modelled P-wave velocities increase a lot for low hydrate saturations indicating a significant stiffening of the sediment which –

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according to effective medium models – would only be achieved by cementing the grain contacts. Comparing your numerical modeling results to effective medium models (Dvorkin, Helgerud, Ecker) and laboratory data (by Priest, Kneafsey, Waite, etc.) might be a good benchmark for your numerical modelling results. This section could benefit from a more thorough discussion about factors causing differences between modelled and laboratory / field data. The authors conclude that this study enables to distinguish gas hydrate from a gas enriched system and gas hydrate from a free gas system based on their seismic response. However, the modelled velocities for both differ by just 40 m/s. That would actually indicate that both formation mechanisms lead to similar elastic properties. . Observed differences from the pore-scale imaging of these two gas hydrate types are not reported in the study. The study is certainly worth publishing but could be improved by relating modelling results to published velocity data.

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