Geosci. Model Dev. Discuss., 8, C2374–C2376, 2015
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Geoscientific Model Development Discussions
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8, C2374–C2376, 2015

Interactive Comment

Interactive comment on "GO2OGS: a versatile workflow to integrate complex geological information with fault data into numerical simulation models" *by* T. Fischer et al.

Anonymous Referee #2

Received and published: 2 October 2015

The authors developed a workflow for converting complex geological models built by GOCAD software into numerical simulation models as an open-source format VTU, which can be used by OpenGeoSys simulator. The workflow is able to transfer structural information as FEM mesh, and inherit stratigraphic unit property through material group identifier. The converting procedure consists of two algorithms. One is implemented to read GOCAD data and convert that into unstructured mesh by integrating the split nodes. With the method of hexahedra resampling, the other one is to cope with reconstructing fault structures from an area element to a volume one. The converted mesh quality has been evaluated by edge aspect ratio, which showed a higher value after reconstruction. A proof-of-concept study was conducted by simulating hydraulic

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head in a regional catchment model with high complexity, and the resulting distribution showed that the faults have high influence on regional groundwater flow patterns.

Subsurface geological models often have complex structures due to the existence of discontinuous stratigraphic layers and faults. Powerful software, e.g. GOCAD, PETREL, have been developed for years to build structured and unstructured geological models, which eventually are applied into reservoir simulation by Oil&Gas industry. However, because of different implemented numerical methods, those models often cannot be directly used by software, e.g. OpenGeoSys, Processing Modflow, which focus on simulating groundwater flow, mass transport and induced THMC impacts in subsurface. Thus, an interface or a preprocessing tool is always demanded. This paper hereby exactly tackles the above mentioned problem and presents a solution as a comprehensive workflow. Moreover, how to well represent fault zones and simulate them within the framework of FEM has always been a tough issue faced by modelers. Although this paper does not invent new techniques, it successfully introduces a reconstruction procedure from GOCAD to OpenGeoSys to handle the above mentioned problem.

Overall, the paper makes its great contributions to geoscientific modelling as a link between diverse tools, and as a useful preprocessing tool to FEM simulation on complex subsurface models.

However, regarding some specific contents in this paper, some recommendations are remained as follows:

1.In Algorithm 1, the functionality of step 7 “Integrate split nodes into structured grid” is clearly shown in Fig.4b, but how it has been exactly accomplished is not clear. The algorithm 1 is recommended to explain more on step 7 instead of listing all the read and write steps.

2.The verifying case ‘Setup A’ does not have faults or outcropping layers, after employing Algorithm 1 as stated in the paper, it would be a structured grid and actually does

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not need step 7 in the conversion, and also there is no simulation conducted on it. The purpose of Setup A is recommended to declare more clearly.

3.The mesh quality has been studied and discussed in section 2.3. The interaction between the elements number for reconstruction and element quality are clear (Figure 7), but a sensitivity analysis on how the aspect ratio is changing with the reconstruction resolution (horizontal and vertical) would be preferred, as it would be a good hint on how the resolution could be chosen.

4.In Algorithm 2, how the unstructured grid and faults have been resampled is clear, but whether there would be conflicts existed when resample the cells near the fault zones is not clearly shown. Therefore, a case on reconstruction near the faults would be preferred to be shown as Fig 5.

5.In Page 6314, line 2, 'Petrel' is considered as a groundwater flow simulation code, which might not be the case.

Interactive comment on Geosci. Model Dev. Discuss., 8, 6309, 2015.