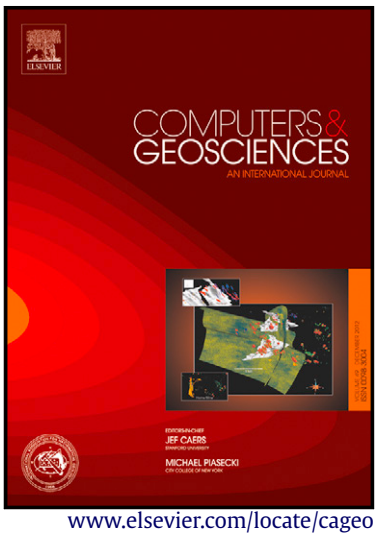

www.elsevier.com/locate/cageo

PET2OGS: Algorithms to link the static model of Petrel with the dynamic model of OpenGeoSys

C.-H. Park, Y.J. Shinn, Y.-C. Park, D.-G. Huh, S.K. Lee

PII: S0098-3004(13)00254-9
DOI: http://dx.doi.org/10.1016/j.cageo.2013.09.014
Reference: CAGEO3271

To appear in: *Computers & Geosciences*

Received date: 8 August 2013
Revised date: 26 September 2013
Accepted date: 28 September 2013

Cite this article as: C.-H. Park, Y.J. Shinn, Y.-C. Park, D.-G. Huh, S.K. Lee, PET2OGS: Algorithms to link the static model of Petrel with the dynamic model of OpenGeoSys, *Computers & Geosciences,* http://dx.doi.org/10.1016/j.cageo.2013.09.014

PET2OGS: Algorithms to link the static model of Petrel with the dynamic model of OpenGeoSys

C.-H. Park[a,*], Y. J. Shinn[a], Y.-C. Park[a], D.-G. Huh[a], S. K. Lee[a]

[a]*Korea Institute of Geoscience and Mineral Resources (KIGAM), 124 Gwahang-no, Yuseong-gu, Daejeon 305-350, KOREA.*

Abstract

A set of three algorithms named PET2OGS is developed to integrate the static model (Petrel) with the dynamic model (OpenGeoSys). PET2OGS consists of three sub-algorithms that convert finite difference methods (FDMs) grids to finite element methods (FEMs) grids. The algorithms and the workflow of the integration procedures are described in detail. After the proposed algorithms are tested on a variety of grids both in homogeneous and heterogeneous media, the integrated platform of the static and dynamic models is applied to model CO_2 storage in a saline aquifer. A successful demonstration of the proposed algorithms proved a robust integration of the platform. With some minor modifications of the algorithms in the part of input and output, the proposed algorithms can be extended to integrate different combinations of FDM-based static models and FEM-based dynamic models beyond the example combination in the paper.

Keywords:
FDM, FEM, Petrel, OpenGeoSys, static modeling, dynamic modeling, CO_2 storage

1. Introduction

Modeling of coupled processes in subsurface media has been a multidisciplinary work that combines the static nature of geology in geological time scales and the dynamic nature of human activities in relatively short time scales. Due to the difference in the time scales of geology and human activities, the former is termed as a static model while the latter is referred to as a dynamic model. In the static model of geology, we often attempt to

*Corresponding author: Tel.: +82 42 868 3502. E-mail: chanhee.park@kigam.re.kr