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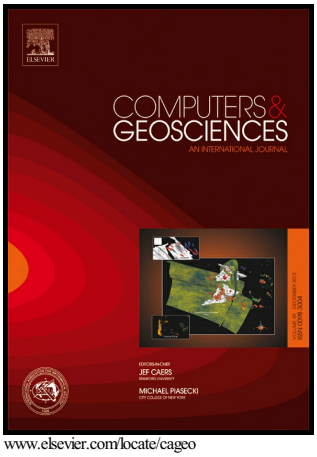

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PII: S0098-3004(17)30190-5
DOI: http://dx.doi.org/10.1016/j.cageo.2017.02.015
Reference: CAGEO3912

To appear in: *Computers and Geosciences*

Received date: 3 March 2016
Revised date: 6 August 2016
Accepted date: 16 February 2017

Cite this article as: Esmail Ansari, Richard Hughes and Christopher White Statistical Modeling of Geopressured Geothermal Reservoirs, *Computers an Geosciences,* http://dx.doi.org/10.1016/j.cageo.2017.02.015

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Abstract

Identifying attractive candidate reservoirs for producing geothermal energy requires predictive models. In this work, inspectional analysis and statistical modeling are used to create simple predictive models for a line drive design. Inspectional analysis on the partial differential equations governing this design yields a minimum number of fifteen dimensionless groups required to describe the physics of the system. These dimensionless groups are explained and confirmed using models with similar dimensionless groups but different dimensional parameters. This study models dimensionless production temperature and thermal recovery factor as the responses of a numerical model. These responses are obtained by a Box-Behnken experimental design. An uncertainty plot is used to segment the dimensionless time and develop a model for each segment. The important dimensionless numbers for each segment of the dimensionless time are identified using the Boosting method. These selected numbers are used in the regression models. The developed models are reduced to have a minimum number of predictors and interactions. The reduced final models are then presented and assessed using testing runs. Finally, applications of these models are offered. The presented workflow is generic and can be used to translate the output of a numerical simulator into simple predictive models in other research areas involving numerical simulation.

Keywords: Predictive model, Statistical model, Experimental design, Geothermal reservoir, Inspectional analysis, Dimensional analysis

1. Introduction

Developing geopressured-geothermal reservoirs reduces global warming and secures energy needs. Identifying attractive candidate reservoirs for producing geothermal energy requires quick and simple models because simulating each case individually is expensive. One approach to translate the output of a simulator into quick models with general applicability at all scales is to combine inspectional analysis with statistical modeling.

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