Available online at www.sciencedirect.com

ScienceDirect

Procedia Engineering 154 (2016) 308 – 316

Procedia Engineering

www.elsevier.com/locate/procedia

12th International Conference on Hydroinformatics, HIC 2016

Importance of Alternative Conceptual Model for Sustainable Groundwater Management of the Hat Yai Basin, Thailand

A. Lukjan[a,b*], S. Swasdi[b], T. Chalermyanont[a,c]

aDepartment of Civil Engineering, Prince of Songkla University, Hat Yai, Songkhla 90110, Thailand
bDepartment of Civil Engineering, Rajamangala University of Technology Srivijaya, Muang, Songkhla 90000, Thailand
cSouthern Natural Disaster Research Center, Prince of Songkla University, Hat Yai, Songkhla 90110, Thailand

Abstract

This study evaluates two sources of conceptual model uncertainty of a groundwater flow model for the Hat Yai Basin (HYB). Two hydrogeological interpretations and five boundary conditions are considered. Ten alternative conceptual models are proposed and implemented in a 3D-mathematical model (MODFLOW). Model uncertainty is evaluated through the information criteria based method. Study results show that the contribution of uncertainty in hydrogeological interpretation has more impact on groundwater system than the boundary conditions. Additionally, these results strongly indicate the importance of conceptual model uncertainty in groundwater modeling for sustainable groundwater management.

Peer-review under responsibility of the organizing committee of HIC 2016

Keywords: Hat Yai Basin; conceptual model; model selection.

* Corresponding author.
E-mail address: federun9@gmail.com

1. Introduction

The Hat Yai basin (HYB) is a sedimentary basin located in the Southern peninsular of Thailand (Fig. 1). Groundwater in the HYB is an important water resource. Because of limited surface water, groundwater demands are high in every sector, such as household, tourism, industry, and agriculture. Over pumping of groundwater has led to serious problems, such as substantial decrease in groundwater levels and seawater intrusion problems. In order to assess groundwater potential, numerical model based on a single conceptual model is often produced in the HYB (e.g., [1-3]). However, consideration only one conceptual model may lead to statistical bias and uncertainty in model

Peer-review under responsibility of the organizing committee of HIC 2016
doi:10.1016/j.proeng.2016.07.480

prediction. In last ten years, conceptual model uncertainty has received more attention in groundwater applications (e.g., [4-10]). Many studies point out that the impact of conceptual model uncertainty is more significant than parameter uncertainty. Multi-model theory is a popular method in handling model uncertainties. A discrimination criterion (or model ranking) is developed based on posterior model probabilities or a model weight that directly uses to evaluate model importance [10].The objective of this study is to generate the multiple conceptual models by incorporating the uncertainty in hydrogeological interpretations and boundary conditions into groundwater flow model of the HYB. The Akaike Information Criteria based Model Averaging (AICMA) method [11, 12] is used to rank and select the plausible or best conceptual model and evaluate the impact on groundwater modeling and groundwater management of the HYB.