

Developing a Large Scale Model for the Estimation of Gas Hydrates

Presenting author: John H. Schuenemeyer, Southwest Statistical Consulting, LLC

Authors: John Grace, Earth Science Associates, Ray Faith, MIT, Matt Frye, U.S. Minerals Management Service & Gordon Kaufman, MIT

Abstract: The U.S. Minerals Management Service recently sponsored research to develop a mass balance stochastic model to assess gas hydrate volume in the U.S. Federal Offshore area of the Gulf of Mexico. We will describe the basic components of the model and how the model is constructed. The basic model consists of four modules – one generates and migrates charge, a second determines the container size, a third defines the saturatable fraction of the container and a fourth accepts input from these modules and generates a distribution of volume of in-place gas hydrates. There are four input variables in addition to water depth, sand percent and location. The model evaluates over 200,000 cells and has been run for 1,000 replications. There are over 20 stochastic sub-models specified by distributions and/or various types of regressions. The current code consists of 40 plus FORTRAN subroutines and thousands of lines of code. The initial template for this model was programmed in Crystal Ball, a high level commercial simulation language. We argue that this two-stage approach is an efficient way to develop a large complex model because it allows easy debugging and testing and allows users to quickly view the results of initial assumptions. In addition, it provides a structure for programming in a lower level and more efficient language such as FORTRAN.