Magnús Þór Jónsson

EVALUATION AND IMPROVEMENTS OF GEOTHERMAL MODELS USING INVERSE ANALYSIS (EIGMA)

EIGMA

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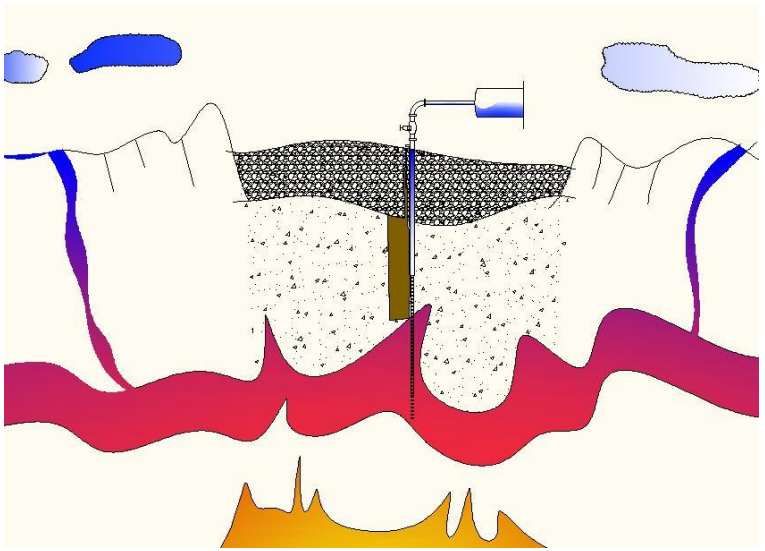


Introduction

EIGMA

Coordinator:

Magnus T. Jonsson, Professor,

University of Iceland

Partner:

Stefan Finsterle, Staff Scientist, Lawrence Berkeley National Laboratory, Earth Sciences Division (LBNL)

Introduction

EIGMA - PhD and MSc. students:

PhD at UI, Heimir Hjartarson

PhD at UI, Gunnar Skúlason

PhD at Stanford (internship), Lilja Magnúsdóttir

MSc at UI, Sigurjón Norberg Kjærnested

MSc at UI, Árni Ólafsson

Connected to the project:

PhD at UCSA, Ásdís Helgadóttir

MSc at UI, Andi Joko Nugroho

MSc at UI, Daniel John Drader

Introduction

Objectives :

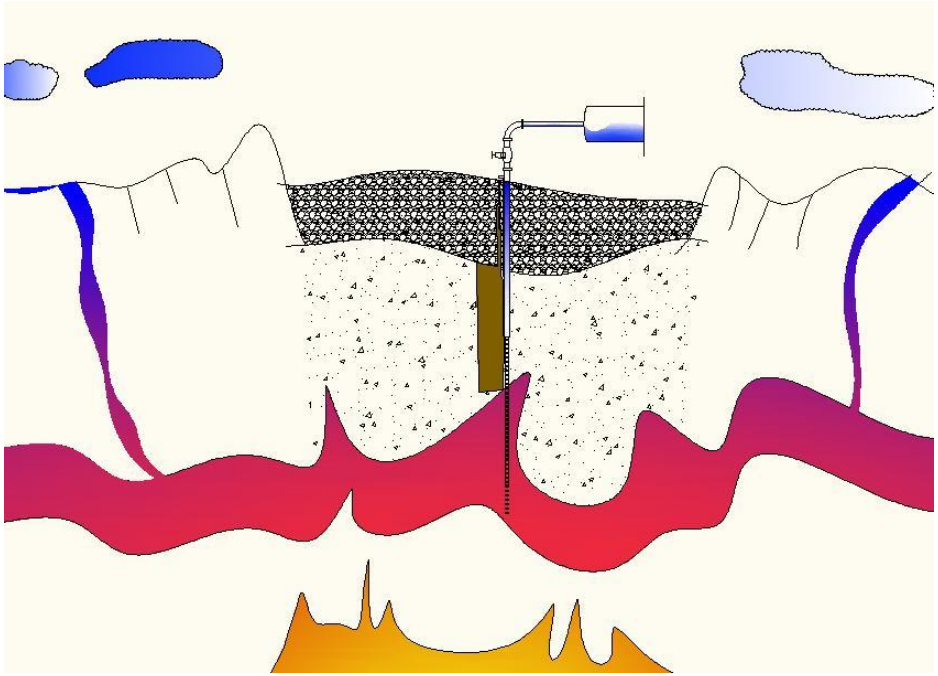
Develop a technology to improve usage of geothermal models for design of geothermal power plants

To better understand the flow and structure of geothermal reservoirs, wells, pipelines and separators.

Systems

Systems:

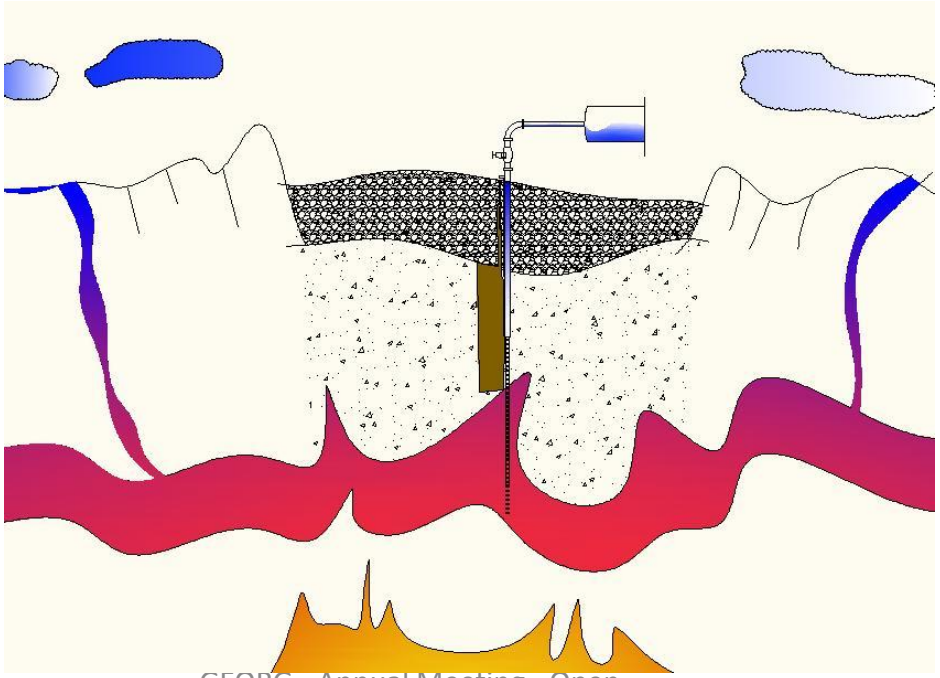
- Entity that is separable from the rest of the universe by a physical or conceptual boundary.



Models

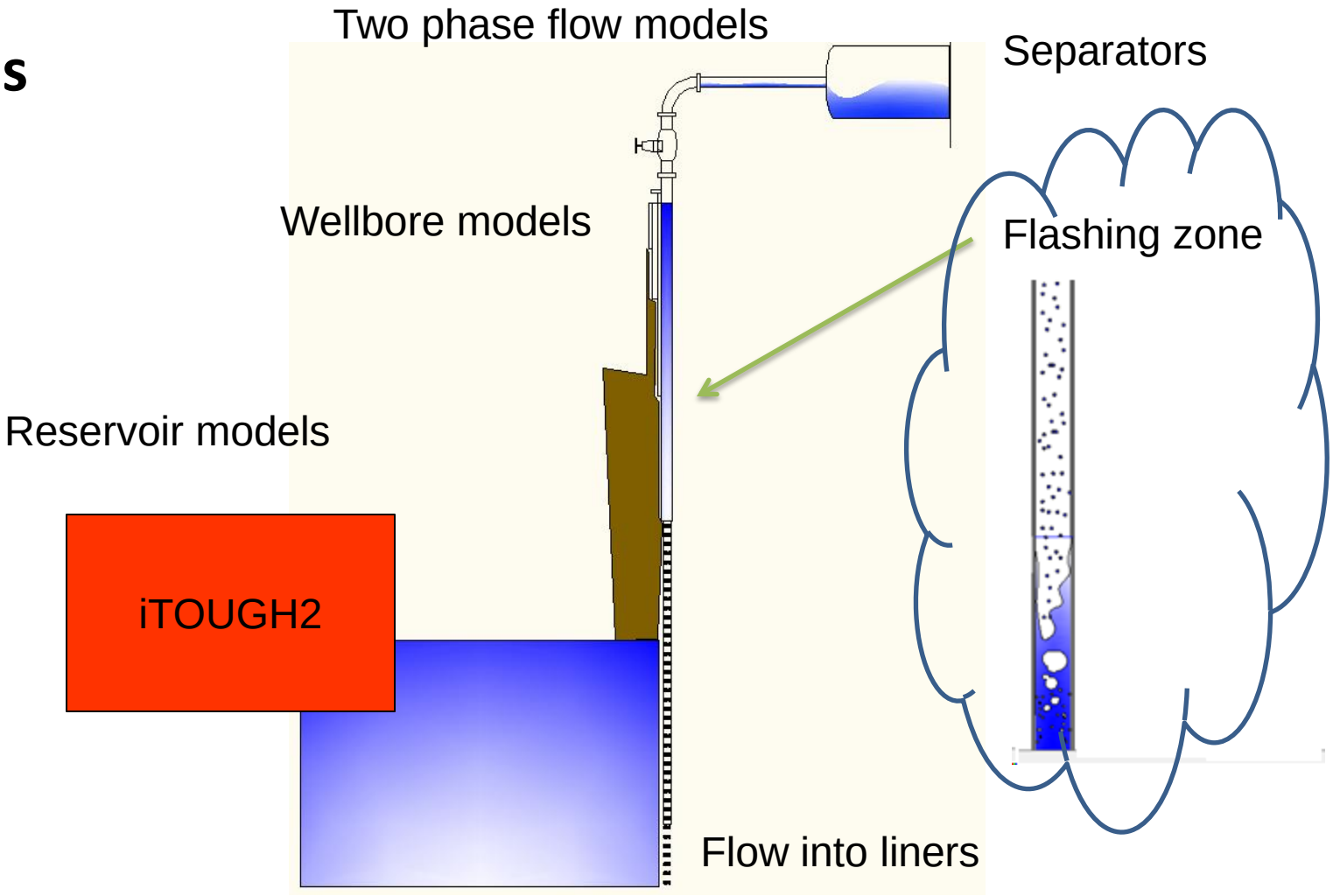
Models:

- Simplified, abstracted constructs of a system used to predict the behavior of the system.



Models

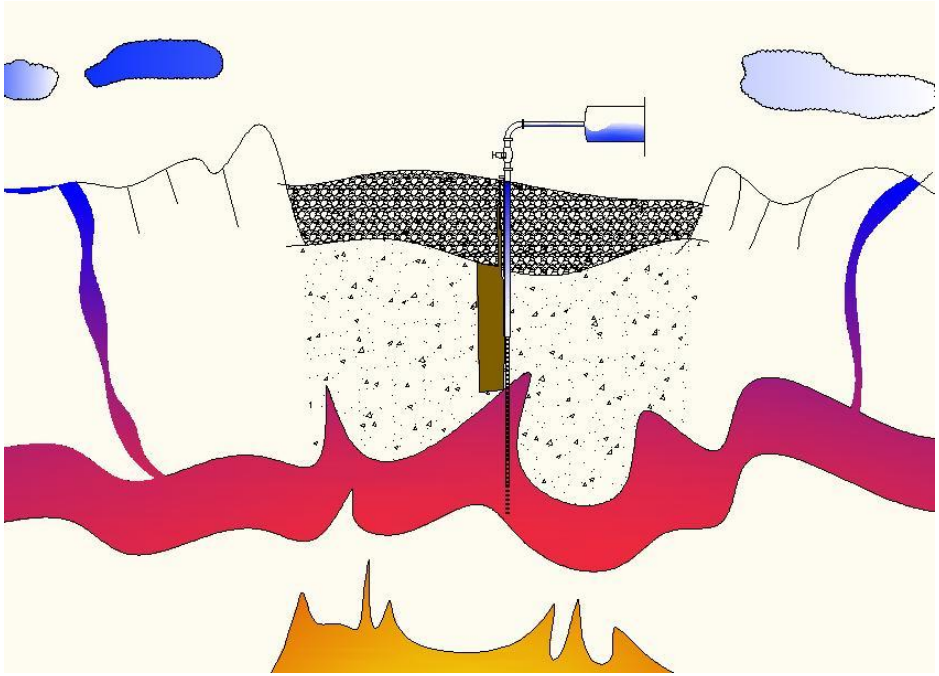
Models



Inverse modeling

Inverse modeling

- Inverse modeling consists of estimating model parameters from measurements of the system.



Inverse modeling

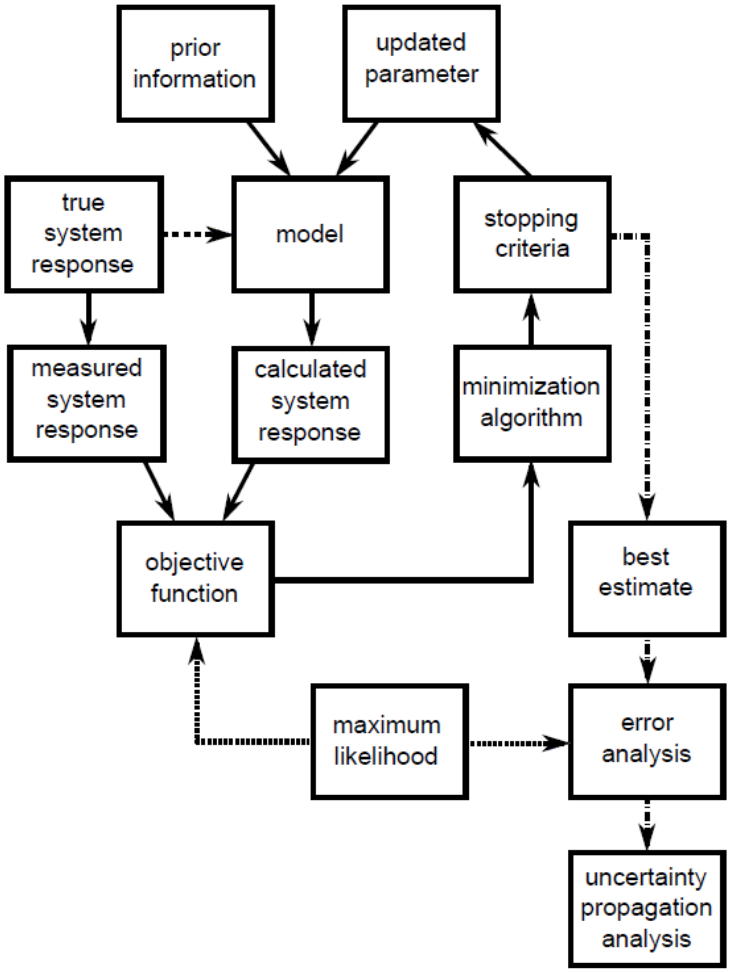
Inverse Modeling Procedure: Major Steps

Step	Description	Issue
1.	Development of a numerical model, representing the system.	- Model conceptualization
2.	Selection of parameters to be estimated.	- Parameter selection
3.	Selection of initial parameter values information/initial.	- Prior guess
4.	Selection of data; identification of points in space and time for calibration.	- Calibration points
5.	Assignment of weights to each calibration point.	- Stochastic model
6.	Calculation of system state.	- Forward simulation
7.	Comparison of calculated and observed system state.	- Objective function
8.	Updating parameters in order to decrease the objective function.	- Min. algorithm
9.	Iteration of Steps 6 through 8 until no further improvement of the fit can be obtained.	- Convergence crit.
10.	Analysis of residuals and estimation uncertainties.	- Residual and error analyses

Inverse modeling

Major steps:

Flow chart of the major steps of inverse analysis



Next step

GEORG course:

UI and LBNL will arrange an Inverse Modeling course:

Instructors: Stefan Finsterle LBNL
Yingqi Zhang LBNL

Time: 3rd – 5th August