

# Mathematical modeling of a geothermal reservoir

Lárus Porvaldsson

University of Iceland

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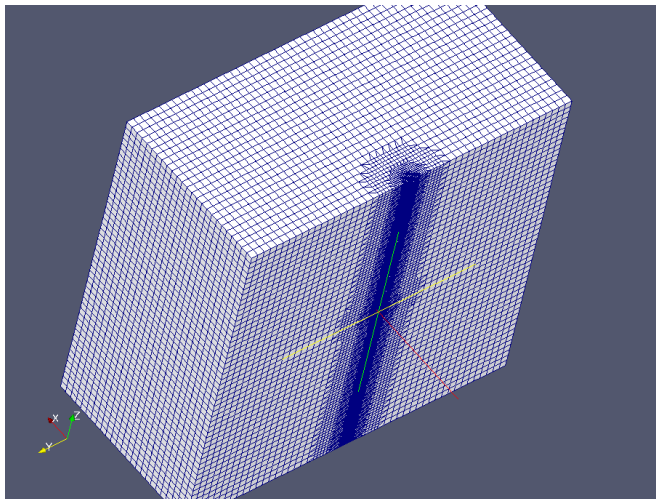
# Progress

The following goals have been achieved in this part of the project

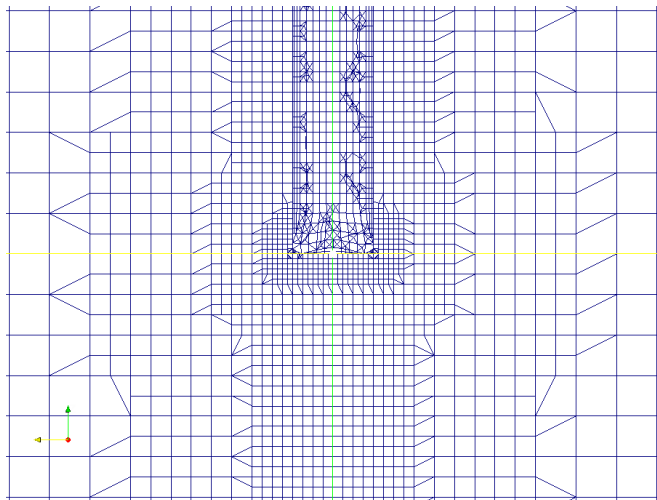
- A model describing flow in a liquid dominated reservoir has been constructed.
- Incorporating two phases in the model (water and air), where the air sits on top of a water saturated porous layer.
- Coupling the wellbore model with the reservoir model in order to account for the fact that the deliverability of each well is a function of the bottomhole pressure which varies with total mass flow and enthalpy.

# Meshing of the reservoir - isometric view

The mesh for the reservoir was generated using snappyHexMesh

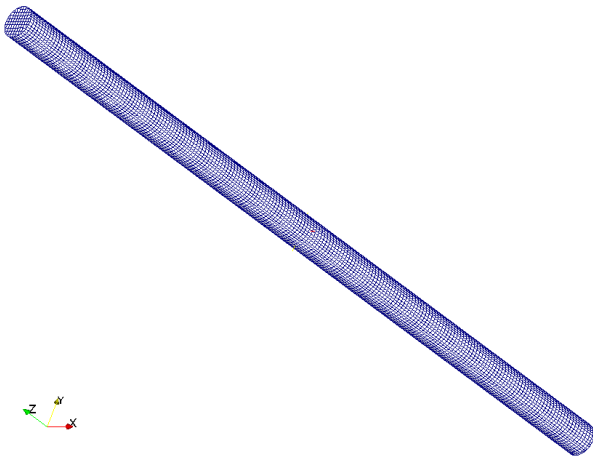


# Meshing of the reservoir - bottom of hole

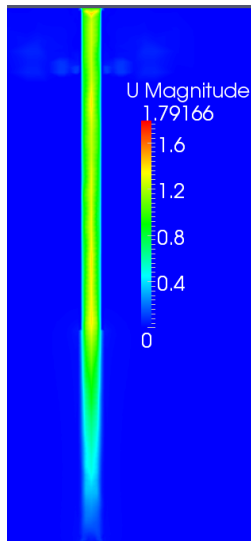


# Meshing of the wellbore

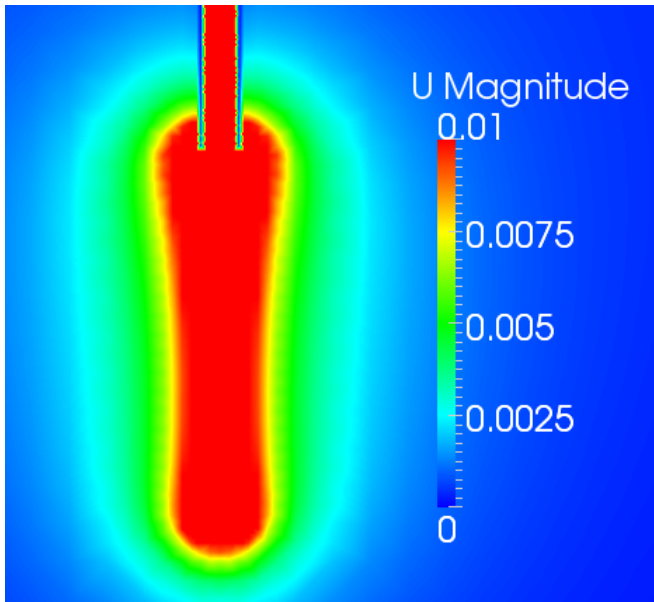
The lining was generated from a STL surface which was fed into the snappyHexMesh utility



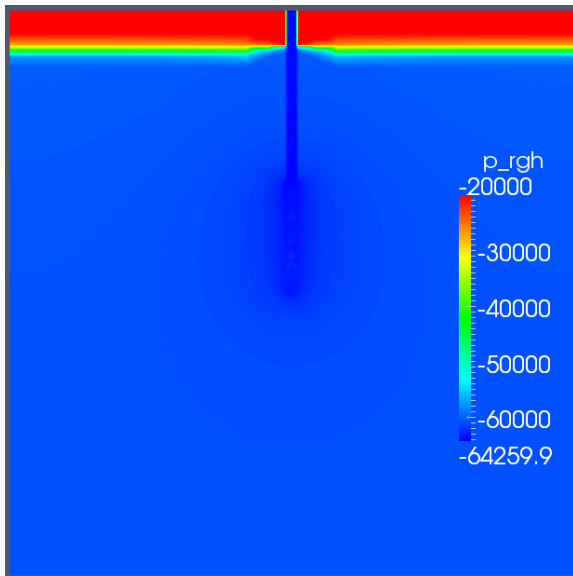
# Velocity magnitude in wellbore



# Velocity magnitude in reservoir

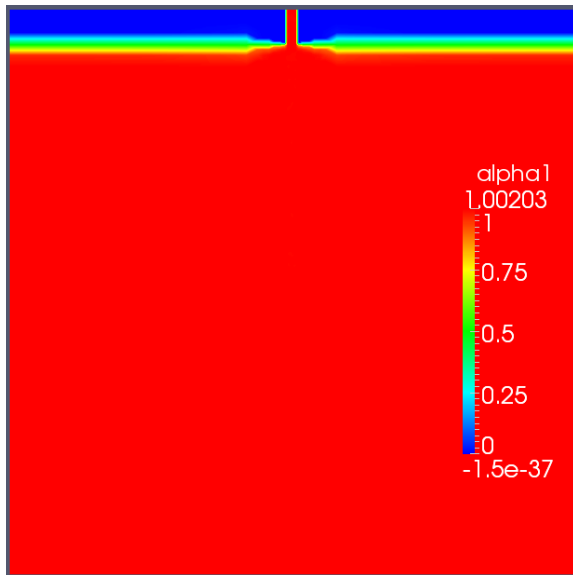


# Pressure in reservoir





# Volume fraction



## Further work

- Simplify to the equations of motions from full Navier-Stokes to Darcy-Forcheimer since acceleration effects are negligible.
- Adding the ability to model a longer period of time by assuming that the flow is steady state while the temperature and volume fraction is assumed to be transient.
- Adding phase change into the model by applying the equation of state.
- Streamlining the process of adding new wells to the model.
- Exploring the effects of pumping water down into the reservoir.