

## USING WARREN AND ROOTS MODEL AND NUMERICAL SIMULATION

Chi Zhang & Zhanyu Li

Supervisor: Dr. Gary G. Zhao

### Introduction

1. Warren-Roots model is one of the fracture models which consists of basically two large scale homogeneous reservoir sections with homogeneous reservoir section being evenly isolated and hydraulically connected by also evenly structured fracture section over rock domain, which is usually named as dual-porosity model.
2. Gilman and Kazemi model is one of the fracture model which is consists a homogeneous reservoir and fractures parallel to each other horizontally.
3. This project will compare those two models and analysis how change different parameters values will affect WR model.

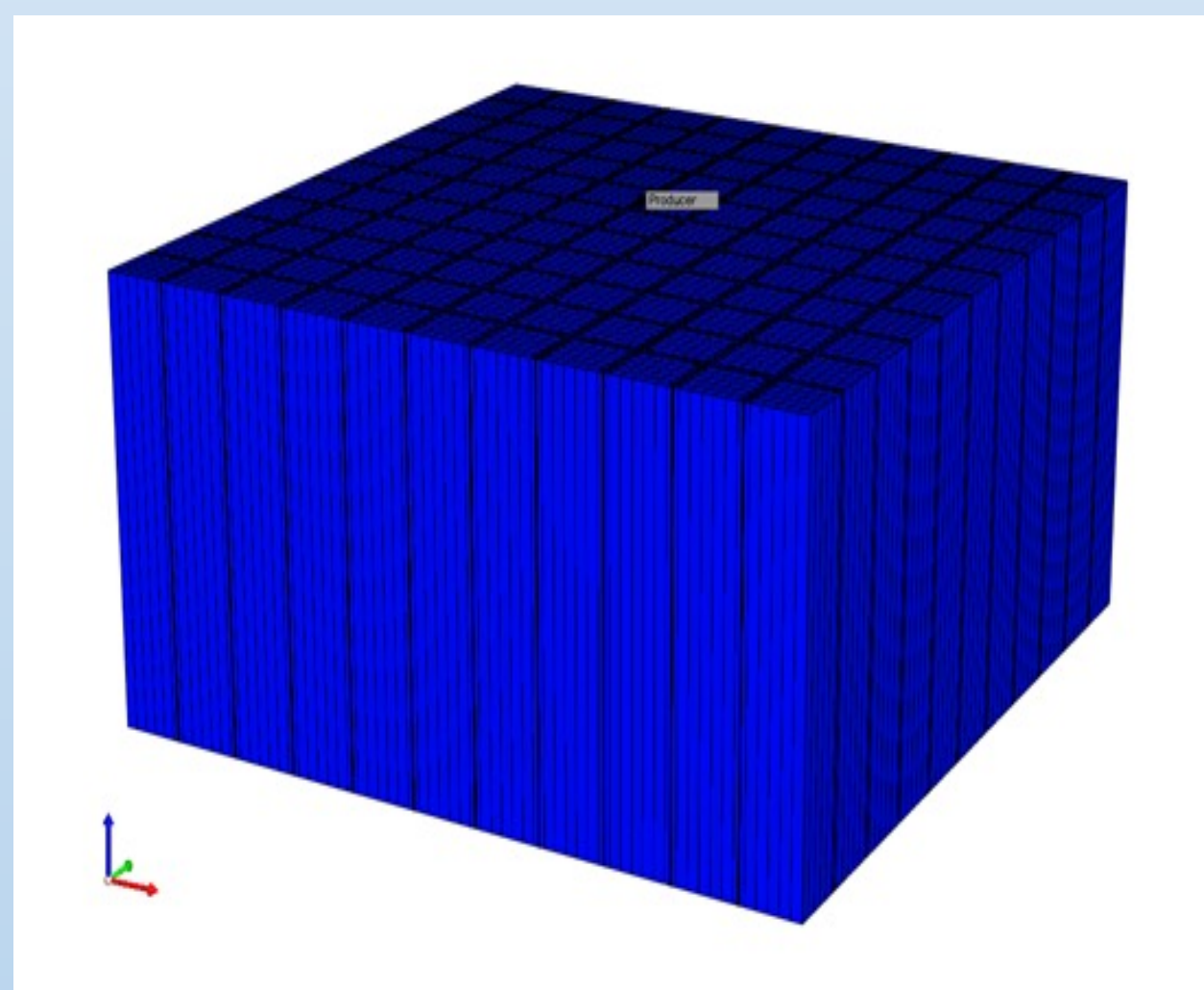


Figure. 3D view of the model

### Objectives

1. to compare two different models: 1. Reproduction of the traditional Warren-Roots like model using CMG. 2. Gilman and Kazemi model use CMG.
2. to improve understanding and for the Warren-Roots model, compare Warren-Roots model pressure difference VS time graph with different lambda, different alfa and other different cases to figure out the graph change

### Results

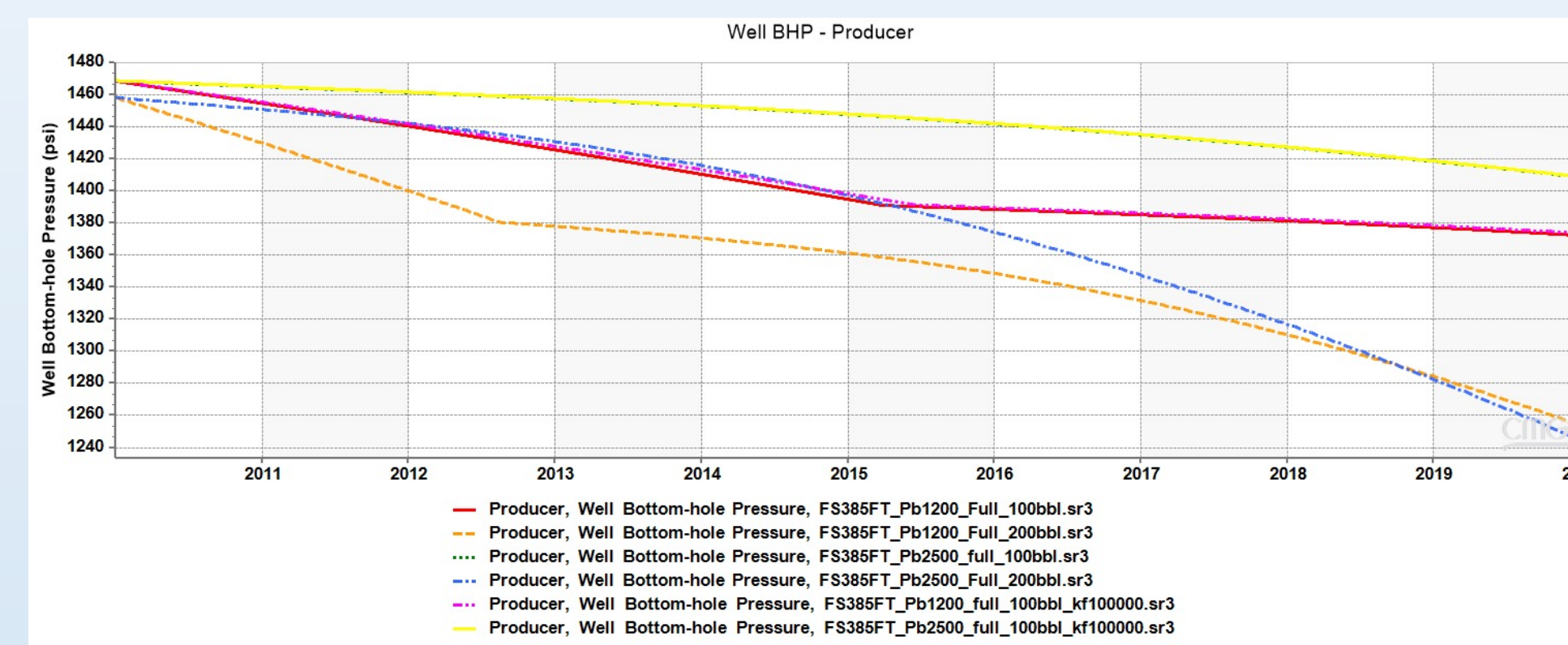


Figure. Well Bottom hole pressure for all cases

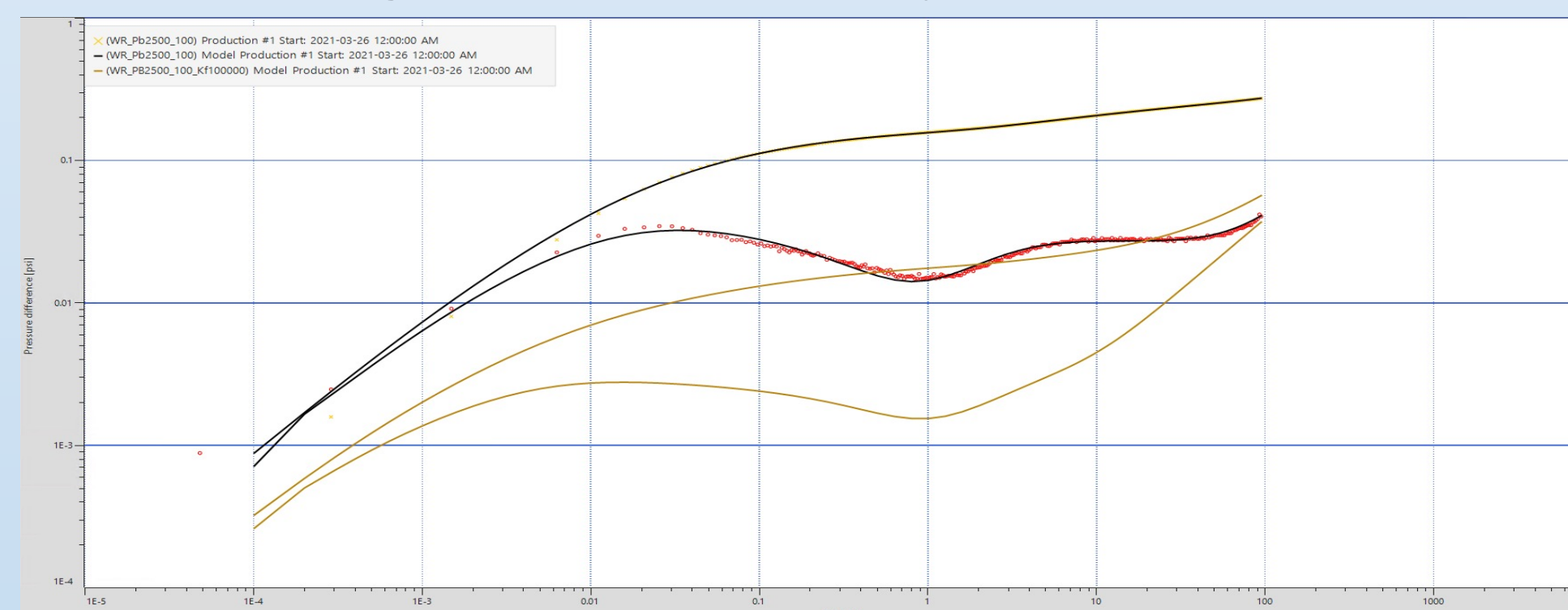


Figure. Comparison of multiphase flow by change fracture permeability

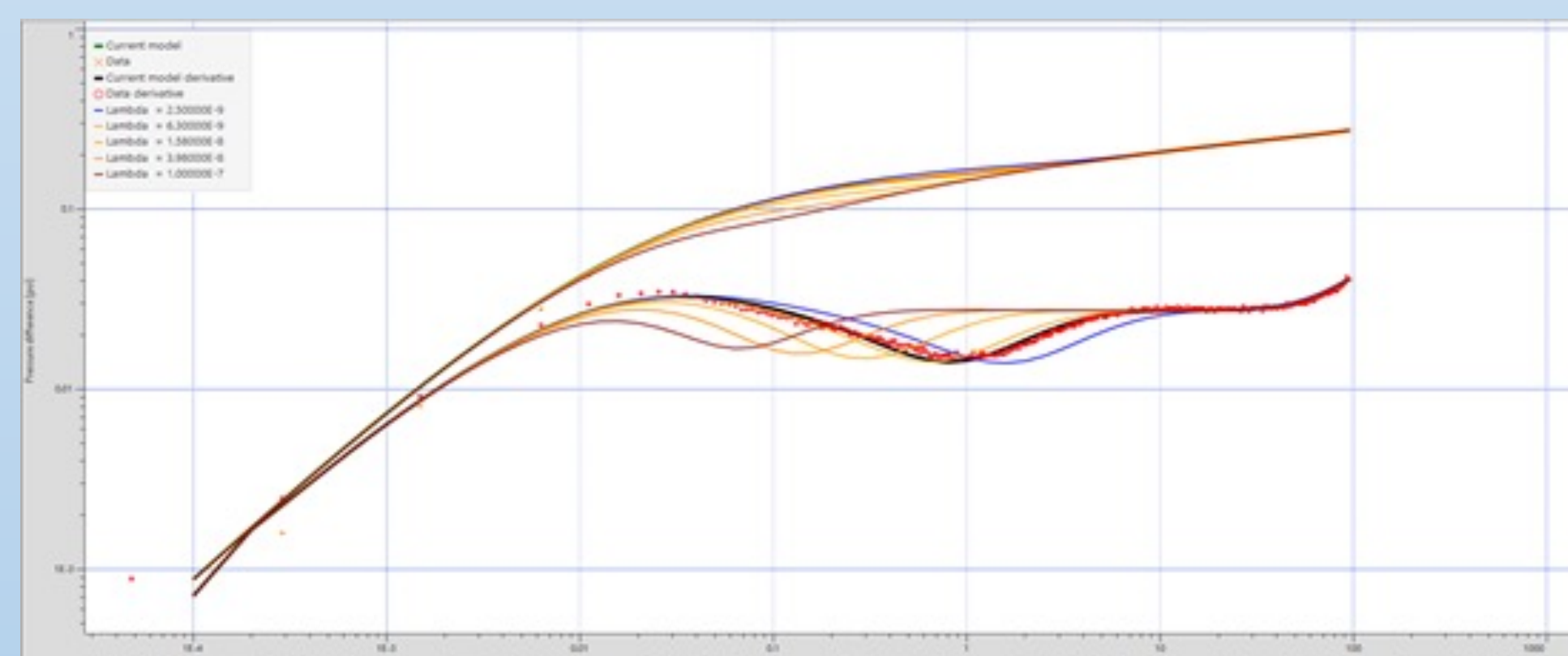


Figure. Comparison of multiphase flow with lambda change

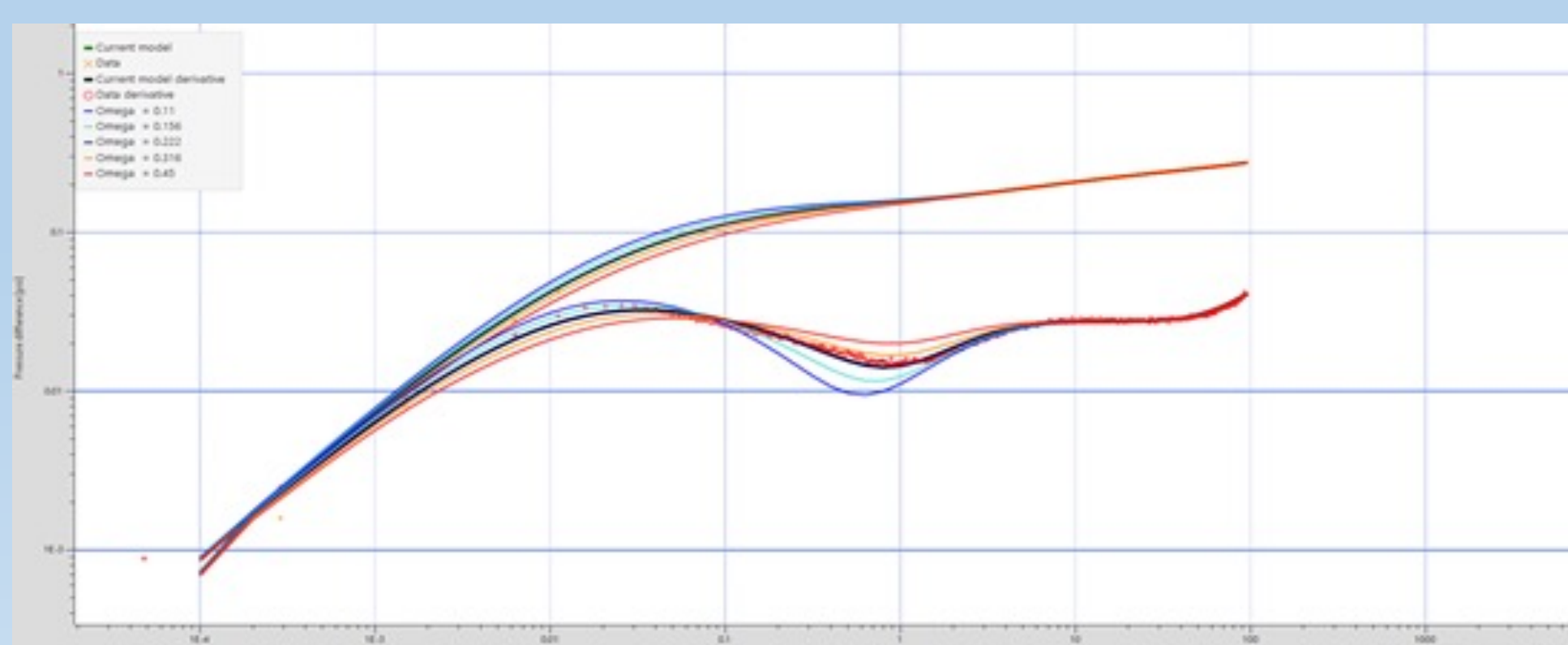


Figure. Comparison of multiphase flow with Omega change

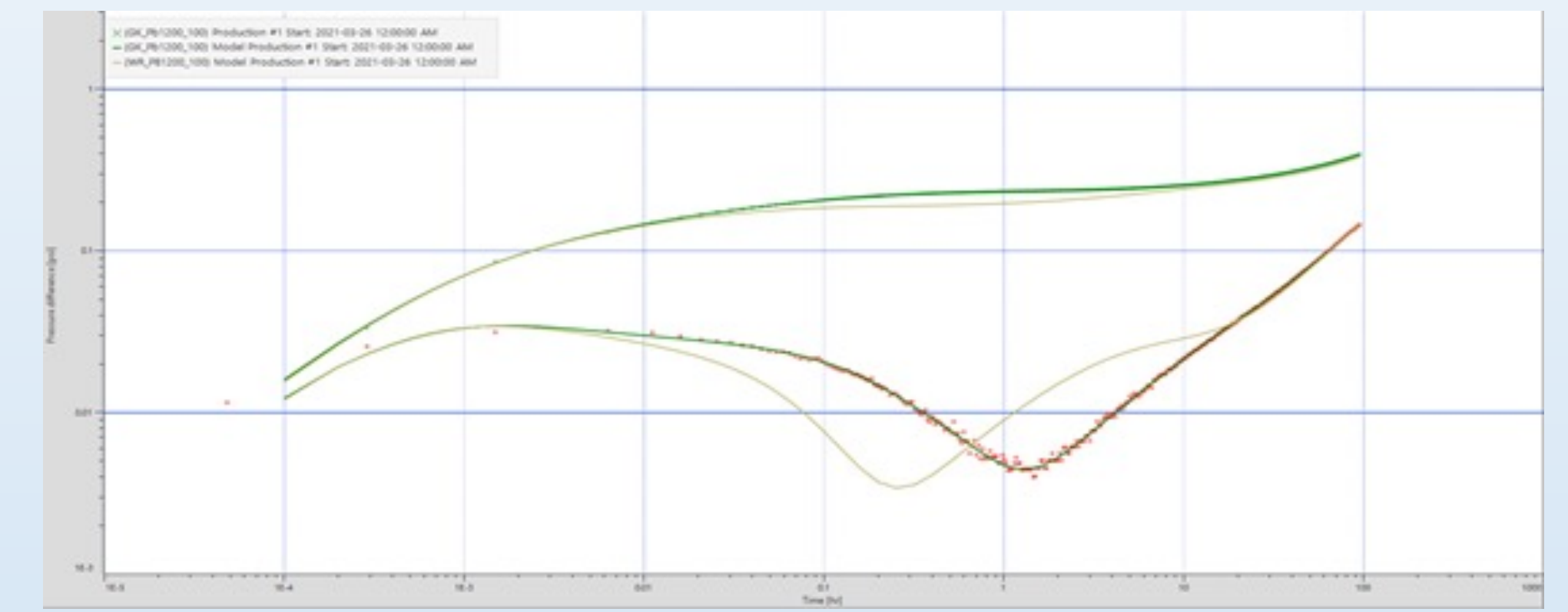


Figure . Comparison of Warren and Roots model with Gilman and Kazemi model

### Discussion

1. Comparison for single-phase flow and multiphase flow, different production rate and fracture permeability in well BHP and GOR
  - Multiphase flow have lower pressure decrease rate, Lower GOR and increase rate
  - Production rate lead well BHP start at lower and higher pressure decrease rate and higher GOR
  - Higher Fracture permeability's similar in well BHP and GOR
  - WR and GK have similar outcome in well BHP and GOR
2. Kappa pressure transient analysis
  - Fracture permeability increase bring pressure difference lower, lambda smaller and boundary detected earlier.
  - Omega affecting by porosity and influence the reservoir storage, deep and width of the dip.
  - Lambda influenced by permeability, the higher lambda have higher matrix permeability and easier to produce oil from reservoir at beginning.
  - Production rate increase result shorter dip and early radial flow.
  - Single-phase flow have shorter wellbore storage and earlier into transitional dip and late time region.
  - GK model's middle time region longer and no radial flow.

### Conclusion

- Designed WR model and GK model represent the natural fracture reservoir model and comparison of changed the parameters shows how the parameters effect the Warren and Root like model and Gilman and Kazemi model. It improves our understanding and general study of fracture reservoir performance.