Modelling and numerical analysis of two-phase flows in fractured porous media

K.Brenner[†], J. Droniou[∗], J. Hennicker[†,♯] and R. Masson[†], P. Samier[♯]

[∗] School of Mathematical Sciences, Monash University
Victoria 3800, Australia
e-mail: jerome.droniou@monash.edu

[†] Université Côte d'Azur, LJAD, Inria, CNRS
Parc Valrose 06108 Nice Cedex 02, France
e-mail: julian.hennicker@unice.fr, roland.masson@unice.fr, konstantin.brenner@unice.fr

[♯] Total SA, Centre scientifique et technique Jean-Féger
Avenue Larribau, 64018 Pau, France
e-mail: pierre.samier@total.com

ABSTRACT

We present a new model for two phase Darcy flows in fractured media, in which fractures are modelled as submanifolds of codimension one with respect to the surrounding domain (matrix). Fractures can act as drains or as barriers, since pressure discontinuities at the matrix-fracture interfaces are permitted. The numerical analysis is carried out in the general framework of the Gradient Discretisation Method. Compactness techniques are used to establish convergence results for a wide range of possible numerical schemes; the existence of a solution for the two phase flow model is obtained as a byproduct of the convergence analysis [1]. A series of numerical experiments compare the numerical solutions obtained with this model to the ones obtained using an equi-dimensional model for the matrix and the fractures [2].

REFERENCES

[1] J. Droniou, J. Hennicker, R. Masson *Numerical Analysis of a Two-Phase Flow Discrete Fracture Model*. Preprint december 2016, https://hal.archives-ouvertes.fr/hal-01422477

[2] K. Brenner, J. Hennicker, R. Masson, P. Samier *Hybrid Dimensional Darcy Flow in Fractured Porous Media with discontinuous pressures at the matrix fracture interfaces*. Preprint august 2016, https://hal.archives-ouvertes.fr/hal-01422477