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Discussions
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Interactive comment on "Laboratory experimental investigation of heat transport in fractured media" *by* Claudia Cherubini et al.

Anonymous Referee #1

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The paper aims to investigate experimentally heat transport in fractured rock networks. The results are interpreted through comparing the Explicit Network Model (ENM).

This paper seeks to fill some of the gap in the literature as there are very few such studies to date. The paper begins with an extensive survey of the current state of the art in this field. The subject is important because it pertains to an important source of renewable energy, namely geothermal energy transported particularly by ground water.

A non-linear flow model with a Forchheimer type correction term is used describe the fluxes of mass and heat flow in a single fracture-matrix setup, yielding transport PDE's for concentration and heat (temperature). Three characteristic time scales are identified, yielding non-dimensional system parameters – Pe (Peclet number), Da (Damkohler number).

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The ENM is based on an analogy with electrical circuits; here the fluxes are analogous to electrical current. Then the 1st and 2nd Kirchhoff's laws are applicable. This leads to breakthrough curves (BTC) that describe the concentration c(t) and the heat (tempertaure) T(t) in the fracture as a function of time.

Experiments are conducted in an already known setup. The parameters that control the mass and heat transport were estimated using the ENM. The ENM model match the results in most cases fairly well.

The main conclusions are that rock-fracture size ratio plays an important role in the fluid to solid heat transfer processes. It is also concluded that it is not efficient to store thermal energy in rocks with high fracture density. Other points discussed pertain to optimal conditions for thermal exchange in a fractured network, and the non-Fickian behavior of solute BTC's.

Overall, the paper tells a good story. The modeling and experiments is well described and conclusions drawn are reasonable.

In the conclusions, the authors should say a few words about future directions. What about more complex fracture networks? What are the range of pore sizes and porosity and permeability that the ENM can be applied to?

Minor point: the quality of the figures should be improved.

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