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

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?

The conclusion has been widely extended and future directions have been better addressed.

This text has been added:

'The Explicit Network Model is an efficient computation methodology to represent flow, mass and heat transport in fractured media, as 2D and/or 3D problems are reduced to resolve a network of 1D pipe elements. Unfortunately in field case studies it is difficult to obtain the full knowledge of the geometry and parameters such as the orientations and aperture distributions of the fractures needed by the ENM even by means of field investigation methods. However in real case studies the ENM can be coupled with continuum models in order to represent greater discontinuities respect to the scale of study that generally give rise to preferential pathways for flow, mass and heat transport.

This study has permitted to detect the key parameters to design devices for heat recovery and heat dissipation that exploit the convective heat transport in fractured media.

Heat storage and transfer in fractured geological systems is affected by the spatial layout of the discontinuities.

Specifically, the rock – fracture size ratio which determines the matrix block size is a crucial element in determining matrix diffusion on fracture – matrix surface.

The estimation of the average effective thermal conductivity coefficient shows that it is not efficient to store thermal energy in rocks with high fracture density because the fractures are surrounded by a matrix with more limited capacity for diffusion giving rise to an increase in solid thermal resistance. In fact, if the fractures in the reservoir have a high density and are well connected, such that the matrix blocks are small, the optimal conditions for thermal exchange are not reached as the matrix blocks have a limited capability to store heat.

On the other hand, isolated permeable fractures will tend to lead to the more distribution of heat throughout the matrix.

Therefore, subsurface reservoir formations with large porous matrix blocks will be the optimal geological formations to be exploited for geothermal power development.

The study could help to improve the efficiency and optimization of industrial and environmental systems, and may provide a better understanding of geological processes involving transient heat transfer in the subsurface.'

Future developments of the current study will be carrying out investigations and experiments aimed at further deepening the quantitative understanding of how fracture arrangement and matrix interactions affect the efficiency of storing and dissipation thermal energy in aquifers. This could be achieved by means of using different formations with different fracture density and matrix porosity.

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

The quality of all figures has been improved in terms of better resolution. Two figures (photos) have been added to show the experimental setup.