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Numerical modeling of fluid flow in a fault zone: a case of study from Majella Mountain (Italy).

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The study of fluid flow in fractured rocks plays a key role in reservoir management, including CO_2 sequestration and waste isolation. We present a numerical model of fluid flow in a fault zone, based on field data acquired in Majella Mountain, in the Central Apennines (Italy).
This fault zone is considered a good analogue for the massive presence of fluid migration in the form of tar.
Faults are mechanical features and cause permeability heterogeneities in the upper crust, so they strongly influence fluid flow. The distribution of the main components (core, damage zone) can lead the fault zone to act as a conduit, a barrier, or a combined conduit-barrier system. We integrated existing information and our own structural surveys of the area to better identify the major fault features (e.g., type of fractures, statistical properties, geometrical and petro-physical characteristics).
In our model the damage zones of the fault are described as discretely fractured medium, while the core of the fault as a porous one. Our model utilizes the dfnWorks code, a parallelized computational suite, developed at Los Alamos National Laboratory (LANL), that generates three dimensional Discrete Fracture Network (DFN) of the damage zones of the fault and characterizes its hydraulic parameters. The challenge of the study is the coupling between the discrete domain of the damage zones and the continuum one of the core.
The field investigations and the basic computational workflow will be described, along with preliminary results of fluid flow simulation at the scale of the fault.