



## **A network model of self organization in geochemical flows**

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During the dissolution of rock fractures the positive feedback between fluid transport and mineral dissolution leads to the spontaneous formation of pronounced wormhole-like channels [1]. As the dissolution proceeds, the channels interact, competing for the available flow, and eventually the growth of the shorter ones ceases. Thus the number of channels decreases with time while the characteristic distance between them increases, which leads to the scale-invariant power-law distribution of channel lengths.

A simple resistor network model of the evolution of dissolving channels is constructed and its properties studied. The results are compared with porescale simulations of fracture dissolution using a microscopic, three-dimensional numerical model developed in [2]. Despite its simplicity, the resistor model is found to retain the essential features of the nonlinear interaction between the channels.

[1] Ortoleva, P., J. Chadam, E. Merino, and A. Sen, Geochemical self organisation II: The reactive-infiltration instability, *Am. J. Sci.*, 287, 1008, 1987

[2] P. Szymczak, A. J. C. Ladd, Microscopic simulations of fracture dissolution, *Geophys. Res. Lett.*, 31, L23606, doi:10.1029/2004GL021297, 2004