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Porous Soil as Complex Network

R. M. Benito (1), A. Santiago (1), J.P. Cárdenas (1), A. M. Tarquis (2), F. Borondo (3), and J. C. Losada (1)

(1) Universidad Politécnica de Madrid, Fisica y Mecanica, Grupo de Sistemas Complejos, MADRID, Spain (rosamaria.benito@upm.es, 34 91336 5726), (2) Universidad Politécnica de Madrid, Matemática Aplicada, MADRID, Spain (anamaria.tarquis@upm.es, 34 913365826), (3) Universidad Autónoma de Madrid, Química, Grupo de Dinámica Nolineal, MADRID, Spain (f.borondo@uam.es, 34 914974964)

We present a complex network model based on a heterogeneous preferential attachment scheme [1,2] to quantify the structure of porous soils [3]. Under this perspective pores are represented by nodes and the space for the flow of fluids between them are represented by links. Pore properties such as position and size are described by fixed states in a metric space, while an affinity function is introduced to bias the attachment probabilities of links according to these properties. We perform an analytical and numerical study of the degree distributions in the soil model and show that under reasonable conditions all the model variants yield a multiscaling behavior in the connectivity degrees, leaving a empirically testable signature of heterogeneity in the topology of pore networks.

References

[1] A. Santiago and R. M. Benito, “Emergence of multiscaling in heterogeneous complex networks”. Int. J. Mod. Phys. C 18, 1591 (2007).

[2] A. Santiago and R. M. Benito, “An extended formalism for preferential attachment in heterogeneous complex networks”. Europhys. Lett. 82, 58004 (2008).

[3] A. Santiago, R. M. Benito, J. P. Cárdenas, J. C. Losada, A. M. Tarquis and F. Borondo, “Multiscaling of porous soils as heterogeneous complex networks”. Nonl. Proc. Geophys. 15, 1-10 (2008).