

P. Morawiecki, “Inverse problem to river networks evolution”, Bachelor Thesis, Warsaw, 2016

Abstract: Headward erosion is a phenomenon responsible for extending the river valley into the hillside and hence creating a ramified drainage networks. Interestingly, this process can be modelled in terms of the geodesic growth of thin lines in a field described by the Poisson’s equation. Here, I analyse numerically the river network evolution for different growth laws and different bifurcation rules, which determine the moments when the stream bifurcates into two daughter branches. Finally, I formulate and analyse the inverse problem: can the growth law of a river be inferred from the analysis of the geometrical structure of its network? The growth law was successfully estimated in a series of numerical tests on synthetic data.

Key words: river network, hydrodynamics, porous media, Laplace’s growth, numerical methods, numerical simulations