

The karstogenesis of a synthetic aquifer is analyzed as a function of the matrix permeability and the fracture density affecting the carbonate reservoir. The synthetic carbonate aquifer generation results from numerical simulations based on Discrete Fracture Network (DFN) and groundwater flow simulations. The aim is to simulate karstogenesis processes in an aquifer characterized by a fracture network, while matching field reality and respecting geometrical properties as closely as possible. DFN are simulated with the soft REZO3D that allows the generation of 3-D realistic fracture networks, especially regarding the relative position of fractures that control the overall network connectivity. These generated DFN are then meshed and considered to perform groundwater flow simulation with the model GroundWater (GW). At each time step and for each fracture element, flow velocity and the mean groundwater age are extracted and used in an analogical dissolution equation that computes the aperture evolution. This equation relies on empirical parameters calibrated with former speleogenesis studies. In this paper, karstogenesis simulations are performed using fixed-head hydraulic boundary conditions within a single stratum as a function of two fracture density settings. The results are interpreted in terms of head fields, mean groundwater age distributions; while total flow rate and average aperture are analyzed as a function of time. The effect of fracture density and rock matrix permeability are then assessed.