Modelling convective-diffusive chemicals carried by groundwater

Palesa Mohajane[1,2]

[1]*Institute of Groundwater Studies, University of the Free State, Bloemfontein, 9300, South Africa*

[2]*Department of Water and Sanitation, Old Rustenburg Rd, Hartbeespoort, 0216, South Africa*

palesam56@gmail.com

Contamination of groundwater remains a big challenge. Researchers have since developed mathematical models in order to be able to portray the behaviour of the flow and the transport of these solids within the subsurface. In the same line of thought, we investigate the convective-diffusive nature of chemical transport contamination in groundwater for convectional porous media, fractal systems and model fading memory effect of chemical contamination in groundwater. We make use of the classical numerical schemes to explain flow contamination in conventional media. Heterogeneous aquifers inhabit the behaviour of self-similarity which replicates itself in different scales. Self-similar behaviour is best captured by fractal differential operators. The non-singular Caputo-Fabrizio differential operator is used to capture the fading memory effect of solute contamination in groundwater. The stability of the used numerical schemes was evaluated using the Fourier Von Neumann stability analysis. In addition to this, we suggested a new numerical scheme that combines the trapezoidal approximation of the integral operator and the Lagrange interpolation polynomial and discretized the special component using the Forward or Backward Euler. The suggested numerical scheme was also used to solve our equation, the numerical simulation let no doubt to believe that the suggested method is highly accurate and efficient for solving partial differential equations.