Impact Factor: 5.32

Numerical Reconstruction and Remediation of Soil Acidity on A one Dimensional Flow Domain with Constant and Linear Temporally Dependent Flow Parameters

Catherine Mutheu Munene, **Thomas Tonny Mboya Onyango*** and Cleophas Muhavini.

**Department of Industrial and Engineering Mathematics*

Abstract

A mathematical backward problem which involves solving a mathematical model based on a one dimensional advection - diffusion process of solute transport in a homogeneous soil structure is considered. The diffusion coefficient and advection velocity in the governing unsteady non-linear partial differential equation (PDE) are varied from constant to linearly dependent on time. This is done to develop a mathematical understanding of the initial root causes and levels of acidification in priori because determination of analytic solution involves a lot of assumptions making the results unrealistic as opposed to the our numerical experiment approach which is cost effective and more reliable results are obtained. Flow domain is assumed semi infinitely deep and homogeneous and it is subdivided into small units called control volumes of uniform dimension. A hybrid of Finite volume and Finite difference methods are used to discretize space and time respectively in the governing PDE. Discretized equations are inverted to obtain the concentrations at various nodes of the control volumes by using mathematical codes developed in Mat-lab and the results presented using graphs at different soil depths and time to determine the parameters that can help detect the contamination levels before disastrous levels are reached and with ease.

From the results it is observed and concluded that the concentration levels of ions with depth and time can easily be detected when diffusion coefficient and advection velocities are linearly depended on time and mitigation strategies can easily be employed.

Keywords: Ill-posed, finite volume method, advection, diffusion, reconstruction, remediation, numerical experiment

Current Journal of Applied Science and Technology 29(3): 1-11.

http://www.sciencedomain.co/index.php/CJAST/article/view/9043