

Numerical solutions of a time fractional reaction-diffusion model for pattern formation in coral reefs

Somathilake L. W.^{*1} and Burrage K.²

¹*Department of Mathematics, Faculty of Science, University of Ruhuna, Sri Lanka*

²*School of Mathematical Sciences, Queensland University of Technology, Australia*

In this paper, we propose a Time Fractional Reaction-Diffusion model for the growth of corals in a tank and solve that model numerically. In order to do numerical simulations, we transformed the model equations in to a system of ordinary differential equations (ODEs) by discretising the model equations in space and represented it in a matrix form. Also, we represented the discrete Laplace operator of the model by a matrix embedding of the boundary conditions. We solved this system of ODEs using an explicit scheme, two implicit schemes and Matlab code FDE12 written by R. Garrappa which is an implementation of the predictor-corrector method. We compared the solutions obtained by these numerical methods.

Keywords: Fractional ODEs, Time Fractional-Reaction-Diffusion Equations, Patterns formations, Caputo Fractional-Order Derivative

**Corresponding Author: sthilake@maths.ruh.ac.lk*