Stabilised Numerical Methods for a Pollution Problem

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Abstract

Today the world is facing a great environmental pollution problem, causing serious and irreparable damage to human society. Pollution can take many forms: the air we breathe, the drinking water, the soil used to grow our food, etc... This happens when a contaminant or pollutants are introduced naturally or artificially into an environment. Here we are concerned with a problem related to organic pollution in surface waters, where a system of partial differential equations that models the organic pollution in lakes or estuaries, is presented. This problem due to Streeter & Phelps (1925) is more precisely reduced to a reaction-dispersion/diffusion problem. We start by proving that this problem is well posed. Then we propose a stable scheme based on finite element discretizations to demonstrate optimal error estimates. The validation is confirmed by the presentation of the numerical results obtained.

References


