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Simplified test cases for modelling the transport of fecal bacteria in hydrosystems

T. Kärnä (1), B. de Brye (1), A. de Brauwere (1,2), O. Gourgue (1) and E. Deleersnijder (1)

(1) Centre for Systems Engineering and Applied Mechanics (CESAME), Université catholique de Louvain (UCL), Belgium, (2) Department of Analytical and Environmental Chemistry, Vrije Universiteit Brussel (VUB), Belgium

Anthropogenic materials have a high impact on marine ecosystems especially in coastal areas at the vicinity of dense urban settlements. The main goal of the TIMOTHY (Tracing and Integrated Modelling of Natural and Anthropogenic Effects on Hydrosystems, http://www.climate.be/TIMOTHY) project is to model the fate of anthropogenic discharges in the the Scheldt river basin and coastal North Sea area.

In this study *Escherichia coli* is considered as a first example of water pollution. Concentration of *E. coli* is an important water quality indicator as presence of such fecal bacteria suggests that the water is contaminated with disease causing microorganisms. We focus on the transport of *E. coli* as modelled by SLIM (Second-generation Louvain-la-Neuve Ice-ocean Model, http://www.climate.be/SLIM). The advantage of SLIM is that it is based on the finite element method on an unstructured mesh and therefore it is able to deal with not only the large scale processes of open sea but also the smaller scale phenomena occurring at coastal areas.

In order to verify the consistency of our model we have developed a set of simplified test cases where analytical solutions can be derived. The test cases include both one dimensional and two dimensional depth-integrated advection-diffusion schemes. An additional decay parameter is introduced to simulate the gradual perishing or settling of the bacteria. Both point sources as well as lineic sources of fecal bacteria are examined. The results verify that the SLIM framework can indeed be used to model the

dynamics of *E. coli*.