A COMPOSITIONAL EULERIAN APPROACH FOR MODELLING OIL SPILLS IN THE SEA

Benjamin Ivorra[1,*], Susana Gomez[2], Jesús Carrera[3] and Ángel M. Ramos[4]

[1] Interdisciplinary Mathematics Institute & Department of Applied Mathematics and Mathematical Analysis, Complutense University of Madrid, Spain; ivorra@ucm.es and
https://blogs.mat.ucm.es/ivorra/

[2] Instituto de Matematicas Aplicadas y Sistemas, Universidad Nacional A. de México, México;
susanag77@gmail.com

[3] Institute of Environmental Assessment and Water Research (IDAEA), CSIC, Spain;
jesus.carrera.ramirez@gmail.com

[4] Interdisciplinary Mathematics Institute & Department of Applied Mathematics and Mathematical Analysis, Complutense University of Madrid, Spain: angel@mat.ucm.es and
http://www.mat.ucm.es/~aramosol/

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Oil spills in the ocean receive significant public attention and their remediation is costly. Forecasting by means of oil spill fate models is helpful to generate the information needed for the control and management of the spill [1]. Additionally, models can be used in preventive mode for environmental impact assessment and to plan emergency actions in response to hypothetical spills.

Here, we present a Compositional Eulerian model to forecast the evolution of oil spills in the sea [2]. The model allows studying the fate of not only the oil concentration but also of each component (e.g., volatile, non-volatile, water in the oil). Therefore, the problem is formulated as a conservation equation for each component, plus an equation to estimate the age of the oil, which allows us to assess weathering processes (e.g., evaporation, natural dispersion, emulsion) and the associated changes in oil properties.

Then, we describe an efficient implementation, using second order numerical schemes for advection and nonlinear diffusion terms, to reduce numerical diffusion [3]. Finally, we perform numerical experiments, based on real and synthetic cases, to illustrate and validate the capabilities of our model to forecast the evolution of oil spills and to perform environmental risk analysis in the case of a potential accident.

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