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MODELLING BI-DIMENSIONAL SOLUTE TRANSPORT PROBLEMS WITH BIODEGRADATION USING THE EULERIAN LAGRANGIAN LOCALIZED ADJOINT METHOD

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Summary. The Eulerian-Lagrangian Localized Adjoint Method (ELLAM), introduced by Celia *et al.* [1], is an interesting alternative to standard methods to solve advection dominated transport equations. It preserves the performance of characteristic methods and treats general boundary conditions naturally in their formulations.

A new ELLAM formulation was developed in [2] for unstructured triangular meshes. This formulation avoids unphysical oscillations and numerical diffusion when several time steps are used. The method requires a very limited number of integration points (usually 1 per element) and is therefore highly efficient. In [2] the method was applied for simple 2D situations (homogeneous domains without sink/source terms). In the first part of this work, we show applicability and performances of this method for more general problems with highly heterogeneous domains containing injection and pumping wells.

In the second part, we show how we can combine the ELLAM with the Sequential Non-Iterative Approach (SNIA) to solve bi-dimensional transport problems with biodegradation. The SNIA-ELLAM combination was shown to be efficient for one dimensional problems in [3]. In this work, different numerical experiments will be presented to show the performances of this approach for bi-dimensional problems and to study the behaviour of the splitting error with the obtained SNIA-ELLAM scheme.

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[2] Younes A, Ackerer P, Lehmann F. A new efficient Eulerian-Lagrangian localized adjoint method for solving the advection-dispersion equation on unstructured meshes. *Adv Water Resour.*2006; 29:1056-1074.

[3] Younes A, Fahs M. Direct and split operator approaches with ELLAM for reactive transport equations. *AIChE Journal.*2007; 53:2161-2169.