Title: **A large-time-stepping scheme for balance equations**

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The authors introduce a numerical method for conservations laws with source term that is not subjected to the CFL restriction on the selection of the time step. The method is unconditionally stable and well suited to calculate stationary state solutions for conservation laws such as:

$$u_t + f(u)_x = A(x, u) \tag{1}$$

where $A(x, u)$ is the source term and f is the flux function of the scalar u.

The scheme is based on the application of a front tracking method (related to the method of characteristics) to a modified form of the conservation law. This modified equation is obtained by re-casting the original equation into a semi-discrete equation that preserves the steady state. The application of the front tracking methodology involve the solution of the Riemann problem that in this case is achieved by the use of the minimal jump entropy condition.

The numerical examples described in the paper show that good accuracy on the steady state solutions are obtained even when large time steps i.e., CFL numbers as high as 80, are chosen. In these cases the transient solution exhibits oscillations that are averaged on the long run. The numerical examples demonstrate the viability of this approach.

Related:

- Conservation Laws Preprint Server at the Norwegian University of Science and Technology. `http://www.math.ntnu.no/conservation/`