# Well-Balanced Schemes via Conservative Formulation Using Global Fluxes

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**Abstract:** I will present a new way of designing well-balanced schemes for hyperbolic systems of balance laws. Our approach is based on a conservative formulation of the system using global fluxes obtained by introducing nonlocal equilibrium variables. A crucial step in the construction of well-balanced second- and higher-order schemes is a well-balanced piecewise polynomial reconstruction of equilibrium variables combined with a well-balanced evolution in time.

A difficulty one may face while implementing our approach is a necessity of (approximately) solving Riemann problems for hyperbolic systems with global fluxes. This may be hard or even impossible. We therefore use Riemann-problem-solver-free central schemes. Our particular choice is central-upwind schemes, which may need to be adapted to reduce the amount of numerical viscosity when the flow is at (near) steady-state regime.

The new method can be applied to a wide variety of hyperbolic systems of balance laws. I will present the new well-balanced central-upwind schemes for shallow water equations and compressible Euler equations with gravitation.

The talk is based on several joint works with

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