A splitting approach for the KdV equation with transparent boundary conditions

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In this talk we propose a numerical approach for the linearized 1-D Korteweg–de Vries (KdV) equation with space dependent coeffcients

$$u_t + a(x)u_x + b(x)u_{xxx} = 0,$$

where the spatial domain is unbounded ($x \in \mathbb{R}$). We cut off a finite computational domain from the unbounded one and we employ transparent boundary conditions. We follow a splitting strategy in order to divide the full equation into its dispersive part $u_t + b(x)u_{xxx} = 0$ and its transport part $u_t + a(x)u_x = 0$. The transparent boundary conditions are then derived in a full discrete setting using the Crank–Nicolson and the explicit Euler finite different schemes for the dispersive and the transport equation respectively. Numerical simulations are presented that illustrate the theoretical results.
This is a joint work with Einkemmer Lukas and Alexander Ostermann.