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Boundary conditions for the time-discrete Green-Naghdi equations

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This talk is concerned with the projection structure of the time-discrete Green-Naghdi equations including bathymetry on bounded domains. Pressure correction methods - well-known for the incompressible Euler equations - have been introduced and analyzed in this context before. However, due to the dispersive nature of this non-linear model the understanding of suitable boundary conditions is still on a rudimentary level. We use the projection structure to identify homogeneous and inhomogeneous boundary conditions for which well-posedness of the correction step is available. Based on this we formulate a general approach to construct splitting schemes for a family of boundary conditions, that satisfy a discrete projection property. This allows us to design efficient and numerically robust schemes which are entropy-stable by construction. To illustrate the benefits and potential of our strategy numerical evidence is provided for some simple cases. In particular, standard boundary conditions (wall, periodic) are included in our framework as well as some boundary conditions that are of practical interest and have not been considered in this way before (wave generation, transparent boundary, fixed discharge).

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