Efficient new scheme for the linear dispersive wave equation for far-field tsunamis

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For calculating tsunami wave propagation, the linear dispersive wave equation is used (e.g. Saito *et al.*, 2010, JGR), which consists of "two" equations of motion and "one" continuity equation. Since the equations of motion contain the dispersive terms of tsunami, they have been usually solved by using an implicit time scheme. Takenaka *et al.* (2017, SSJ) proposed a new method to efficiently solve the linear dispersive wave equation in the Cartesian coordinate system. The dispersive terms in the equations of motion are transferred into the continuity equation by replacing the flow rate variables to the new ones. Then, since we can solve the equations of motion using an explicit time scheme and the continuity equation using an implicit one, the computation time is at least four times faster than the previous procedure. They proposed the two different schemes to solve the continuity equation containing the dispersive terms. Hata *et al.* (2017, SSJ) implemented these schemes into a code for the linear long wave equation in Cartesian coordinates to demonstrate the effectiveness of the new schemes. In this study, we apply Takenaka *et al.*'s (2017) idea to the linear dispersive tsunami equation in the spherical coordinates with the Coriolis force (e.g., Tanioka, 2000, Papers in Meteorology and Geophysics) for far-field tsunami simulations. For the implicit solution, we use the ICCG method as Poisson solver. In this presentation, we show the actual numerical scheme based on the finite-difference method in spherical coordinate system and illustrate their efficiency through several computational examples.

Keywords: Far-Field Tsunami, Linear Dispersive Equation