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Amplitude equation for under water sand-ripples in one dimension. TEIS SCHNIPPER, Dept. of Physics and Center for Fluid Dynamics, The Technical University of Denmark, DK-2800 Kgs. Lyngby, Denmark , KEITH MERTENS, Dept. of Mathematics, Colorado State University, Fort Collins, CO 80523-1874, USA, CLIVE ELLEGAARD, The Niels Bohr Institute, Blegdamsvej 17, DK-2100 Copenhagen Ø, Denmark, TOMAS BOHR, Dept. of Physics and Center for Fluid Dynamics, The Technical University of Denmark, DK-2800 — Sand-ripples under oscillatory water flow form periodic patterns with wave lengths primarily controlled by the amplitude d of the water motion. We present an amplitude equation for sand-ripples in one spatial dimension which captures the formation of the ripples as well as secondary bifurcations observed when the amplitude d is suddenly varied. The equation has the form

$$h_t = -\epsilon(h - \bar{h}) + ((h_x)^2 - 1)h_{xx} - h_{xxxx} + \delta((h_x)^2)_{xx}$$

which, due to the first term, is neither completely local (it has long-range coupling through the average height $\bar{h}$) nor has local sand conservation. We discuss why this is reasonable and how this term (with $\epsilon \sim d^{-2}$) stops the coarsening process at a finite wavelength proportional to d. We compare our numerical results with experimental observations in a narrow channel.

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