

The Square Root Depth Wave Equations

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(Submitted on 11 Dec 2009)

We introduce a set of coupled equations for multilayer water waves that removes the ill-posedness of the multilayer Green-Naghdi (MGN) equations in the presence of shear. The new well-posed equations are Hamiltonian and in the absence of imposed background shear they retain the same travelling wave solutions as MGN. We call the new model the Square Root Depth equations, from the modified form of their kinetic energy of vertical motion. Our numerical results show how the Square Root Depth equations model the effects of multilayer wave propagation and interaction, with and without shear.

Comments: 10 pages, 5 figures

Subjects: **Fluid Dynamics (physics.flu-dyn)**; Chaotic Dynamics (nlin.CD)

Cite as: **arXiv:0912.2194v1** [physics.flu-dyn]

Submission history

From: James Percival [[view email](#)]

[v1] Fri, 11 Dec 2009 10:45:36 GMT (321kb)

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