Weak and Global solutions for the one-dimension Boussinesq-Peregrine system under small bottom variation

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The Boussinesq-Peregrine system is derived from the water waves system in presence of topographic variation under the hypothesis of shallowness and small amplitude regime. The system becomes significantly simpler (at least in the mathematical sens) under the hypothesis of small topographic variation. In this work we study the long time and global well-posedness of the Boussinesq-Peregrine system. First, We show the intermediate time well-posedness and the continuity of the associated flow map in the case of general topography (i.e. the amplitude of the bottom graph $\beta = O(1)$). The novelty resid in the functional siting, H^s, $s > \frac{1}{2}$. Second, We show that the results obtained in [1] still valid for the Boussinesq-Peregrine system under the hypothesis of small amplitude bottom variation (i.e. $\beta = O(\mu)$). More precisely we prove that, the system admits unconditional unique global solution in the Sobolev spaces of type $H^s(R)$, $s > \frac{1}{2}$, as well as the continuity of the associated flow map. Third, we establish the existence of a weak global solution in the Schonbek sense [2], i.e. existence of low regularity entropic solutions of the small bottom amplitude Boussinesq-Pelegrine equations emanating from $u_0 \in H^1$ and ζ_0 in an Orlicz class as weak limits of regular solutions.

Références

[1] L. Molinet, R. Talhouk and I. Zaiter. The Boussinesq Systems revisited. *Nonlinearity* **34,** (2021), 744-775.

[2] M. E. Schonbek, Existence of Solutions to the Boussinesq System of Equations, *Journal of Differential Equations* **42** (1981), 325-352.

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