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Darboux transformations and rogue wave solutions of a generalized AB system for the geophysical flows. (English) Zbl 1448.76087

Appl. Math. Lett. 88, 201-208 (2019).

Summary: In this paper, we investigate a generalized AB system, which is used to describe certain baroclinic instability processes in the geophysical flows. For the two short waves and mean flow, we derive out the Darboux and generalized Darboux transformations, both relevant to the coefficient of the nonlinear term and coefficient related to the shear. When the coefficient of the nonlinear term is positive, with the generalized Darboux transformation, we present the algorithm to derive the N th-order ($N = 1, 2, \dots$) rogue wave solutions. The first- and second-order rogue wave solutions are shown, where our first-order rogue waves are different from those in the existing literatures. The two short waves and mean flow are related to the coefficient of the nonlinear term under certain conditions; the coefficient related to the shear has a linear effect on the mean flow while has no effect on the two short waves. The N th-order rogue wave solutions turn to be singular when the coefficient of the nonlinear term is negative.

MSC:

76E20 Stability and instability of geophysical and astrophysical flows

35Q35 PDEs in connection with fluid mechanics

35A22 Transform methods (e.g., integral transforms) applied to PDEs

Cited in **18** Documents

Keywords:

geophysical flows; generalized AB system; Darboux transformations; higher-order rogue waves

Full Text: [DOI](#)

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