Two-Dimensional Rossby Waves: Exact Solutions to Petviashvili Equation

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Abstract: The two-dimensional (2D) nonlinear Rossby waves described by the Petviashvili equation, which has been invoked as an ageostrophic extension of the barotropic quasi-geostrophic potential vorticity equation, can be investigated through the exact periodic-wave solutions for the Petviashvili equation, while the exact analytical periodic-wave solutions to the Petviashvili equation are obtained by using the Jacobi elliptic function expansion method. It is shown that periodic-wave 2D Rossby solutions can be obtained by this method, and in the limit cases, the 2D Rossby soliton solutions are also obtained.

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