Symmetry Reductions and Exact Solutions of the Two-Layer Model in Atmosphere

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By means of the classical symmetry method, we investigate the two-layer model in atmosphere. The symmetry group of two-layer model equations is studied and its corresponding group invariant solutions are constructed. Ignoring the discussion of the infinite-dimensional subalgebra, we construct the optimal system of one-dimensional and two-dimensional group invariant solutions. Furthermore, using the associated vector fields of the obtained symmetry, we give out the reductions by one-dimensional and two-dimensional subalgebras, and some explicit solutions of two-layer model equations are obtained. For some interesting solutions, the figures are given out to show their properties. Some solutions can describe the horizontal structure of tropical cyclones (TC). Especially, a new solution of double-eyewall structure of TCs is firstly found in this two-layer model.

Key words: Two-Layer Model Equations; Classical Lie Symmetry Method; Optimal System; Explicit Solution.