Nonlinear Processes
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Discussions

Interactive comment on *"Time dependent Long's equation" by* M. Humi

Anonymous Referee #2

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This paper purports to derive a time-dependent generalizations of Long's equation and to investicate its solutions under some simplifications.

The derivation and discussion of the 'new' equations is problematic. The derivations includes two scalings, the first given in equations (5), the second in equation (18). The nondimensionalization could have been done in one step. Doing so would show that the net result is that the dimensional spatial variables x and z are non-dimensionalized with the same scalings which is why the hydrostatic parameter μ disappears after the second scaling. This would show that $\nabla^2\Psi$ is in fact the non-dimensional vorticity in contrast to the authors statements to the contrary (see first line of page 1679 and above equation (24)).

The new equations are the standard vorticity equation and density equations so there is nothing new here. The reductions (pages 1680–1682) amount to setting the total

vorticity to a constant.

In section 3 the time evolution of a stratified flow is considered. The solutions make use of equations (26) and (27) and hence are solutions with no vorticity. That there are such solutions seems very surprising. Do these solutions in fact exist? If they are correct they need to be discussed in more detail. What do these solutions mean?

Given these problems the paper should be rejected.

Some minor problems:

1. Below (12) it is stated 'assuming $U_0 \neq 0$. Since U_0 is the scaling for the horizontal velocity it can not possibly be zero.

2. In (5) ρ_0 is a characteristic density and hence is a constant. So the derivative of ρ_0 in (6) is incorrect.

3. bracket in $\nabla^2 \psi)_t$ shouldn't be there.

4. There are missing brackets in equation (22).

5. There is a $+$ sign missing in (23)

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