Nonlinear Processes
in Geophysics

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Interactive comment on "Complex environmental beta-plane turbulence: laboratory experiments with altimetric imaging velocimetry" *by* A. M. Matulka et al.

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The interest of this paper in using laboratory experiments to model geophysical complex flows is dual: Besides confirming the role of Coriolis beta effect on the latitudinal range of vortex sizes, the presentation and use of AIV (Altimetric Imaging Velocimetry) may be used both in the laboratory and in Geophysical and Environmental field and satellite analysis.

The technique of applying PIV like spatial and temporal correlation analysis on the Gradients of measured height and presenting its spectra provides very interesting turbulence information in order to examine the rotating stratified flows.

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It would be interesting to detail more the way in which the gradient vector field is presented it the plots as a scalar, and what is the range of precision in determining actual heights.

How the Spectra of the height variation of the flow relates to actual Lagrangian Tracer Spectra is assumed from a barotropic behavior of the flow, can you detect any actual baroclinic mixing events and local vorticity production ?

Some specific comments and questions:

1,- in the page 1510 – line 10: you have a concentration of salt 30 ppt, in the brine, why do you decide this kind of concentration, Was the reason to mach the concentration of salt, so the buoyancy was comparable to that due to the heat flux and the thermal gradient experiments?. It would be important to present the Richardson numbers or the buoyancy fluxes for both types of experiments.

2,- page 1511 – line 5. From your comments: Do you think this technique, not only can be extrapolated to determine the vortices in oceanografic context, maybe if can also possible to calculate the vortex induced deformations of the surface in some river estuaries, or in some areas where the river outflow mixes with the ocean salty water. Or in the situation of the Mediterranean outflow in the Atlantic (Meddies)

3,- in page 1512: Because you comment that the velocity was calculate using a (quasi-) geostrophic approximation, which is an indirect method, did you check this method with independent measurements, or have you considered the possibility to generate an alternative field of velocity with direct PIV or with the dispersive characteristic velocity obtained with some floating tracers.

4,- From Figure 1: what is the heigh of the camera position in the experiments, and if the position of the camera is vertical. How do you avoid the errors due to the video parallaxing, and how does the rotation affect the sides and centre of the tank, because you have both the slope of the surface flow and the slope (parabolic) of the (salt or

heat) interface?

5,- Figures 4 and 5 showing the spectra of both heat and salt experiments should have the same axes so comparisons are better made

6,-Can you estimate the pdf of vortices (heigh structures) as a function of (Latitude) radial position within the tank, It is clear that vortices near the (Pole) centre are smaller than near the (Equator) sides of the tank. In both experiments plots will be different (as Spectra are also) but could it be possible to collapse the data with a suitable length scale ?

Interactive comment on Nonlin. Processes Geophys. Discuss., 2, 1507, 2015.

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