Nonlin. Processes Geophys. Discuss., 2, C72–C74, 2015
www.nonlin-processes-geophys-discuss.net/2/C72/2015/

Nonlinear Processes in Geophysics
Discussions
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Interactive comment on "Dynamics of turbulence under the effect of stratification and internal waves" *by* O. A. Druzhinin and L. A. Ostrovsky

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Received and published: 16 March 2015

General comments: This work is a continuation of the DNS study of the effect of small-scale turbulence on internal gravity waves (IW) propagation in a pycnocline published by Druzhinin et al. in Nonlin. Processes Geophys., 20, 2013 (DOZ2013). The numerical set-up is the same as in DOZ2013 with one significant difference: in the previous work the turbulence was continuously forced, while in the current work the unforced evolution of turbulence from a given initial condition in the presence of IW is considered. Less significant but an important difference is that the IW amplitude in the current work is larger by factor of 2 than in the DOZ2013. The main objective of the current work is to study the enhancement of small-scale turbulence by IW propagating in a pycnocline, which is also different from the objective of the DOZ2013 work. The paper is

clearly written and contains new results that shed some light on an issue of theoretical interest to the geophysical community; therefore the manuscript merits publication in the NPGD. It is not without its deficiencies, however, and these should be addressed before the manuscript is published.

Specific Comments: 1) The title of the paper is too general. I think it should directly reflect the main objective of the work, namely, the effect of IW on a free evolution of small-scale turbulence near a pycnocline. 2) Throughout the paper the authors promote the idea that in the strongly stratified regions the turbulence becomes quasi-two dimensional. For example, on p.338, lines 20-23 and on p.339, lines 20-25, they argue that since the vertical velocity fluctuations become much smaller than their horizontal counterparts, the 3D turbulence collapses to quasi-2D. It is true that the vertical fluctuations often diminish due to strong stable stratification. However, a strong vertical variability of the other components remains and even increases. The flow becomes organized in thin layers, "pancakes", weakly correlated with one another. Such a velocity field should be called "almost two-component". The term "quasi two-dimensional", on the other hand, only refers to a flow in which the variability of fluctuating quantities is severely restricted in one (vertical) direction; such a flow is rather organized in columnar structures, but vertical motion is not necessarily excluded. 3) The related issue is the strength of the horizontal and the vertical components of vorticity. The space distribution of y and z vorticity components (wy and wz) are shown in Fig. 3e and is discussed in terms of "3D – quasi-2D" transition in the last paragraph on p. 340. The formation of "pancake large-scale vortex structures" is shown. But are they quasi-two dimensional? It would be very informative if the horizontal rms of wy and wz as functions of the vertical coordinate z were shown. The argument of "two-dimensionalization" would only be valid if wz were the dominant component.

Minor corrections & typos: 1) Caption to Fig. 1: "...Nm the buoyancy frequency in the pycnocline center" - should be N0 instead of Nm. 2) Page 341, lines 15-17: "In the latter region (far from the pycnocline, z=11?), the decay rate of the turbulent kinetic energy is reduced as compared to the region in the vicinity of the pycnocline (z=9?)". I suppose that there is a typo because the rate of decay is higher at z=11.

Interactive comment on Nonlin. Processes Geophys. Discuss., 2, 329, 2015.