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Nonlinear Processes in Geophysics
Discussions
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Interactive comment on "Estimating vertically averaged energy dissipation rate" *by* Nozomi Sugiura et al.

Anonymous Referee #2

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This manuscript discusses the estimation of vertically averaged dissipation in marine turbulence. The authors seem to rediscover some well known results (scale dependence of the local average of the energy dissipation in turbulence), and seem also to ignore the relevant literature, which is vast and classical on this topic.

The manuscript lacks a clear structure; it lacks a review of the literature about intermittent turbulence, and intermittent marine turbulence. The problem addressed is not well explained and globally the whole object of the manuscript does not seem to be to be relevant. I do not suggest to accept such manuscript. I do not recommend major changes: this manuscript must be totally rewritten.

Below some more comments to help improve the manuscript (which should be completely rewritten, taking into account the theoretical framework of intermittent multi frac-

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Discussion paper

tal turbulence): Equation 1: a general book on turbulence should be cited, such as e.g. Pope (2000). Text between equation 1 and equation 3: the authors should indicate that the local energy dissipation in turbulence is intermittent and that an expression such as equation 3 has been proposed by Kolmogorov (1962) to deal with the scale dependence of the locally averaged energy dissipation. Kolmogorov (1941) scaling law should be cited and the scale dependence of the statistics of the locally averaged energy dissipation, given in the framework of multifractal cascade models in turbulence (a relevant reference can be here Frisch 1995) should be provided. It is correct that a lognormal approximation for the dissipation is often assumed, but it is also known that the turbulent dissipation is not strictly lognormal. There are many references on such topic, some of them should be cited.

The authors should discuss the inertial range in which there is a cascade from large to small scales. The scale dependence of the statistics of the locally averaged energy dissipation should be found in the inertial range. In the multifractal framework, which is widely used to describe and model the intermittency of the dissipation, the scale dependence of the moments of the locally averaged dissipation field has a theoretical expression which could be tested in the manuscript.

About the data analyzed: what is the quantity measured? The dissipation epsilon cannot be directly measured. Sometimes epsilon is estimated from vertical profiles using some hypothetical expression: this must be specified and the relevance of the formulae should be discussed. In the inertial range, in the framework of multiplicative cascades models, the dissipation field has a scaling power-law Fourier spectrum. This should be check using the data. The PDF given in Figure 4 is not lognormal, very clearly. It is not symmetric; it has fat tails. A lognormal test can be applied to check the quality of the lognormal fit of the PDF.

The correct average of the dissipation field is the arithmetic average; other types of averages -geometric or taking log- have no physical meaning. This questions the objective of the manuscript, since the authors perform statistics on the log of epsilon, as-

suming Gaussianity of this quantity. Since this assumption is an approximation, what is the quality of the analysis done in this manuscript? The authors should try to quantify this.

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