REVIEW REPORT ON

Turbulence observations in the Gulf of Trieste under moderate wind forcing and different water column stratification
by F. Falcieri et al.

The authors report about turbulence measurements in the Gulf of Trieste (Italy) performed during the experimental campaign CARPET in 2014 with the CNR vessel URANIA. The specific conditions from the atmospheric and oceanographic point of views are of moderate wind forcing and of variable water column stratification, respectively.
Turbulence measurements are performed using two miscrostructure (MSS) profilers, while the atmospheric conditions are established in terms of soundings and local measurements recorded during the cruise. A downward looking hull-mounted ADCP at resolution of 75Khz is also used to complement MSS measurements.
Main results presented by the authors concern the profiles of the turbulent kinetic energy dissipation rates ϵ, together with estimates of the dissipation rate due to bottom shear stress ϵ_{sb} and the dissipation rate due to the surface wind stress ϵ_s.

This work is of clear importance for both a theoretical assessment of the validity of classical theory of turbulence in the context of ocean dynamics, and for modeling applications needing estimates of parameters such as ϵ, ϵ_s and ϵ_{sb} and their variations. Hence I would like to see it published, however I find that it has to be modified before being accepted.
My most relevant concerns, detailed here below, are about the results presentation and the statistical analysis performed. In particular, the paper is somehow difficult to read: the results are worthy to be discussed in a better and clearer way. I find that they are lost among many informations not necessarily relevant, which might be shortened or moved to Appendices.
Finally, other corrections are listed at the end of this report.

Main concerns:

1 The first part of the paper describing the experimental campaign and different features is too long. The reader is sometimes lost in many details, risking to loose the main points of the work. I would ask the

authors to make it shorter and less descriptive, but highlighting the main and important features. In the end this is a work about turbulent velocity and velocity gradient measurements, and this should be the focus.
The procedure sketched in Sec. 2.2 is to me justified in its purpose but it is rather arbitrary in the method: I am not sure it significantly improves the data quality. I would ask the authors to move it in the Appendix, together with the associated Figure 3.

2 The turbulent kinetic dissipation rates are extracted from the MSS profilers: we can say that these ARE the most important data in the paper, or among the most important ones. However no detailed info is given on how these are extracted.
Which is the working frequency of the MSS? Which formula is used to derive the TKE from the shear rate measurements? Can the authors show the averaged shear rate spectrum? How is the water column stability accounted for?
Also, with MSS, TKE can be extracted from scalars behaviour. It would be interesting to check how TKE derived from the shear rates compare to that extracted from scalars microstructure.

3 At page 13 of the paper (page 1741), the authors introduce the reference relations they use to estimate the kinetic energy dissipation rates from data. I find that this part of the paper is too vague, in particular since the focus of the work is turbulence.
First the authors should cite the literature they refer to in this sentence:
It is generally accepted that mechanical generation of turbulence due to surface wind stress (ϵ_s) follows a law of the wall relationship for which[...] .
Second and most importantly the authors should explain exactly how and where they use Eq. 2. How is the surface wind stress τ_a estimated? Which value is used for z? Are there any corrections due to drag coefficients? and if yes which ones?

4 Still at page 13 and then 14 (1741 and 1742), the authors refer to the turbulent kinetic energy dissipation rate ϵ_{sb} due bottom shear stress,

estimated from the bottom friction velocity u_{*b}. Observations similar to those expressed above arise for the application of eqs. (4) and (5). As the authors clearly state *Hence the bottom stress computed using a drag coefficient of 0.003 and quadratic drag law needs to be regarded as just a rough estimation.* Why have the authors not used ADCP data to extract an alternative "estimate" of ϵ_{sb}? The first one is by using the turbulent kinetic energy spectrum: altough the ADCP frequency is moderate, an attemtp could be done. The second one is by using the ADCP data to estimate horizontal velocity vertical gradients in terms of velocity increments along the vertical direction, and then appling $\epsilon \simeq C\nu(\partial u'/\partial z)^2$, where C is an order one constant. Again, since the focus of the paper is turbulence measurements, the authors should pay more attention to this part.

5 I would ask the authors to rephrase the Conclusions. While a short summary of the content of the paper is useful, a long discussion is not needed. To me, the main point of the paper is that TKE measurements are highly variable (as it is known in turbulence in general), and can be influenced by different features in ocean turbulent flows, in particular. Density stratification and the impact of suspended sediments have to be better investigated to be able to quantify, at least phenomenologically, ranges of values for which TKE is substantially modified.

Other corrections:

1 at Page 1739, it is written *Shear data from both profilers were used to determine the turbulent kinetic energy dissipation rate (ϵ), the dissipation rate of temperature variance (χ), eddy (K_ρ) and heat diffusivity (K_h) and the Thorpe scale (L_T).*
Where are these data discussed? Am I missing something?

2 page 1741, line 15 : ϵ_b is to be replaced by ϵ_{sb} and u_{*a} is to be replaced by u_{*b}.

3 Caption of Figure 1: fro –¿ for; insert –¿ inset.

4 The list of Reference is to me a bit unbalanced. Authors refer to lots of papers about the Adriatic circulation, but references about turbulence analysis are unexplainably missing.