

## ***Interactive comment on “Exceedance frequency of appearance of extreme internal waves in the World Ocean” by Tatyana Talipova et al.***

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Received and published: 23 February 2018

The manuscript requires major revision. My comments are below and attached.

The authors analyze data in several regions of the global ocean to estimate the exceedance frequency of internal waves with various amplitudes in the actual range of amplitude variation. Their analysis is based on the statistical theory. They find the probability distribution of the occurrence of large and small amplitudes of internal waves. They compare the distributions of amplitudes described by the Gauss and Poisson functions. The authors find statistical estimates of the existence of internal waves with different amplitudes. They conclude that internal waves with large amplitudes cannot be described by the Gaussian distribution. The authors find that the observed ex-

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ceedance probability of large-amplitude internal waves in most cases can be described by the Poisson distribution function, which is one of the typical curves of extreme statistics.

The manuscript can be published in the Nonlinear Processes in Geophysics, but much more work is needed before publication to improve the text and analysis. Major revision is needed. The authors should check the style and grammar of the text.

Line to line comments are below.

Page 1 line 25 It is better to cite paper [Morozov E.G., Trulsen K., Velarde M.G., and Vlasenko V.I., Internal tides in the Strait of Gibraltar, J. Physical Oceanography, vol. 32, 3193-3206, 2002] instead of [Morozov 2003] to show extreme waves in the shelf region. The amplitudes of internal waves in the Strait of Gibraltar reach 150 m. Extreme waves of high amplitudes in the Kara Gates Strait are analyzed in [Morozov E.G., Parrilla-Barrera G., Velarde M.G., Scherbinin A.D., The Straits of Gibraltar and Kara Gates: A Comparison of Internal Tides, Oceanologica Acta, Vol. 26 (3), 231-241, 2003; Morozov E.G., Paka V.T., Bakhanov V.V., Strong internal tides in the Kara Gates Strait, Geophysical Research Letters, p. L16603, 2008].

Page 1 line 28 Citation: “Large-amplitude internal waves have great interest...” I believe that this is not true. It is better to write: Internal wave cause interest of researches because...

Page 2 line 4 Citation: “intense large-amplitude waves being are treated as outliers of a given random process” I believe the authors wanted to say that they interpret internal waves as outliers of a random process.

Page 2 line 9 Citation: “is observed at the longitude 116.5°E and the June 2000 was the most reach on the generation of the internal wave packets”

It is not correct to relate the physical phenomena to longitude and dates. I believe that the fact of intense generation of internal wave packets is related to the steep bottom

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topography in the region of this longitude in the South China Sea and intense tidal forcing in this time period.

Page 2 line 18, Page 7 line 22, Page 10 line 8 Please unify the name of the Mesopolygon experiment

Page 4 line 5 Citation: "which can be as danger as large crests" Where does the danger come from?

Page 6 line 1 Citation: "Its mean value can be calculated only if wave record is long enough, that is usually to measure in the ocean." Do you mean that you have to make long measurements in the ocean?

Page 6 section 3.1 You analyze distributions of amplitudes in different regions of the ocean, but in this section you did not say anything about the amplitudes of internal waves in this region.

Page 7 line 26 It is very difficult for the readers to get an access to this book [Kort, 1988]. Please write a few more sentences than you did explaining the experiment with many moorings.

Page 7 line 28 Canary Deep and the Green Cape Deep These names of the deep basins are not correct. It is better to use Canary Basin and Cabo Verde Basin or Gambia Abyssal Plain for the entire region.

Page 7 line 30; page 9 line 6 Horizon is not a proper term. Please use depth or level

Page 8 line 1 Celsius řČđ Celsius degrees or centigrade

Page 8 line 8 You can use mean vertical temperature gradient in the region to convert temperature fluctuations to vertical displacements

Page 8 line 20 Please explain what do you mean by poor regime? Do you mean that internal tides are not intense?

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Page 8 line 20 The wave height distribution function is calculated from these data. You did not say anything about the data. Please explain what sort of data you use because you calculate amplitudes. Do you use towed measurements?

Page 9 line 1 Citation: "smaller amplitudes than in the ocean, where 100-meter waves are recorded (Ramp et al., 2004)."

Internal wave amplitudes equal to 100 m are not characteristic of the ocean. They can be found only in a few regions, for example the Mascarene Ridge [Morozov E.G., Vlasenko V.I., Extreme tidal internal waves near the Mascarene ridge, J. Marine Systems, Vol. 9, no 3-4, p. 203-210, 1996] or in the region of the Luzon Strait described in (Ramp et al., 2004). The third region of intense internal tides is south of Alaska (Amukta Pass) (52řČř N, 172řČř W). [Cummins P.F., Cherniawsky J.Y., Foreman M.G. (2001) North Pacific internal tides from the Aleutian Ridge: Altimeter observations and modeling. J. Mar. Res. 59:167–91].

Page 9 line 29 Citation: "Nevertheless, the internal waves in the eastern Mediterranean Sea have amplitudes not more than 2 m but the amplitude distribution function closes to the Poisson law."

Is the distribution function close to the Poisson law? How do you explain this fact? Small amplitudes should be described by the Gaussian distribution

Page 10 line 6 I think fresh water intrusions into the ocean do not generate intense internal waves. Intense internal waves are generated due to the interaction between the barotropic tide and bottom topography. It is known that tropical South Atlantic is a region of strong internal waves due to strong generation of internal tides by the interaction between the barotropic tide and bottom topography [Morozov E.G. Semidiurnal internal wave global field, Deep Sea Research, vol. 42, No 1, 1995, 135-148]. In this publication you can find characteristics of internal tide and comparison of their intensity in different regions of the ocean needed for the analysis of your review of internal waves in different regions. A review of internal tide generation is given in [Garrett C.,

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Kunze E. (2007) Internal tide generation in the deep ocean. Annual Rev. Fluid Mech. 39: 57–87]

Page 10 line 9 Citation: "...that internal waves in the Mezoppoligon-85 are not too often generated." I would say that internal waves of high amplitudes are not often recorded in this region, but ordinary internal waves are generated always.

Page 10 line 13-16 It is difficult to understand the sentences in lines 13-16, please remove them and write reasonable section of conclusions (pages 9-10). Please compare distribution functions for internal wave amplitudes in each region studied. Recalculate temperature fluctuations to vertical amplitudes using vertical gradients of temperature.

Please also note the supplement to this comment:

<https://www.nonlin-processes-geophys-discuss.net/npg-2018-12/npg-2018-12-RC1-supplement.pdf>

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Interactive comment on Nonlin. Processes Geophys. Discuss., <https://doi.org/10.5194/npg-2018-12>, 2018.