

Interactive comment on “Current temporal asymmetry and the role of tides: Nan-Wan Bay vs. the Gulf of Elat” by Yosef Ashkenazy et al.

Yosef Ashkenazy et al.

ashkena@bgu.ac.il

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We thank Reviewer 1 for her/his thoughtful comments. Reviewer 1 concludes that *“In my opinion, the paper is in principle clearly written, regarding methods and results. However, to truly appreciate the added value of this study, I think the motivation of the study should be better articulated (including the choice of bays) as well as the wider implications and overall significance of the results.”* We are grateful for the reviewer’s comments which helped us to improve the paper. Below is our detailed response.

Specific comments

§1, first goal. The first goal, stated on line 17 op page 2, only seems meaningful because of the outcome. I mean: what if you would have found the opposite results, i.e. different statistics? In my opinion, you could not conclude anything about uniqueness

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because of the profound differences between the two bays. Please comment on this.

We agree and rephrased the goal of the paper as follows:

The first goal of the present study was to verify whether the spatial variability of the statistical properties of the surface currents in the Gulf of Elat, reported in Ashkenazy and Gildor (2011), also exists in a quite different environment such as the Nan-Wan Bay of Taiwan (Fig. 1a,c).

§1, choice of bays. These differences between the two bays appear to be so profound that it is hard to really learn from the results. To avoid the impression of a somewhat artificial choice, I invite the authors to better motivate their choice to compare these two bays.

These two bays are very different, as described in manuscript, while at the same time, high-quality radar data exist for both. This is exactly why we choose these two locations. It wouldn't be that interesting to compare two similar bays. Moreover, had the results show that both bays share the same statistics (in all aspects), it would have been very surprising. That some of the characteristics are the same despite the large differences between the bays, suggest that our choice was actually not so bad, and that the reported conclusion regarding the natural variability of the statistical properties of surface currents is relevant in other marine environments.

We stress that we purposely choose such different environments in page 8, lines 12-14. We also state in the Summary section:

We fitted the PDFs of the surface currents to the Weibull distribution and found large spatial and seasonal variability of the Weibull distribution parameters (the shape k and scale λ parameters) in both basins, in spite of the many differences between the two regions.

§3.4, asymmetry. The notation of τ seems incorrect. According to Eq. (2), it is a

number of time steps, i.e. an integer number. Yet, according to the text it is a time interval, measured in days. What is missing is the conversion by the time step Δt of the time series. Correct would be: time interval $\tau = N_\tau \Delta t$ with N_τ the number of time steps to be used in the summation in Eq. (2). Please correct/clarify., choice of bays.

We agree and changed the text and Eq. (2) accordingly as follows:

The asymmetry measure, A , of the current speed time series s_i ($i = 1 \dots N$ where N is the length of the time series) can be expressed as:

$$2A(\tau) = \frac{1}{N - N_\tau} \sum_{i=1}^{N-N_\tau} \Theta(s_{i+N_\tau} - s_i), \quad (1)$$

where $\tau = N_\tau \Delta t$ is the asymmetry time interval, Δt is the measurement temporal resolution, N_τ is the number of time steps compose the asymmetry time interval, and $\Theta(x)$ is a step function which is 1 for $x > 0$ and zero otherwise.

§4, standard deviation. I think the last statement on p.6 (line 33) is only correct if, in the calculation of the standard deviations per season, the annual mean is used (rather than the mean of that particular season). For example: it is theoretically possible to have zero standard deviations per season (constant values within season, but differing from one season to another), in combination with a nonzero overall (annual) standard deviation. Can you comment on this?

Following the reviewer's comment we decided to remove this confusing sentence from the revised manuscript.

§5, summary. I miss some elaboration on the wider implications of these results. This makes it hard for me to assess the overall significance of the results. Please expand.

Following the reviewer's comment we added the following sentences to the end of the summary section of the revised manuscript:

Our results indicate large spatial variability of the statistical properties of surface currents, even in small regions of a few kilometers and in very different environments. Thus, regional ocean modeling verification as well as the estimation of kinetic energy that can be extracted using ocean currents should be performed by using sufficiently fine spatial resolution. In addition, the statistical characteristics of the various regions should be used as a benchmark for model performance.

Technical corrections

Throughout manuscript: please be consistent with 'fall' vs 'autumn'.

Done—we now only use the term 'fall'. Thank you.

§2.1-2, study regions. Perhaps consider mentioning the form factor F to quantify the relative importance of diurnal and semidiurnal tides for both basins?

We agree that the form factor F is a useful measure to quantify the importance of diurnal and semidiurnal tides. Yet, since it is clear that tides are much more significant in Nan Wan Bay compare to the Gulf of Elat, and to simplify and ease the reading of the manuscript, we prefer not to introduce and present this form factor measure.

Page 5, below Eq. (1). Please state that x represents the random variable (symbol not explained).

We now write that x is a “Weibull random variable”.

Page 5, line 15. It is not clear that these are three alternatives: I guess either (i), (ii) or (iii) is used. Further to this, I presume that 'different moments' refers to statistical moments, and I think that 'hazard function' may not be clear to some readers.

We actually analyzed using all three alternatives. The different methods yielded similar results and we mention it in the text. Following the reviewer's comment we rephrased these sentences as follows:

... it is possible to estimate k using either (i) the different statistical moments, or (ii) the hazard function (see Ashkenazy and Gildor, 2011, for more details), or (iii) the maximum likelihood estimator of the Weibull distribution The different methods yielded similar results, and we thus present below only the results that are based on the different moment estimation (see Ashkenazy and Gildor, 2011).

Page 5, line 32: “The asymmetry measure of the current speed. . .” change into “The asymmetry measure A of the current speed. . .”

Done.

Figures 3, 4, 5, and 7: please include in the caption that these plots are about Nan Wan Bay

Done.

Figure 5: it is not clear from the figure and caption that the quantity A is plotted here. Please add.

Done.

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