MS No.: egusphere-2025-283
Title: Enhancement of near-inertial waves by cyclonic eddy in the northwestern South China Sea during spring 2022

Point-by-Point Response to Reviewers

In this point-by-point response, we reproduced the comments (**black font**), provided our responses (**blue font**), and highlighted the corresponding revisions in **red**.

Specific Comments

1. Did the authors apply a moving average to the energy transfer rate estimates? The moving-average window should be substantially shorter than 7 days, as longer windows may affect the integrated energy transfer rate value. In either case, if any kind of temporal averaging was applied, the authors should explicitly describe the method and clearly state the window length in the manuscript.

Response: Thanks for this comment. We didn't apply any kind of other temporal averaging during the calculation. Our previous calculation lay in this formula:

$$\varepsilon = -\left(\langle u_i u_i \rangle - \langle v_i v_i \rangle\right)\frac{S_n}{2} - \langle u_i v_i \rangle S_s$$

The $\langle \cdot \rangle$ represents a moving average of 3 internal wave periods. The moving average needs to be applied after multiplying the variables; however we applied the moving average to individual variables before the multiplication, which thus resulted in excessive smoothing of the final results.

2. Thank you for considering the revision. However, the revised sentences do not convey the intended meaning. I recommend rephrasing as follows:

Original:
Meanwhile, we calculated the relative vorticity based on surface geostrophic currents and the local inertial frequency, and found that the average spectral peak frequency reached about 0.69 cpd during the eddy period. This value is very close to our observed ωp.

Suggested revision:
The observed near-inertial spectral peak, ω_p=0.667 cpd, in the CE is consistent with the effective inertial frequency, f_eff=f+ ζ ≈ 0.69 cpd, estimated from surface geostrophic currents and the local inertial frequency.

Response: Thanks for this comment. We have rephrased as your advised: "The observed near-inertial spectral peak, ω_p=0.667 cpd, in the CE is consistent with the effective inertial frequency, $f_{eff} = f + \zeta \approx 0.69$ cpd, estimated from surface geostrophic currents and the local inertial frequency."

3. The authors appear to have misunderstood my earlier concern.
Near-inertial wind work (NIWW) refers to the rate of energy transfer from wind stress to near-inertial motions, and it should be computed as:
NIWW=τ_i·u_i,
where both the wind stress τ_i and surface current u_i are band-pass filtered to isolate near-inertial frequencies.
However, in Equation (6) (and accompanying text in lines 120-126), it seems that the wind stress is not filtered to retain only the near-inertial components. This means the resulting calculation does not represent near-inertial wind work.
I recommend that the authors carefully check their calculation, ensure appropriate filtering is applied to the wind stress, and revise the corresponding interpretation accordingly.

Response: Thanks for this comment. We reviewed several different references and found that some of them directly used wind stress for calculating the near-inertial wind work (Liu et al., 2019; Voelker et al., 2020), while others performed calculations after applying near-inertial filtering to wind stress (Flexas et al., 2019; Voet et al., 2024a). Relevant references are listed at the end. After careful consideration, we concluded that using filtered wind stress is more appropriate and thus have made corresponding adjustments. The change is as follows:

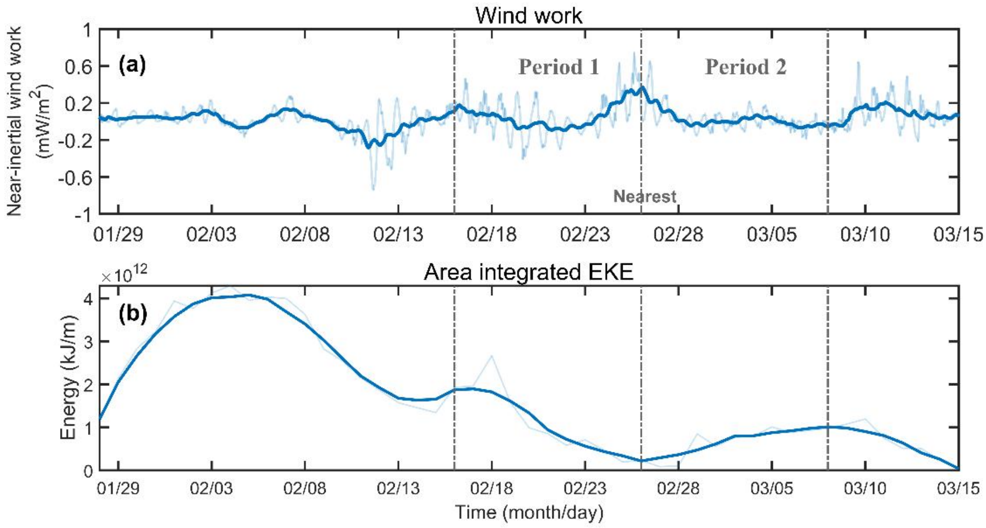

Figure 5: (a) Time series of raw (thin lines) and daily-smoothed (thick lines) averaged wind-input NIKE at Q1-Q4. **(b)** Time series of raw (thin lines) and daily-smoothed (thick lines) area integrated EKE.

section 2.2:

Near-inertial wind work was estimated as (Alford, 2001; Dasaro, 1985; Voet et al., 2024b):

$$W = \vec{\tau}_i \cdot \vec{u}_i, \tag{6}$$

where $\vec{u}_i$ is near-inertial velocity at sea surface derived from CMEMS products and $\vec{\tau}_i$ is bandpassed near-inertial wind stress after calculated as (Alford, 2020; Liu et al., 2019):

section 3.2:

The wind work during the eddy period is about several orders of magnitude smaller than that affected by typhoons (Ouyang et al., 2022; Yuan et al., 2024) and several times smaller than the wind work results of Voet et al. (2024) in the Iceland basin.

4. Typos:
L226: qualified -> quantified
L237: Q1 -> Q1, Q2?

Response: Thanks for this comment. We have changed these two typo mistakes.

References:

Flexas, M. M., Thompson, A. F., Torres, H. S., Klein, P., Farrar, J. T., Zhang, H., and Menemenlis, D.: Global Estimates of the Energy Transfer From the Wind to the Ocean, With Emphasis on Near-Inertial Oscillations, Journal of Geophysical Research: Oceans, 124, 5723-5746, 2019.

Liu, Y., Jing, Z., and Wu, L.: Wind Power on Oceanic Near-Inertial Oscillations in the Global Ocean Estimated From Surface Drifters, Geophysical Research Letters, 46, 2647-2653, 2019.

Voet, G., Waterhouse, A., Savage, A., Kunze, E., MacKinnon, J., Alford, M., Colosi, J., Simmons, H., Klenz, T., Kelly, S., Moum, J., Whalen, C., Lien, R.-C., and Girton, J.: Near-Inertial Energy Variability in a Strong Mesoscale Eddy Field in the Iceland Basin, Oceanography, doi: 10.5670/oceanog.2024.302, 2024a. 2024a.

Voet, G., Waterhouse, A. F., Savage, A., Kunze, E., Mackinnon, J. A., Alford, M. H., Colosi, J. A., Simmons, H. L., Klenz, T., and Kelly, S. M.: NEAR-INERTIAL ENERGY VARIABILITY IN A STRONG MESOSCALE EDDY FIELD IN THE ICELAND BASIN, Oceanography, 37, 2024b.