Reply to Referee #1:

Summary and recommendation: This paper is an important contribution and should be published pending a major revision.

Thanks very much for your helpful comments and suggestions. Our responses to the comments are as follows. The Referee's comments are cited in italics.

Major concerns:

Satellite data alone are not sufficient to reveal dynamical mechanisms that maintain various fronts except for some obvious cases such as, e.g., river plume fronts. Therefore, it is not clear how the authors can tell a tidal mixing front (TMF) from a "thermohaline" front (using the authors' terminology). Perhaps, the authors relied on numerous studies by Japanese oceanographers who studied the Seto Inland Sea (SIS) from in situ data. If this is the case, then (A) such in situ studies should be cited with regard to each of 12 fronts identified in this study; (B) vertical sections of T and S across these 12 fronts should be provided in the main text or in the Supplementary Materials.

Thank you for raising this issue. Theoretically, a tidal front forms in warming seasons while a thermohaline front in cooling seasons. This helps us to identify them from satellite data. Among the fronts in the Seto Inland Sea, the tidal fronts in Bungo Channel, Iyo-nada, Hiuchi-nada, and Osaka Bay (Figure 1) and the two thermohaline fronts in Iyo-nada and Kii Channel have been studied by field observations. We can therefore add the vertical distributions of temperature and salinity across these fronts to the revised Supplementary Materials (Figures S1 to S3). For the other 6 tidal fronts, we did not find in situ data for them. However, these fronts are located between the well-mixed strait area and the stratified basin area, and the value of $\log_{10}(h/u^3)$ at these fronts is between 2.5 and 3 (Figure S5). Furthermore, they appear in the warming seasons. All of these factors allow us to judge them as tidal fronts.

The authors write about fronts "around" various straits. This is confusing. The authors should re-write such sentences, avoiding the ambiguous "around" descriptor.

Thanks for your suggestion. We rewrote them in the revised manuscript.

TMFs are typically aligned with certain isobaths. The depth of such isobaths marks the maximum depth of wintertime convective mixing. The authors apparently ignored this fundamental relation between TMFs' locations and bathymetry.

According to Simpson and Hunter's energetics (Simpson and Hunter, 1974), which derived from a balance between the potential energy increase due to surface heating and turbulent kinetic energy dissipation induced by tidal stirring, the tidal front position depends on a critical value of $\log_{10}(h/u^3)$. Here h is the water depth, and u is the tidal current amplitude. Except for the tidal

fronts on both sides of Hayasui Strait (Figure 1), where the bathymetry is about 70 m, the bathymetry at other fronts is between 30 and 50 m. However, the critical values of $\log_{10}(h/u^3)$ at all tidal fronts are between 2.5 and 3, which is consistent with a previous study (Takeoka, 2002). Therefore, the tidal front position is determined by the water depth and the tidal current amplitude.

Because tidal fronts depend on the formation of stratification, they appear only in warming seasons. Therefore, the dependence of winter convective mixing on bathymetry should be the mechanism for different types of fronts.

Many references are incomplete. Make sure that volume number, issue number, article number, and pages are always provided when available.

Thank you for pointing this out. We have revised the reference.

L140: "Generally, pixels with grad T >0.1 ℃/km are identified as fronts." – This threshold (used by many authors) is arbitrary. A discussion of front definitions is warranted.

Thank you for raising this issue. For the tidal front with significant intra-tidal variations in Bungo Channel, the minimum front intensity is approximately 0.1 ℃/km when the front is closest to the mixed water area, and then the intensity can increase by 0.25 ℃/km as it moves toward the stratified water area (Dong and Guo, 2021). Similarly, the observed minimum intensity of the tidal front in the Iyo-nada is also slightly greater than 0.1 ℃/km (Sun and Isobe, 2006). Therefore, we define the pixels with $T_G \geq 0.1$ ℃/km as the fronts in the Seto Inland Sea. We have added related text on lines 141-145 of the revised manuscript.

L175: "Shapes of tidal fronts in the SIS primarily align orthogonally with the direction connecting the straits and basins, coinciding with the tidal current direction." – See Comment #3 above.

As mentioned above, the tidal front position is determined by the parameter depending on the ratio of water depth to cubic tidal current amplitude. The water depth increases gradually from the basin area to the strait area. The tidal current amplitude also increases from the wide basin area to the narrow strait area because of the decreasing of the sectional area the tidal current passes from the wide basin area to the narrow strait area. Consequently, the critical value of the parameter, i.e., the position of the front, is generally aligned with certain isobaths.

Comments on Figures:

Figure 1. The color scale in Figure 1a is not good. Use standard color scales like "jet" or "nipy_spectral" in Matlab. The color scale in Figure 1b is awful. Use jet or nipy_spectral.

Figures 2, 3, 4, and 6: Color scales are poor. Use jet or nipy_spectral.

Thanks for your suggestions. In revision, we have changed the color scale used in these figures.

Minor comments:

L15: "spatial amplitude" (?)

This is our mistake. What we wanted to present here is the spatial variation of tidal current amplitude. We have revised this sentence on line 15 of the revised manuscript.

L30: "crucial in" (?)

We have revised this word to "promote" on line 30 of the revised manuscript.

L47: "appearance frequency" (?)

This means the front frequency calculated by Equation 4.

L72: "intensigied" – intensified [Use spellchecker!]

Thanks. We have made this change in the revised manuscript and checked the manuscript again.

L75: "intra- and month-dependent variations" (?)

The month-dependent variation means that the fortnightly variations of the front are dependent on the month. We have revised this expression to "intra-tidal and month-dependent fortnightly variations" on line 77 of the revised manuscript.

L145: "…the SST data phase in a tidal cycle…" (?)

This means the SST data corresponding to different tidal phase in a tidal cycle.

L271: "… heavy water … above the light water..." (?) – "Dense water" would be better.

Thanks. We have made this change in the revised manuscript.

L382: "According to the effects of horizontal motion of water which has a horizontal buoyancy gradient on frontogenesis" – Re-write.

Thanks. We have revised this sentence to "According to the effect of the horizontal motion of water with a horizontal buoyancy gradient on frontogenesis" on line 389 of the revised manuscript.