This paper discusses the author's efforts to map the baroclinic N2 tide from satellite altimeter data collected from 1993 to 2019. The newly-derived maps are used to predict tides for missions in the 2020-2021 time period, and evaluate the quality of the maps. The mapping methodology has been presented in the author's previous papers. Mapping of baroclinic N2 was previously attempted by Dushaw (2015), and the work in this paper shows that additional data collected since that time, in combination with the author's analysis technique, makes it possible to map the N2 tide with more precision. While the results in this paper may be a step forward, I don't believe that it provides enough new material or insight to justify publication at this time. Although, with some added analysis, the paper could stand on its own and make a worthwhile contribution to the literature.

Thank you for your time and suggestions. My initial plan is to publish a short note. Now I change it to a long paper with 13 figures (vs 4 figures). In the revised manuscript, I present more details and more scientific insights.

Major Comments:
(1) The paper's qualitative observations about N_2 in relation to M_2 are completely plausible and expected, as the author points out.

Now the relation between M_2 and N_2 tides is quantitively studied. Figure 7 shows scatter plots of their amplitudes for both barotropic and baroclinic modes. Their correlation coefficients are given.

I don't understand the significance of the analysis of wave dispersion (section 3.3), though, since it seems to just verify the properties of the wave fields which are already assumed by the analysis technique. I would be surprised if there is anything of significance to say about the dynamics of N2 in contrast to M2, but maybe the author can convince me otherwise.

This analysis is removed. Now the phase difference of M_2 and N_2 internal tides are simply examined along two long-range beams.

(2) At line 48, the author states, "the resulting N2 internal tides still have considerable errors ... and work as a useful internal tide model," but I believe this is unproven. The qualitative discussion of the errors, from lines 170 to 183, may be correct, but there are certainly plenty of locations in Fig 4a where N2 is large-amplitude, but it exhibits negative explained variance (e.g., in the Western Pacific and Philippines Sea). If the discussion of noise or error level of the tide model could be made precise, then it might provide an objective means of deciding where the model can or cannot be a "useful internal tide model." Otherwise, it is just guesswork whether this could be used to provide a useful correction for the SWOT mission.

In the revised manuscript, the model errors are objectively estimated and shown in Figures 4c and 5. The model evaluation is improved, and Figure 6 clearly shows regions of positive or negative variance reduction.

Minor Comments:
l3: "technique" -> "techniques"
Fixed.

l57-58: Some of these missions have not been used previously for the estimation of N2 tides. What are the alias periods of N2 for the following missions: Cryosat-2, Haiyang-2A/2B, and Sentinel-3A/B? The Copernicus web site mentions that the products used are "tailored for data assimilation". It would be useful to explain what this involves.

Figure 2 is added to check the tidal aliasing issue. I check the histogram of the phase lags of the SSH measurements in one typical fitting window with respect to one N_2 (M_2) tidal cycle. The result shows that the SSH data evenly distribute over one M_2 cycle. Their distribution over one N_2 cycle is a little bumpy, which may cause larger errors in the N_2 model.

The satellite along-track data I used in this study are along-track unfiltered data. Thus, ALL internal tide signals are retained. My results (Figure 4) clearly show that the empirical N_2 model is informative, though imperfect. In this regards, the SWOT data can help.

l80-81: "orthogonal equation" ? Please use correct terminology

Changed to "*the Sturm-Liouville equation.*"

l86: I am curious why this bandwidth was selected and what are the implications?

Figure S1 below shows my 2D bandpass filter and the bandwidth. The bandwidth (upper cutoff and lower cutoff wavenumbers) is indicated by the two concentrical circles in (b). They are empirically chosen to be [0.8 1.25] times the local wavenumber *k*. It is because the 2D spectrum (b) shows outstanding peaks near *k*. If the bandwidth is too wide (say [0.5 1.5]), the output field will contain more background errors. If the bandwidth is too narrow (say [0.9 1.25]), the output field will lose real internal tide signals.

l137: typo: "beams are prone to affected" Also -- the beams are not affected by the measurement noise; the estimates for these features are affected by the noise.

Thank you. Changed. Later it is removed.

Section 3.3: I don't really understand the significance of this section. The frequencies of the tides are given, and the wavenumbers are assumed given by the dispersion relation. Thus, the observations of wave dispersion reported here are a consequence of the assumptions of the analysis method, aren't they?

This analysis is removed. The phase difference is studied along two long-range beams.

Section 3.4: Figure 4a shows that the proposed model of N2 does explain SLA variance in some regions and not others, as the text states. I think it would be important to provide an error estimate for the N2 tide. How would someone know where the correction should be applied and where it should not be applied? The qualitative discussion in the text mentions the amplitude of N2 in relation to the model error, sigma_epsilon, but this quantity is not estimated, even though it appears in mathematical inequalities.

In the revised manuscript, the model errors are objectively estimated and shown in Figures 4c and 5. The model evaluation is improved. My new Figure 6 clearly shows regions of positive or negative variance reduction.

l205: "sum-mesoscale" ?

Fixed.

Figures: I would like to see the figures much larger; I cannot make out much detail in the global maps in the sizes they are presented.

In the revised manuscript, all figures are plotted large.

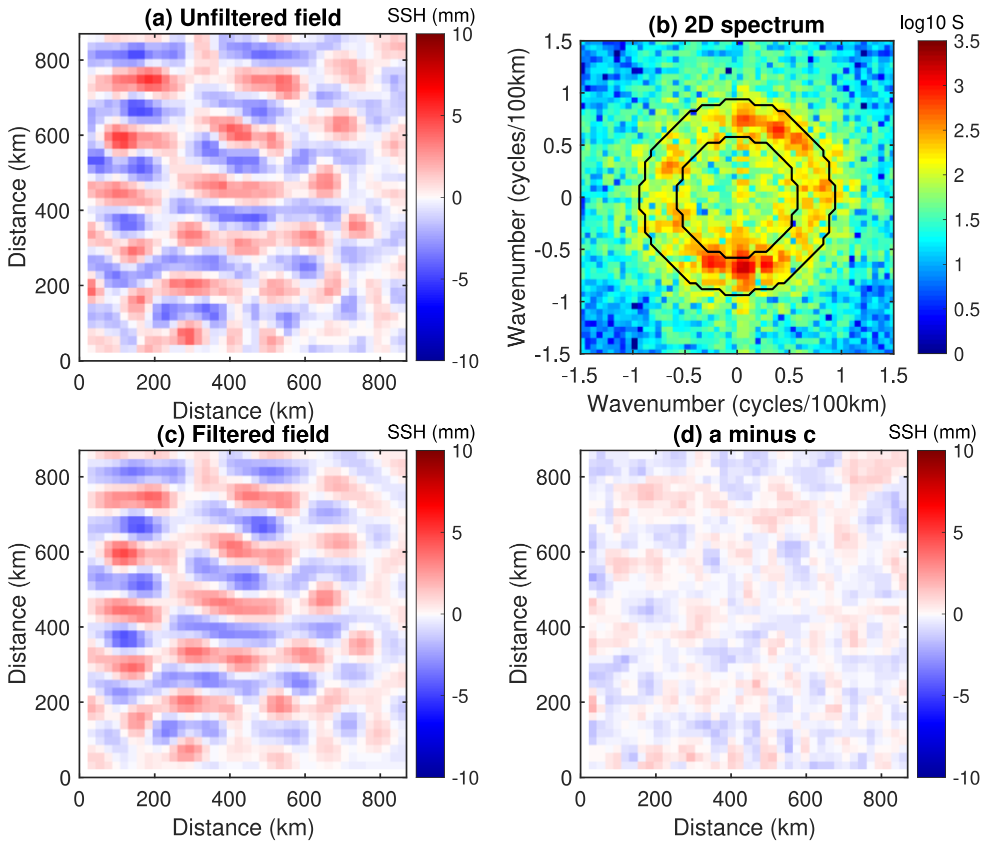

Figure S1. Horizontal 2D bandpass filter. Shown is a typical 850 km by 850 km window. (a) Snapshot N_2 internal tide field. It is obtained in the first-round plane wave analysis. (b) 2D wavenumber spectrum of (a). The two concentric circles indicate the upper and lower cutoff wavenumbers of the 2D filter. They are 0.8 and 1.25 times the mean wavenumber in this window. (c) Snapshot output N_2 internal tide field. (d) Difference between the input and output fields.