

## ***Interactive comment on “Interaction of Small-Scale Gravity Waves with the Terdiurnal Solar Tide in the Mesosphere and Lower Thermosphere” by Friederike Lilienthal et al.***

### **Anonymous Referee #3**

Received and published: 10 March 2020

This is a well-written manuscript, but this reviewer is confused about what the paper's focus was supposed to be, and what it turned out to be. Also, the gravity wave spectra used for the numerical experiments did not seem to be rooted in any clearly articulated or compelling physical reasoning.

In the Introduction, please explain what new science that the current paper provides in the context of what is already provided in Lilienthal et al. (2018) and Lilienthal and Jacobi (2019). The titles of those papers sound like they cover the same topics as the current paper.

In the Introduction, it is stated that a "significant amount of work has been conducted

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on the relation between GWs, DTs, and SDTs", but then the authors go on to quote some rather old papers by Miyahara and Forbes (1991) and Manson et al. (2002) in the context of providing examples of the "vast majority of the studies" (that) "focus on the MLT region in the context of GW-tide interactions". Are there not more current and comprehensive works focusing on GW-DT and GW-SDT interactions to quote?

This paper spends a lot of its time and effort on the zonal mean circulation and thermal structure, whereas according to the build-up in the Introduction, and the title of the paper, this work ought to be more focused on GW-TDT interactions. Maybe the title needs to be changed.

The changes in GW spectra in experiments EXP1, EXP2 and EXP3 are not very big, and they do not produce very big changes in the TDT. What is the thinking behind the changes in these spectral parameters? What is the physical basis for including only one horizontal wavelength in the spectrum? Aren't the GW with higher momentum fluxes at shorter wavelengths, i.e., < 100 km? Is there a difference between the part of the spectrum that is effective in determining the zonal mean circulation, and the part of the spectrum that interacts efficiently with tides? If so, please discuss in the context of making the choices that you do in the parameters for EXP1, EXP2, EXP3.

What do Sections 3 and 4 and Figures 2-7 (the bulk of the paper !!) have to do with GW-TDT interactions, which is supposed to be the main focus of this paper?

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Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2019-339>, 2020.

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