

## Author Response to Reviewer #1

*Author responses are in italics.*

**Reviewer:** The manuscript "Validation of SOFIE Nitric Oxide Measurements" by Hervig et al. represents a laudable effort to critically assess the quality of the NO data of the SOFIE experiment. In the very detailed analyses the contribution by water vapor, important below 85 km, emerges as an identified weakness of the data obtained by the SOFIE retrieval. Another significant discrepancy is between SOFIE and MIPAS above 120 km (Fig. 12). The fact that [NO] at sunrise and sunset in the mesosphere differ, is well established; why the differences between SOFIE vs. ACE (sunrise) and SOFIE vs. MIPAS (sunset) should also be different may have escaped me (Figs. 7 & 8). Similarly, I miss (or overlooked) a statement/suggestion why [NO] is apparently systematically different in the two hemispheres. Finally, I recommend to propose (or compose) a preliminary empirical model of NO considering the valuable findings that result from the present paper. Given that the above comments are addressed, I definitively recommend publication.

***Author:** SOFIE spacecraft sunrise (sunset) always occurred in the North (South), for the 2007-2016 data used in this paper (in late 2018, this reversed due to orbit changes). This is the main reason that SOFIE NO measurements are different between hemispheres, and the explanation is two-fold. First is the natural diurnal variation in NO (as you mention), and second is that measurement errors are different for sunrise vs. sunset (as discussed in Section 2.1). We feel that the coincident measurements were close enough in LT that diurnal variations should be a small part of the differences. It is rather the increased SOFIE errors for sunrise (NH) that explain differences in the SOFIE - ACE and SOFIE - MIPAS comparisons in the NH and SH. We have added statements that clarify these points (start of Section 2; discussion of Fig. 9).*

*We would support an empirical NO model that includes SOFIE observations, and welcome any collaboration in this future endeavor, however we feel that this is beyond the scope of the present paper. We note that there are already several empirical models for extant NO datasets from SNOE (Marsh et al.), ODIN-SMR (Kivrinta et al.) and SCIAMACHY (Bender et al.).*