

## **Review of Gumbel et al., “The MATS Satellite Mission-Gravity wave studies by mesospheric airglow/aerosol tomography and spectroscopy”**

This paper is an overview of the new Swedish satellite mission, MATS, which will be launched in 2019. It is thoroughly written, covering scientific objectives, instrumentations, retrieval methods for tomography, etc. No major concerns were found. Only some minor issues. Publication in the ACP LPMR special issue is recommended after some clarifications being made.

Some references cannot be found in the reference list.

Comments:

1. Page 1, line 16, “gravity wave interactions”, interactions with what? And many places throughout the manuscript.
2. Abstract, “Major scientific objectives...”. This sentence is redundant with the first sentence in the abstract.
3. Page 2, line 1, “large scale circulation” -→”large scale circulations”
4. page 2, line 5, “upwell at the summer pole”, the summer polar region might be a better expression. Same to “ the winter pole”.
5. page 2, line 9, nomenclature, why “PMCs” are not used in this paper? Aren’t PMCs often used by satellite measurements?
6. page 2, line 22, “is today understood”, is there a typo?
7. page 2, line 23, “important mechanisms and interactions”, what mechanisms and interactions? Please specify.
8. page 3, line 6, “MLT data...”, gravity wave observations in the MLT?
9. page 3, line 14, “Also concerning mesospheric ice formation and NLC..”, this sentence jumped out of nowhere in a gravity wave paragraph. How about a separate paragraph on the importance of NLC studies?
10. page 5, line 9, “extending below 100 km” and “extending below 10 km”, this could cause some confusion. “Below 100 km” means below 100 km altitude? How about “extending shorter than 100 km wavelength”?
11. page 5, line 21, “NLC” should use plural. “NLCs”

12. page 7, line 16, "Both O atmospheric band airglow and NLC feature...". It is very difficult to convert gravity waves in NLCs to temperature, geopotential or wind perturbations of gravity waves, that could be useful for models. Can the authors comment on this?
13. Figure 1. What are the red and purple lines in the two boxes?
14. page 8, line 11, "patters" or "patterns"?
15. page 9, lines 8-10, "nadir" actually means "from below the satellite."
16. page 9, the paragraph below Table 1. The orbit is near terminator (sunrise or sunset). Are you sure the nadir imager can see nightglow?
17. page 15, line 12, "Since the MATS...", this sentence belongs to the paragraph below.
18. page 16, line 22, "Section 0"?
19. page 17, line 17, "Figure.." which figure?
20. page 21, line 26, "MSIS-90", a newer version of MSIS is available:  
<https://en.wikipedia.org/wiki/NRLMSISE-00>  
Why chose to use an older version of MSIS?