

***Interactive comment on* “Solar and lunar tides in noctilucent clouds as determined by ground-based lidar” *by* Jens Fiedler and Gerd Baumgarten**

Anonymous Referee #2

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SUMMARY

This paper extends other recent studies of lunar tide effects in noctilucent cloud (NLC) observations by using the long data record (21 years) of lidar measurements collected at the ALOMAR observatory in Norway. The lidar measurements supplement other satellite data sets because all local times are sampled, which improves the ability to separate solar and lunar tidal signatures. These data have been used successfully in many other studies of NLC behavior.

This paper is well-written, and the results are generally reasonable. Some suggestions and comments related to specific items are provided below.

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SPECIFIC COMMENTS

1. p. 3, line 11: Please give 1-2 references for examples of the application of the superposed epoch analysis method.
2. p. 3, line 15: Extending the harmonic fit analysis to a 4th order term (period = 6 hours) requires high data quality to ensure that small noise fluctuations do not alias into apparent real behavior. Given the small magnitudes that are reported for this term in Table 1, is there any to demonstrate statistically that using it is valid?
3. p. 4, lines 16-21: The magnitude of the data reduction with the use of a “core” season is not that much different than the reduction when a long-term brightness limit is imposed (35% vs. 48%). It seems more likely that the brightness threshold eliminates some faint clouds that have a greater relative response to the weak lunar signal, whereas the use of a core season may actually improve the opportunity to identify this signal because faint clouds have better background conditions in which to form. If the authors agree with this premise, I suggest adding it to the discussion.
4. p. 5, lines 7-8: Fiedler et al. [2011] show significant interannual variation in amplitude and phase of solar tidal components in NLC properties measured at ALOMAR over 14 years. If similar variations are present in lunar tidal behavior, does that cause a problem for the application of the superposed epoch analysis method, which combines data taken during many separate years?
5. p. 5, lines 21-22: Note that von Savigny et al. [2017] and Hoffman et al. [2018] only present a semi-diurnal variation (as a single fit). So you should be careful in evaluating the agreement (or difference) between amplitudes and phases derived from those analyses vs. the 4-term results presented here. I would not expect complete agreement even if the same data set was examined because of the extra terms present in the 4-term fit.
6. p. 6, lines 12-14: Some of the terms in the lunar tidal results are barely larger

than their 1-sigma uncertainty (e.g. 6-hour period for OF, 12-hour and 8-hour period for Bmax). Since the original lunar signal is fairly weak, are you sure that all of these terms are really significant? Have you looked at fit results using only 2 or 3 terms?

7. p. 7, lines 28-30: What is the meaning of a negative vertical wavelength? Is this related to the sign of the phase term?

8. p. 8, lines 30-32: Would you expect that a nadir-viewing instrument (such as SBUV), that integrates the NLC signal vertically, would see something like a linear sum of the frequency values at each altitude? Or would it see a weighted sum because the larger (brighter) ice particles are present at lower altitudes?

TYPOGRAPHICAL ERRORS AND GRAMMATICAL SUGGESTIONS

p. 1, line 21: “waver” should be “water”.

p. 2, line 2: “Prominent influence have diurnal and semidiurnal components” could be changed to “Diurnal and semidiurnal components have a prominent influence”.

p. 2, line 6: “in atmosphere” should be “in the atmosphere”.

p. 2, line 18: “overhead” could be changed to “above”.

p. 2, line 31: “begin of” should be “the beginning of”.

p. 3, line 1: “a subset of 3100 hours” could be changed to “with a subset of 3100 hours that”.

p. 4, line 19: “restricts to” could be changed to “restricts the sampling to”.

p. 4, line 28: “observed 1997” should be “observed in 1997”.

p. 5, line 27: “Limp” should be “Limb”.

p. 6, line 8: “make aware” could be changed to “make the reader aware”.

p. 6, line 28: “results into” could be changed to “results in”.

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p. 6, line 34: “only be small impacted” could be changed to “have only a small impact”.

p. 9, line 21: “vertical” should be “vertically”.

p. 9, line 22: “hinting for” could be changed to “suggesting”.

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