



EGUsphere, referee comment RC2
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Comment on egusphere-2022-126

Anonymous Referee #1

Referee comment on "Responses of CIPS/AIM noctilucent clouds to the interplanetary magnetic field" by Liang Zhang et al., EGU sphere,
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Responses of CIPS/AIM Noctilucent Clouds to the Interplanetary Magnetic Field by Liang Zhang, Brian Tinsley, Limin Zhou.

The manuscript describes an analysis of space based observations of Noctilucent Clouds, also called Polar Mesospheric Clouds.

Observations between 2007 and 2017 are used and a correlation study with the IMF is performed on a day-to-day basis. The paper is well structured and reads in most parts well.

The analysis has a couple of major flaws that make the results questionable:

Tides and observational effects:

Tides at the cloud altitude are known to have a large effect on cloud occurrence and brightness, and other properties. Orbit changes and changes in the local time of the ascending and descending node might affect the correlation coefficients. A discussion is needed.

Microphysics:

The authors provide no detailed discussion about microphysical aspects that are well

elaborated in literature (e.g., Rapp and Thomas, 2006 and references therein). Instead, they mention "coagulation", which is less relevant (unimportant) for mesospheric clouds.

For example, IWC, brightness, and radius have a strong relation to each other. Since the detection threshold of CIPS depends on the particle size, it should be discussed how this affects the small particle size cutoff and its changes (e.g. Fig. 6).

Electron densities:

A discussion about the state of knowledge on IMF effects on the electron density at cloud altitudes is needed. E.g. in case IMF effects are longitude dependent, the results may be different for ascending and descending nodes. Since the electron density is relevant for particle charging in the dusty plasma environment, it is a key parameter.

A discussion of radar echoes associated with icy particles (PMSE) is completely missing. These radar echoes are caused/affected by electron density fluctuations and icy particles. Following the authors "IMF By - ionospheric potential - NLCs microphysics - NLCs brightness", they are likely more directly affected than NLCs.

Specific comments:

Line 106: Due to the large number of noisy lines in Figure 1, a correlation is not visible. A more convincing display would help.

Line 112: Figure 2 does not provide uncertainties. How significant are the year-to-year changes shown?

Line 126: It may be more convincing if negative lag days are also shown in Fig. 3.

Line 127: *"In previous studies of the link between Ly- α and NLCs, the proposed mechanism involving photodissociation, heating, or circulation all required longer time"*:
What causes the *"longer time"*, for example, for photodissociation? A more detailed discussion/references may help.