

Interactive comment on “Technical Note: VUV

photodesorption rates from water ice in the 120–150 K temperature range – significance for Noctilucent Clouds” by M. Yu. Kulikov et al.

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First of all, the authors are very grateful to the Referee for excellent evaluations of our work, its significance and quality, as well as the valuable comments.

Below we give our response to all the comments of Referee 1 (***bold face italicized text***) and indicate the changes introduced in the revised manuscript.

1 *What is the phase composition of your ice sample, i.e. hexagonal vs. cubic vs. amorphous ice? Since you have chosen a fast water vapor deposition for*
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sample preparation, an amorphous ice sample seems very feasible.

Each water ice sample was created relatively fast (during 1-3 min) and the first IR spectra were obtained after 3-5 min after the end of deposition. Nevertheless, all the obtained spectra were characterized by a shoulder at about 3360 cm^{-1} and two maxima at about 3200 and 3140 cm^{-1} , which corresponds to crystalline (cubic) ice (Schriver-Mazzuoli et al., IR reflection-absorption spectra of thin water ice films between 10-160 K, Journal of Molecular Structure, 2000). Apparently, real NLCs (or PMC) particles also consist of crystalline ice as it was found during direct IR scanning of PMC carried out by the ACE-FTS satellite instrument (Eremenko et al., GRL, 2005).

To clarify this issue, we included in the revised manuscript three sentences. Please see the first paragraph of Section 2.2 (lines 152-158):

“The time of individual sample deposition varied within 1-3 min. ... In spite of the relatively fast velocity of deposition, the main features of these spectra demonstrated that all samples were crystalline (cubic) ice. It should be noted, that direct IR scanning of clouds carried out by the ACE-FTS satellite instrument also showed that the water ice particles were composed of crystalline ice (Eremenko et al., 2005).”

Also, we have included a new citation in References:

Eremenko, M. N., Petelina, S. V., Zasetsky, A. Y., Karlsson, B., Rinsland, C. P., Llewellyn, E. J., Sloan, J. J.: Shape and composition of PMC particles derived from satellite remote sensing measurements Geophys. Res. Lett., 32, L16S06, doi:10.1029/2005GL023013, 2005.

2. What happens during a phase change from amorphous to cubic ice and further into hexagonal ice? Could photoproducts and secondary products be released during these structural changes?

As was mentioned above, we studied initially cubic ice. Moreover, no phase transition from cubic to hexagonal ice was observed during the irradiation. Nevertheless, it can

be supposed that such effects will appear during irradiation of water ice samples by more intense irradiation, which greatly exceeds the capabilities of our equipment.

The revised manuscript was supplemented by two sentences. Please see the first paragraph of Section 3 (lines 211-214):

"No phase transition of water ice samples to hexagonal or amorphous ice was registered during irradiation, as was found, for example, by Leto and Baratta (2003). So, the value of S_0 can be considered to be constant."

3. What are the crystal sizes of the ice? What impacts have grain boundaries?

Unfortunately, our laboratory setup does not include special means (X-ray or electron diffraction) in order to analyze small-scale structure of water ice samples and measure crystal (grain) sizes. However, obtained results and our estimations (please see Discussion and Conclusion) demonstrate that recombination of photoproducts follows immediately after photodissociation of H_2O , so photoproducts do not have sufficient time to escape from the lattice site (unit cell) where they were born. Unit cell has significantly lower sizes than grains of the ice. It means that grains sizes and their boundaries features can not essentially influence the rate of photodesorption.

4. I also wonder that so little information is presented concerning the history of NLC discovery and about the ideas of Alfred Wegener who is the patron of the host institution where the experiments were carried out.

Equitable note. Unfortunately, as we can see from the published Technical Notes, the format of this type of article differs from usual research articles of Atmospheric Chemistry and Physics. As we understand, Technical Notes should be more compact and except detailed review of history of studied problem. Nevertheless, in order to answer this Referee's comment we included in the revised manuscript a special footnote. Please see page 2 (after line 60):

"For more details about the history of the discovery and investigations of NLCs please

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see reviews by Gadsden and Schröder (1989) and Thomas (1991)."

Please also note the supplement to this comment:

<http://www.atmos-chem-phys-discuss.net/10/C13817/2011/acpd-10-C13817-2011-supplement.pdf>

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 22653, 2010.

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