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## Noctilucent clouds and the mesospheric water vapour: the past decade

U. von Zahn<sup>1</sup>, G. Baumgarten<sup>1</sup>, U. Berger<sup>1</sup>, J. Fiedler<sup>1</sup>, and P. Hartogh<sup>2</sup>

<sup>1</sup>Leibniz-Institute of Atmospheric Physics, Kühlungsborn, Germany

<sup>2</sup>Max-Planck-Institute for Solar System Research, Katlenburg-Lindau, Germany

**Abstract.** The topic of this paper is the sensitivity of the brightness of noctilucent clouds (NLC) on the ambient water vapour mixing ratio  $f(\text{H}_2\text{O})$ .

Firstly, we use state-of-the-art models of NLC layer formation to predict NLC brightness changes in response to changes in the 80km mixing ratio  $f(\text{H}_2\text{O})$  for the two cases of ground-based 532nm lidar observations at 69° N and for hemispheric satellite SBUV observations at 252nm wavelength.

In this study, we include a re-evaluation of the sensitivity of NLC brightness to changes in solar Lyman  $\alpha$  flux. Secondly, we review observations of episodic changes in  $f(\text{H}_2\text{O})$  and those in NLC brightness, the former being available since 1992, the latter since 1979. To this review, we add a new series of observations of  $f(\text{H}_2\text{O})$ , performed in the Arctic summer at the ALOMAR observatory. The episodic change exhibited by the Arctic summer means of  $f(\text{H}_2\text{O})$  turns out to be quite different from all those derived from annual means of  $f(\text{H}_2\text{O})$ . The latter indicate that since 1996 a significant reduction of annually averaged upper mesospheric water vapour has occurred at low, mid, and high latitudes. These decreases of  $f(\text{H}_2\text{O})$  have been observed over the same time period in which a slow increase of SBUV NLC albedo has occurred. From this scenario and additional arguments we conclude that the cause for the observed long-term increase in NLC albedo remains to be identified. We close with comments on the very different character of decadal variations in NLC brightness and occurrence rate.

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