

Long-Term Evolution in Noctilucent Clouds' Response to the Solar Cycle: A Model-Based Study

Ashique Vellalassery *, Gerd Baumgarten, Mykhaylo Grygalashvyly and Franz-Josef Lübken

Table S1. A table presenting the definitions of technical terms used in the article.

Technical term		Definition
NLC brightness (β)		Backscatter coefficient at a wavelength of 532 nm (β in units of $10^{-10}/(\text{m}\cdot\text{sr})$). Defined as the cross-section per unit volume and per unit solid angle for photons being scattered in the backward direction.
Maximum NLC brightness (β_{max})		Maximum backscatter coefficient at a wavelength of 532 nm (β_{max})
Brightness threshold (β_{lim})		Some observations detect NLC only above a certain brightness threshold, only NLC above a given threshold ($\beta > \beta_{\text{lim}}$) are considered when averaging. β_{lim} is set to 0.05, considering even small NLC events while excluding non-NLC events.
NLC altitude or β_{max} altitude		The altitude of maximum NLC brightness (β_{max} altitude)
Degree of water vapour supersaturation (S)		The saturation ratio of air with water vapour is defined as $S = PH_2O/P_{\text{ice}}$, where PH_2O is the H_2O partial pressure ($CH_2O \cdot P$), and P_{ice} is the saturation vapour pressure over a plane ice surface (CH_2O is the water vapour mixing ratio). An environment with value $S > 1$ is supersaturated.
Maximum number of events (N_{max})		The maximum number of events per year is $N_{\text{max}} = 89,280$ given by the number of latitudes within each range (6), longitudes (120), days (31), and time slots per day (4).
NLC event		Whenever an ice layer occurs in a given latitude/longitude bin and time segment in MIMAS.
Pressure altitude (z_p)		Pressure altitude, z_p , is given by $z_p = H \cdot \ln(p_0/p_{\text{mean}})$ where $p_0 = 1013 \text{ hPa}$ (sea surface pressure), p pressure at certain level, and $H = 7000 \text{ m}$ (scale height).
NLC Sublimation		Direct transition of NLC ice particle from a solid to a gas without passing through the liquid phase.
Frost point temperature		Temperature at which air becomes saturated with water vapour ($S > 1$), leading to the formation of ice particle.
Ice water content (IWC)		The amount of ice in a column (in units of g/km^2)

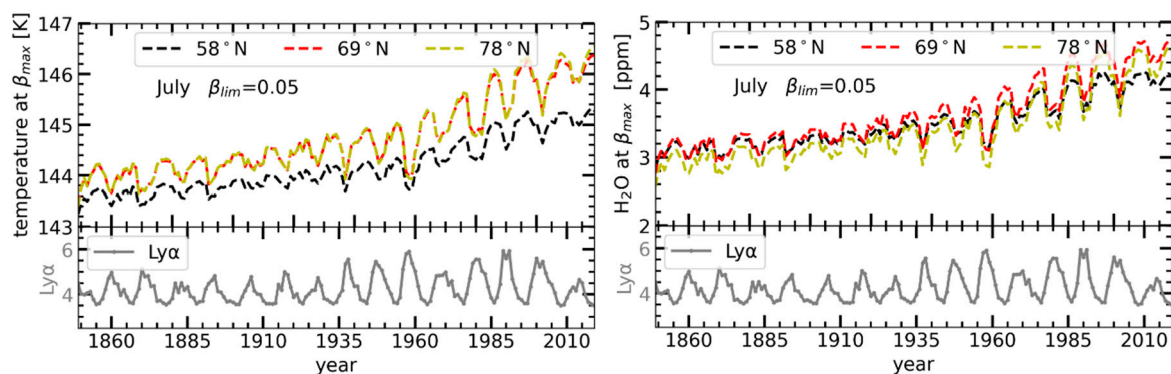


Figure S1. Time series of background temperature and H_2O at the maximum brightness altitude for three different latitudes (58°N , 69°N , and 78°N) spanning the years 1849 to 2100.

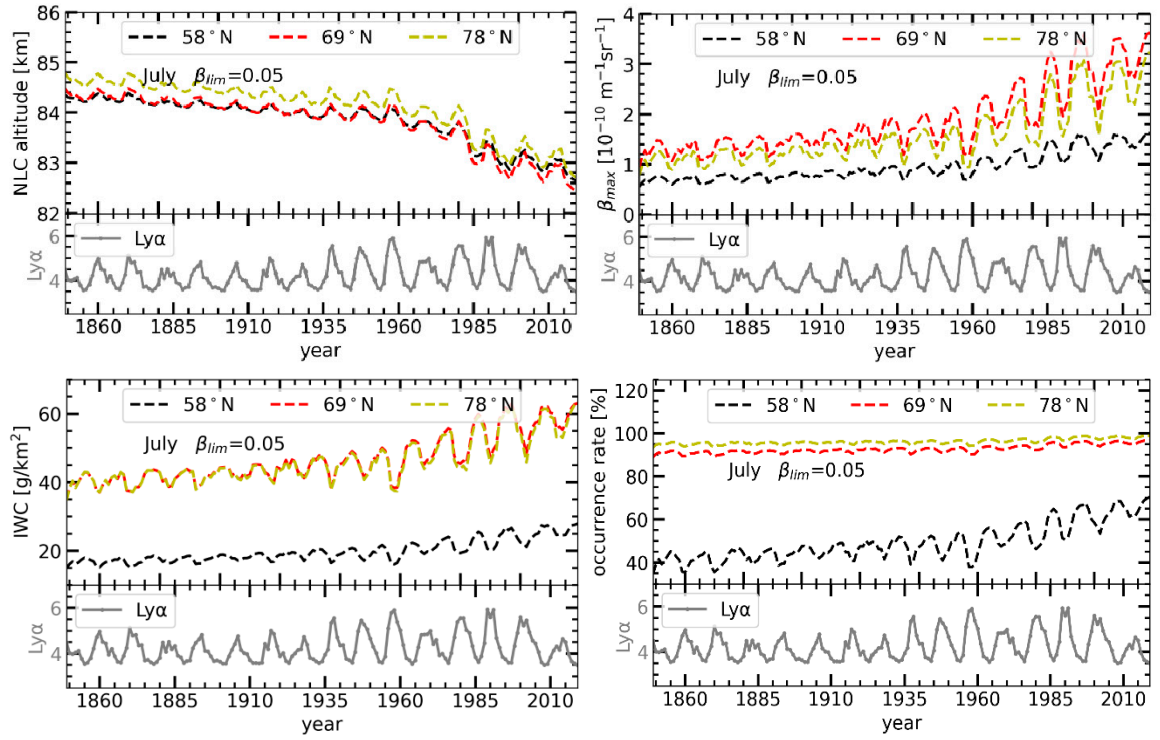


Figure S2. Time series of NLC properties (see y-axis label) for three different latitudes (58°N, 69°N, and 78°N) spanning the years 1849 to 2100.