

THE INFLUENCE OF PLANETARY WAVES ON NOCTILUCENT CLOUD OCCURRENCE OVER NW EUROPE.

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Noctilucent clouds (NLC) are very high-altitude (ca 80-85 km) ice clouds which appear at high latitudes during the summer months. An apparent increasing frequency of occurrence of these clouds superimposed on a 10-11 year modulation has been reported e.g. by Gadsden (1990). It has been suggested that the increased occurrence is due to greenhouse gas emissions leading to increased methane (Thomas , 1989) or lower temperatures (Gadsden 1990, 1998) at the relevant heights. However, direct measurements of temperature in the region of interest over the last 40 years (Lubken, 2000) show no evidence of a temperature trend. Here we re-examine the observational data for NLC occurrence in the Western-European sector of the northern hemisphere. We have found that travelling, planetary-scale waves strongly modulate the temperature at the height of the clouds at high latitudes. This would be expected to lead to clouds appearing at different longitudes on different days. When NLC observations are carefully restricted to a limited longitude sector, we find that there is no significant trend in NLC occurrence over the last 35 years, whereas the 10-11 year modulation remains strong. We further find a strong correlation between the observations of mid-latitude NLC and the combined effects of stationary and 5-day planetary waves over NW Europe. Clouds are much more likely to be seen when the warmest part of these waves occurs over Western Europe. This apparent contradiction may be explained if transport of NLC to mid-latitudes from higher latitudes is more important than the local temperature at mid-latitudes. The dependence of NLC occurrence on planetary waves may partly explain the 10-11 year cycle as their are indications of 10-11 year variations in the planetary waves.