Noctilucent clouds: anywhere, anytime?

From Dr Wilfried Schröder

I note with interest the paper in the 2003 April *Journal* by Gadsden & Taylor.[1] Readers may find it useful to have some more information in this topic.

The authors discussed the reality of a few noctilucent clouds that occurred outside the solar depression angle. It is known in general that NLC are observed during nautical and part of astronomical twilight when the Sun is between 6 and 16° below the observer's horizon. However, this criterion is not the main point for identification. From observations over the past 110 years often unusual data have been reported in winter and lower latitudes. Gadsden & Taylor gave only a few examples. For example, for Britain James Paton remarked: 'Our observations of the occurrence of noctilucent clouds, using data from Britain, Scandinavia and Denmark, show that the clouds are never seen before May 26th and seldom after 3rd August.'[2,3] For Germany, from more than 110 years longterm data we found a frequency between the beginning of May and mid-August. Also, for American data, Fogle reported that most NLC have been studied in July and August.[6]

Of special importance is the question of the appearance of noctilucent clouds in winter. From the former USSR there are repeated reprorts regarding observations during the months of October/November, but most of these are very doubtful. In Great Britain and Germany[2,3,9] observations are made during the entire year. In Germany (Rönnebeck) auroras are observed, in addition to NLC, as well as the appearance of intensified nocturnal air glow. These programmes are also carried out during the entire year. Reference should also be made to the Statistics of Intensified Nocturnal Air Glow (Hoffmeister, Schröder[4,5]) which cover a period over 80 years. When we examine the results of these three undertakings, all independent from each other, we can say that during the winter months no NLC appear. The possibility that, for one reason or another, NLC were 'overlooked' may also be excluded. If NLC did really occur in winter at any time, one of these groups would have been sure to detect them.

The geographical distribution of NLC is well documented.[8,9] We found a distribution in an NLC belt between 75–45° N/S with a maximum of appearance *ca.* 67° N/S (see also references 7, 10). In these belts NLC appeared during the time of summer mesospheric circulation. This time is determined by special thermic and physical conditions, which are only found in the small zone of mesopause at *ca.* 82km altitude. The summer mesospheric circulation system is limited to between the transition periods in spring and autumn. They varied in spring and were finished in autumn at nearly mid-August in the region of mesopause. In that time NLC disappeared in the northern hemisphere according to the German and British data. Outside these mechanisms no NLC may be created.

Gadsden & Taylor present a few examples of NLC seen out of place. Most of them are well known and not of main interest or not NLC. It is not enough to discuss the solar depression angle or to say that data were accepted because of the 'authority' or 'experience' of the observer. It is clear that the data by Vasilyev and Willmann are not really NLC, and also the other reports are not very reliable. Most of the reports of out of time or out of place data may have been aurora, sunlit high cirrus, increased airglow, or difficult twilight displacements rather than NLC.

It may be possible to understand from the model of mesospheric circulation and transition periods that a possible latitudinal shift of NLC toward the pole exists (or southward) and it may also be possible that 'isolated' NLC appear at the edges of NLC zones. But these are not a sign of any significant expansion of NLC.

Summarising, we note that NLC are a strictly summer phenomenon which depend on a specific physical mechanism at the mesopause level. Therefore NLC can be used as an 'indicator' for the mesospheric circulation system[4,5,10] and between the transition periods. Outside of these, NLC are unlikely to be seen.

Wilfried Schröder

Geophysical Institute, Hechelstrasse 8, D-28777 Bremen, Germany

References

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▸ brief, often pretty, planetary nebulae; low mass stars just fade away.

I am really indebted to section 4.16 which gives a brief, unambiguous description of the different supernova types. This is one I can recommend to my OU students. In the end, I suspect the studious may make more use of this book than the observant, but such is fate. I am glad I have my copy to refer to.

Roger O'Brien

Roger is still finding classes who want to learn about astronomy and cosmology. There must be a lot of it about and it is evidently incurable as he got bitten by the bug in 1955.

The Revd Thomas William Webb and a transit of Mercury

From Dr Stewart Moore

With the transit of Mercury (2003 May 7) still fresh in my memory, I was intrigued to discover in Webb's notebooks in the RAS library that the Revd Webb observed a transit of Mercury on 1848 November 9. The following is reproduced from one of his notebooks by kind permission of Peter Hingley, RAS librarian.

1848 November 9. Transit of Mercury

'Day almost cloudless, but wind N.E. Tremulous, especially at the ingress. I was prepared with [×]112, but not having my eye on the right part of the limb, a considerable notch was formed before I noticed it. The total ingress could hardly be perceived from the extremely bad definition of the limb, so that I could scarcely tell whether the object was in focus or not: it must have been uncertain to 5s. As the transit proceeded, the air somewhat improved, and the planet was seen to pass in a very interesting manner centrally over two contiguous groups of small spots. I subsequently tried 144 and 300 as the air became more still. The planet was intensely black; and the nuclei of the spots compared with it were decidedly, but not very much, fainter; the umbra were brown in comparison. About 2h 30m when I ceased to observe it, the effect was very striking, especially with 80, as the planet then formed a tolerably equatorial triangle with two fine spots at no great distance, one of which was of very large dimensions. It would have been

T. W. Webb... continued

easy in such a state of atmosphere to imagine the existence of white specks on the black disc; but of course the observation would have been worthless. I had but little opportunity for uninterrupted observation, having been obliged, by the low altitude of the Sun to remove the instrument into a public thoroughfare; and having had at least 80 or 90 persons anxious to be allowed to see it'.

His next solar observation in this notebook is 1852 October 26 when he refers to '…a large naked eye sunspot on the disc of the sun, dimmed by the morning fog of London about 10am. Mrs Webb perceived it with ease.'

Stewart Moore

Conifers, New Town Road, Thorpe-le-Soken, Essex CO16 0ER. [slm@sigarro.demon.co.uk]