Letters

Total solar eclipse of 1999 August 11 – duration of the total phase when observed away from the centre-line

From Mr J. S. H. Battison

Since one is unlikely to be lucky enough to be located exactly on the centre-line of the eclipse, it would be useful to know the actual duration of the total phase for a given distance from the centre-line.

The booklet published by the Stationery Office in 1996 called *A Guide to the 1999 Total Eclipse of the Sun* by Steve Bell of the Royal Greenwich Observatory (in collaboration with the US Naval Observatory) indicates that for southwest England, the duration of the total phase on the centre-line will be about 126 seconds and that the path width of the eclipse over land will be about 108km. This conflicts slightly with figures issued by Fred Espenak of NASA, which are of the order of 122s and 104km. Steve Bell recently stated that whilst the centre-line positions are the same, more significance should be placed on the NASA times and track widths.

In 1995, I converted the centre-line co-ordinates (longitude and latitude) issued by both NASA and the USNO, to Ordnance Survey grid references, and fitted an average straight line to the *very* slightly curved line (accurate to about 0.2km in the region of Cornwall and Devon). For the purposes of this letter, I have assumed that the coordinates of the centre-line track have not changed. For those who are interested, the formula is:

$$N_c = 48.0 - 0.0977E_c \qquad [1]$$

where N_c is the full Northing in km, for E_c the full Easting in km, measured from the false origin of the National Grid (see the south west corner of any Ordnance Survey map for the full reference in metres).

It is a matter of mathematics to derive the equation for the length of a perpendicular from a straight line to a point. Substituting [1] from above, the following formula is obtained:

$$d = 0.0972E_o + 0.995N_o - 47.8 \qquad [2]$$

where d is the distance from the centre-line track, (positive above the centre-line), for the location of the observer whose full Easting is E_o and whose full Northing is N_o, all units in km.

As an example, the full OSGR of Newton Ferrers in south Devon is E_o = 255km and N_o = 48km. Using [2] above, d = 25.7km. Using the following formula which may be derived from the geometry of eclipses:

$$s = d/w \text{ and } t_o = t_c\sqrt{1-s^2} \qquad [3]$$

where w is the half-path width, 52km (see above), t_c is the duration of totality for a centre-line observer, 122s, and t_o is the duration of totality for an observer situated distance d from the centre-line, we obtain s = 25.7/54, and therefore, the duration of totality at Newton Ferrers is about 106 seconds. It is worth noting that even if one is situated 70% of the half-path width from the centre-line, the duration is still a good 71% of t_c.

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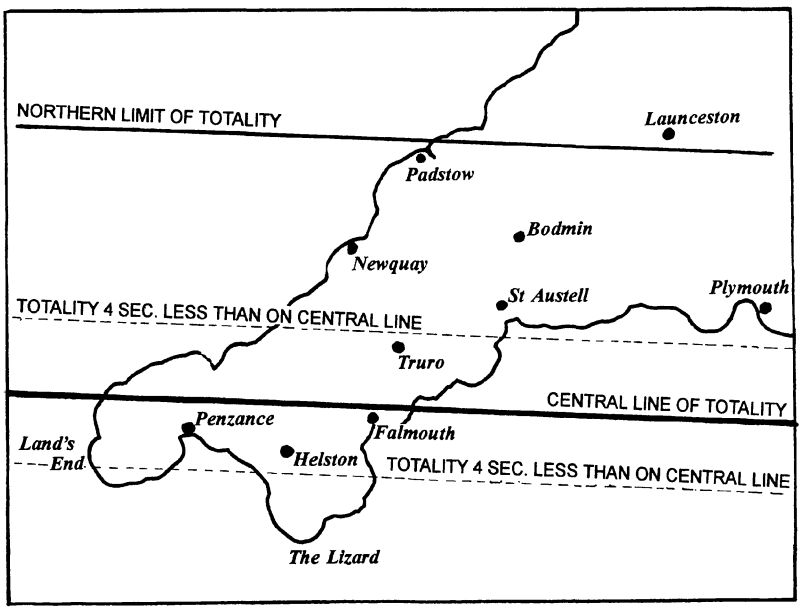

The track of the August 11 eclipse over Cornwall and part of South Devon. The dotted lines show the limits of the belt where the period of totality will be approximately four seconds less than on the centre-line. *(Map prepared by Howard Miles, reproduced from JBAA, **105**(6), December 1995.)*

An early observation of noctilucent cloud?

From the Director of the Comet Section

The first known observations of noctilucent clouds are generally associated with the eruption of Krakatoa in 1883. Since then observations have gradually become more common, and it is assumed that either the clouds did not exist prior to this, or that they were very rare.

Another possible explanation is that they were simply not recorded. I have been reading *Fire in the Sky* by Olson & Pasachoff,[1] which includes two renditions in colour of Coggia's comet made by Charles Piazzi Smyth from Edinburgh in July 1874. Both drawings show what appear to be blue-white clouds on the northern horizon, with dark tropospheric clouds below and silhouetted against them. The drawings were for midnight on July 12 and 10.30pm on July 15. The moon was then near new and the Sun between 9 and 12° below the horizon.

The clouds are shown occurring up to a little above the comet, which was then between 11 and 19° above the horizon and near the meridian. These circumstances are consistent with the clouds being noctilucent and suggest that they were perhaps visible more commonly than is supposed.

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1 Olson R. J. M. & Pasachoff J. M., *Fire in the Sky: Comets and Meteors ... in British Art and Science*, Cambridge University Press, 1998

Unusual object 1998 DK36

From M. Jean Meeus

In 1998 David Tholen and Robert Whiteley announced the discovery of a new class of asteroids. As mentioned in the February *Journal* (**109**(1), 5), they said that the object 1998 DK36 orbits wholly within the orbit of the Earth.

However, this object was observed on only two successive days, namely on 1998 February 23 and 24. There are no other observations of 1998 DK36, and with only two positions no orbital elements can be calculated (except if a circular orbit is assumed). So it was premature to announce the 'discovery' of that new class of asteroids. Indeed, Gareth V. Williams, of the Minor Planet Center, let me know that '1998 DK36 *may* have an orbit entirely inside the Earth's, but it is not certain that this is the case.'

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