

2003 Leonid Post-Mortem

(Current as of December 1, 2003)

Bill Cooke
Space Environments Team
CSC/ED44
Marshall Space Flight Center
(256) 544-9136
bill.cooke@msfc.nasa.gov

Despite expressions of disappointment from many visual observers, the 2003 Leonids appear to have taken place largely as usual (times of maxima predicted well, amplitude of maxima over predicted). Enhanced numbers of meteors were seen at times corresponding to Earth's encounters with the 1499 and 1533 dust trails, with a contribution from the 1733 stream as well.

An optimistic scenario involving the broad dust component known as the Filament failed to materialize. It had been hoped that the Filament would contribute a population of bright meteors to produce a more visually appealing display.

Instead, each of the Leonid stream encounters between Nov. 13 and 23 yielded only relatively faint meteors, which makes sense when one considers that the meteors must have been significantly retarded by radiation pressure in order for them to encounter Earth this far past comet perihelion (the effect of radiation pressure upon a particle is approximately inversely proportional to the particle size, all else being equal).

Figure 1 compares the forecast predictions for Earth with the IMO data (as of November 27). Note that

- 1) Three forecast peaks (1499, 1533, 1733) are obvious in the ZHR data; the fourth forecast peak (636) shows up weakly (if at all) against the elevated Leonid background. A possible unmodeled stream passage occurs around 18:30 UT on November 14. However, this peak may not be real, as indicated by the large error bar (the bright Moon and the "dimness" of the Leonids contributing to this uncertainty).
- 2) As with past years, the forecast peaks tend to be too high and narrow with the timing of the maxima pretty close to observed.

Integrating the ZHR profiles over the 11 days of activity yields 5124 Leonids for the IMO data as opposed to 2435 for the forecast, implying that the actual LEO fluence was a factor of 2.1 greater than predicted

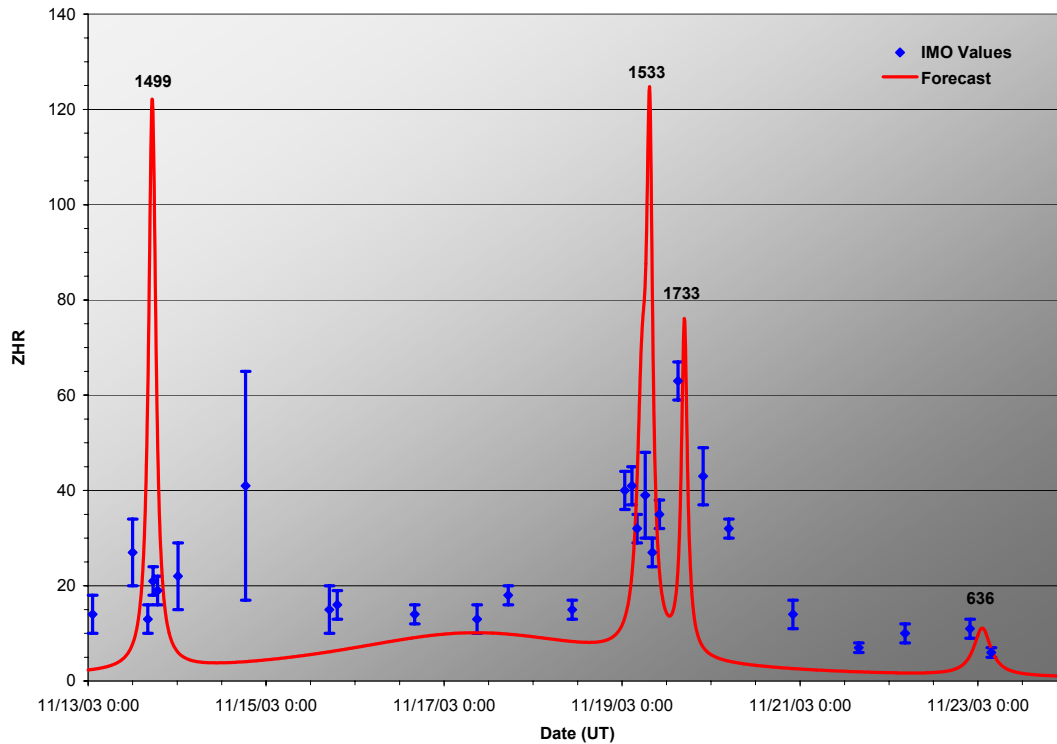


Figure 1. 2003 Leonid forecast compared to IMO visual data.

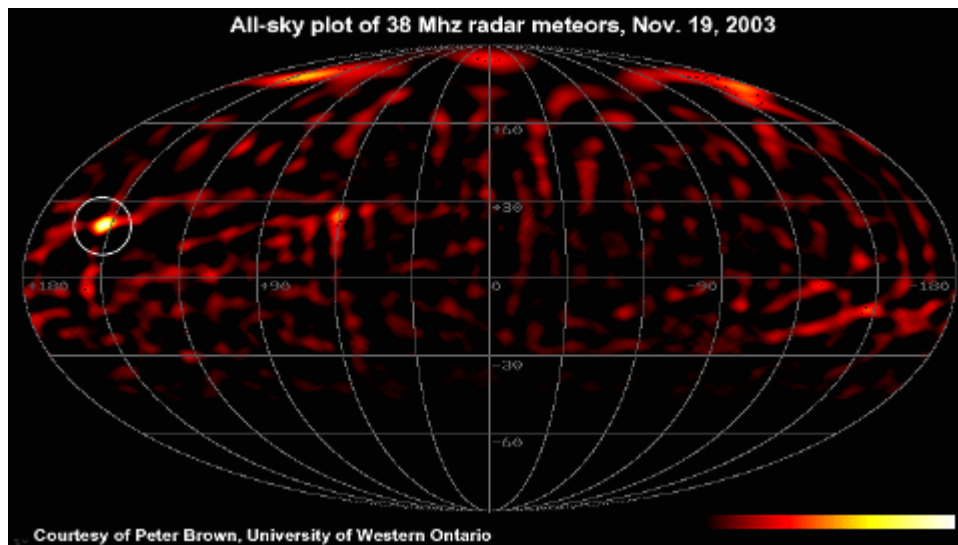


Figure 2. University of Western Ontario radar map of the sky for November 19 UT. The Leonid radiant is at the center of the white circle.

It is important to note that the IMO visual observers were often hampered by poor seeing and the Moon's presence. Ranier Arlt notes that "Many of the observations suffer from low limiting magnitudes, and the value of the limiting magnitude may be systematically over- or underestimated...", which could significantly affect the reported ZHR's. MSFC deployed a team to the Florida

Keys, and it is hoped that the reduction of the electro-optical data collected there will shed more light on the 1533/1733 peaks. The 2003 Leonids also produced relatively strong numbers on meteor radars (see figure 2), and it may well be that the reduction of radar observations will provide our best understanding of this year's shower.