Radio Observations of the 2006 Perseid Meteor Shower

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The radio station “Sunny 102.3 FM”, located at Modesto, California (Latitude 37.66 N, Longitude 120.99 W), is too far from Penticton, British Columbia (Latitude 50 N, Longitude 120 W) to be received directly, however it is ideal for reception by scatter from the ionisation trails left by meteors.

For some years now I have been running a radio meteor detector tuned to that frequency. It is a relatively simple device, consisting of a 3-element Yagi antenna pointing up at an angle of about 45 degrees in an easterly direction.

Figure 1: 3-element Yagi used on the meteor detector. The elements are made from 20mm diameter aluminium tube, attached to a 60mm diameter galvanized steel pipe. A 4:1 balun and a preamplifier are attached to the steel boom. The weedy south slope of our property is reserved for radio experiments.

The receiver is an old FM tuner. The only modifications made are to the antenna input, which is now a BNC connector, and a connection to the local oscillator lock light on the front panel. This charges up a capacitor through a diode. If the lock is poor or short-lived, a lower voltage builds up on the capacitor. This voltage is amplified and buffered using a DC amplifier and then digitized using an analogue-digital converter. This sounds like overkill, but allows thresholds and trigger criteria to be changed, and for different classes of signal lock to be identified by the software.

Figure 2: The meteor receiver is an old FM tuner, with access to the LO Lock light to detect meteor signals. The silver box above contains a DC amplifier and computer interface.

The computer program simply logs how many echoes have been received per hour.

This year's Perseid Meteor shower produced some good results. The number of echoes per hour received around the date of the Perseids (12-13 August) are shown in Figure 3. The normal diurnal variation shows up well. This is due to the Earth's rotation rotation. At 6am local time we are facing the direction of the Earth's rotation around the Sun, and are therefore catching all the meteors coming towards us and all those receding at velocities slower than the Earth's orbital velocity. On the other hand, around 6pm local time we are looking behind us, and catching only the meteors that overtake us. As one astronomer described the phenomenon, we always get more insects on the windscreen than we do on the rear window!

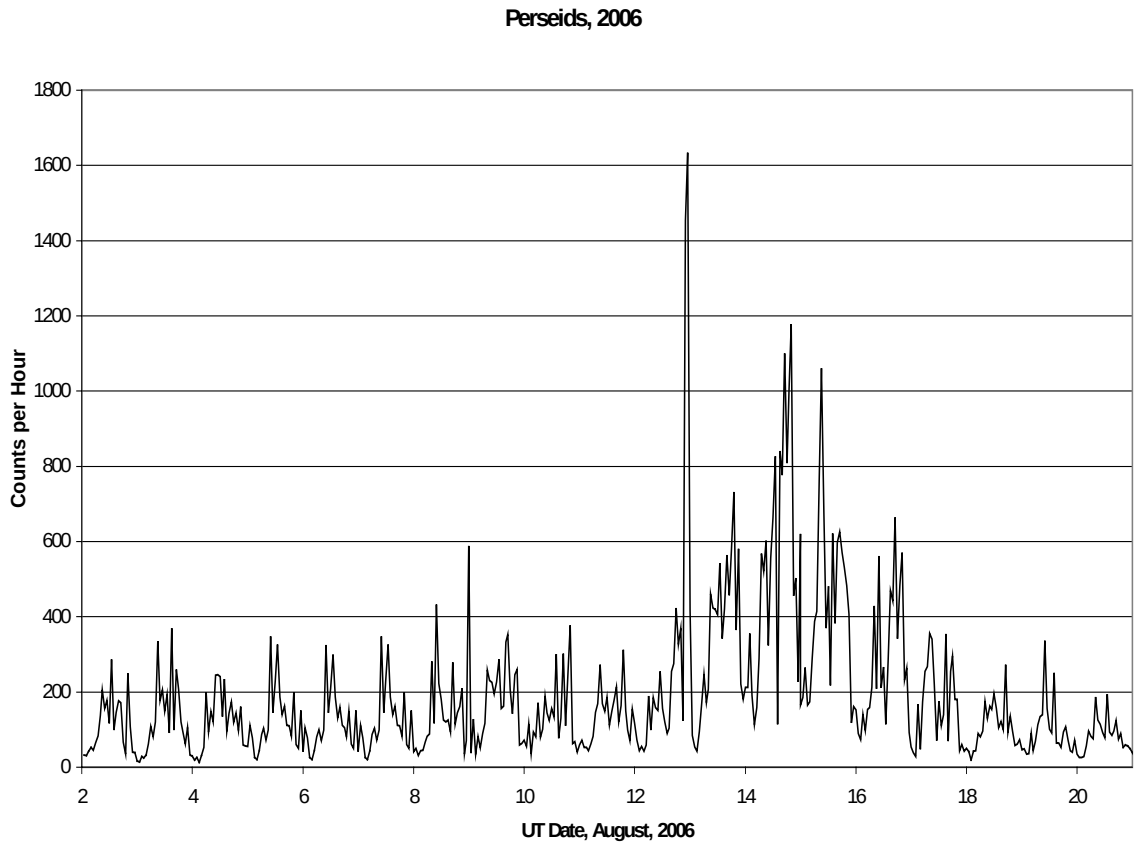

Figure 3: Perseids 2006. Meteor echoes of signals from Sunny 102.3 FM, Modesto, California, as received at Penticton.

The strong spike late on the 12th could be the main stream of the meteors, but it is interesting that there is a peak lasting about 5 days following it. That these count rates were due to meteors and not auroral reflections is shown by the strong diurnal modulation of the peak. Something rather weird and for which there is no immediate explanation is the short spikes that turned up around the same time each day.