Correlating video meteors with GRAVES radio detections

Richard Fleet
Wilcot video camera coverage
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D. Morgan  Example antenna bearing compared to GRAVES
Approximate Wilcot radio coverage
12th August 2015  20:58:59 UT - Very bright Perseid
12th August 2015  20:58:59 UT - Strong radio event
Spectrum Lab waterfall plot during the Perseids

Plot spans 150 seconds
Approximate Wilcot radio coverage plus overlapping camera coverage
Analysis

• Logs from Spectrum Lab script
• UFOAnalyzer Mcsv files
• 1st July 2015 to 12th August 2015
• 21,010 radio events
• 3,076 meteor events
• Each camera processed separately
• Merged and sorted by time in Excel
• Video events compared with nearest radio events
• Selected
  • energy > 500
  • 1 second before up to 5 seconds after video time
  • 52 candidates
Comparison of video times with the nearest radio event
Video and radio time differences

-20 -15 -10 -5 0 5 10 15 20
-20 -15 -10 -5 0 5 10 15 20

Radio event energy (arbitrary units)

Camera SE  Seconds from video event
Locations of match candidates
Paul Hyde – Radio comparison from Basingstoke

• Compared 200 brightest meteors from Wilcot SE
• Basingstoke had 47 matches to nearest second
• 28 had a radio duration > 1 second

• Wilcot radio had 53 matches to nearest second
• 27 had a radio duration > 1 second
• 17 of those matched the 28 Basingstoke candidates

• 19 Wilcot events had an energy > 500
• 15 of those matched the 28 Basingstoke candidates
Wilcot radio - Chelmsford video (Nick James)
Two station orbits Wilcot-Chelmsford (Nick James) - August 2015
BOAM August 2015 captures

Base des Observateurs Amateurs de Météores (BOAM)
Wilcot radio - BOAM video (single station)

Radio event energy (arbitrary units)

Seconds from video event
BOAM August 2015 captures
Estimated single station matches
with Wilcot radio detections
UKMON-BOAM multi-station orbits - August 2015
Wilcot radio matches with UKMON-BOAM orbits - August 2015
European Database (EDMOND) orbits for 2014 compared to GRAVES main area
Conclusions

• The initial expectation was too pessimistic
• GRAVES radar echoes detected from the UK are not limited to meteors over southern France
• Meteors over the English Channel were detected by radio reflection from GRAVES
• Stations further north in the UK should be able to do the same
• A simple timing comparison using spreadsheets is sufficient to identify the brighter events
• Enough events can be identified to make further investigation worthwhile
• Single station video meteors can be useful for roughly locating matching radio events
• For this data set at least, the majority of detections are not from the main area illuminated by GRAVES
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Thanks to Nick James, Paul Hyde and the contributors to UKMON and BOAM for making their data available
GRAVES is not a steady source
ISS and the Moon pass through the beam

Chart size: 800 (500 - 1600)

Date: 27 September 2015
Orbit: 398 x 407 km, 51.6° (Epoch: 30 October)