

Interactive comment on “Radar and optical leonids” by N. Brosch et al.

Anonymous Referee #1

Received and published: 8 April 2004

General comments: This paper brings the unusual contribution of L-band phased array radar observations and is therefore a potentially important contribution that should be explored. The combination of visible and L-band observations are rare and could provide further information on the frequency dependence of meteor detection. A few trouble areas exist in the paper: 1) explicit detail should be provided to delineate meteor head echoes and meteor trails from the general description of $\$$ meteor event \checkmark in the analysis 2) the meteor head echo average lifetime duration at L-band/visible needs to be established, 3) the basis of all quantities presented in the document needs to be defined.

Page 1426 Line 15, this reference needs to be corrected; Oppenheim has never had anything to do with observational work (experiment design and data collection) using ALTAIR. The following reference should be cited on line 15.

Close, S., S. Hunt, M. Minardi and F. McKen 2000, Analysis of Perseid meteor head

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echo data collected using the Advanced Research Projects Agency Long-Range Tracking and Instrumentation Radar (ALTAIR), Radio Science, 35, 1233-1240.

Line 18, it is generally believed that a shock front does not form in front of relatively small meteors because the meteoroid particle is so much smaller than the atmospheric mean free path. Please specify the size range (estimated range of mass and radius) of the meteoroids observed. Are these micrometeoroids or larger?

Page 1427 Line 2, please specify what ~ 10 collisions and other related quantities are based on.

Page 1428, Dyrud et. al should be cited here as he deduced the relationship describing the time lag between head echo and trail echo observations using plasma theory. This is the material you cited as being presented by oppenheim. See below.

Title: Interpretation of non-specular radar meteor trails Authors: Dyrud, Lars P.; Oppenheim, Meers M.; Close, Sigrid; Hunt, Stephen Journal:Geophysical Research Letters, Volume 29, Issue 21, pp. 8-1, CiteID 2012, DOI 10.1029/2002GL015953 (GeoRL Homepage) Publication Date: 11/2002

Line 13 The Kwajalein rocket range is really called the Reagan Test Site located at the Kwajalein Atoll in the Republic of the Marshall Islands.

Page 1429 Lines 2-5, this description leaves out the strong radio frequency dependence on meteor detection and should be discussed, see Close 2004. Even though the L-band phased array has a wide field of view, the frequency dependence of the plasma reflection coefficient is strong. Many fewer detections will be observed at L-band versus UHF per unit steradian for two systems with all other radar parameters the same (power aperture product etc). But the phased array has a large field of view and therefore does potentially have significant detection capability.

Page 1430 Line 26-27 Cite references for instrumentation (if they exist).

Page 1431 The criteria for selection of simultaneous (RF and visible) observations, as

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defined, is ambiguous due to its loose tolerance and should be made more convincing if possible. Suggestion: compute the average lifetime of L-band meteors (head echoes and trails should be kept separate). Then use the average lifetime of L-band and visible (two numbers, one for each) head echoes as an estimate (bound) of the allowable time separation window for the simultaneous visible and L-band detections. As I understand you are using 10 seconds right now, which is probably too large. I suspect the average lifetime for L-band head echo detections will be less than .3 seconds. Meteor trails on the other hand can persist for minutes.

Line 10 The spatial correlation of the simultaneous L-band and visible meteor detections should be made stronger if possible.

Page 1433 Line 14 I would like to see the average sweep time of the beam compared to the average lifetime of the meteor head echo but understand why this may not be possible to divulge.

Page 1434 Line 5, this statement is probably too strong given that light emission and electron production are two different processes that require different amounts of energy to occur.

Lines 16-25 the relationship between the L-band radar observations, as to whether head echoes of trails are being discussed, should be clarified.

Page 1435 Lines 1-10 it is difficult to relate this argument to the L-band observations because free electrons exist in the absence of meteoric smoke. Line 13, please cite reference or define §puzzling observations.

Page 1436 Based on the information provided, I am uncertain about the basis of the conclusion. Please strengthen the arguments provided in the paper to better support the conclusion.

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 1425, 2004.