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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Radar observations of meteor trails, and their interpretation using Fresnel holography: a new tool in meteor science" *by* W. G. Elford

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Paper acpd/2004-4-695 (MS-NR: 2003si01-05) Title: Radar observations of meteor trails, and their interpretation using Fresnel holography: a new tool in meteor science Author: W. G. Elford

AuthorŠs Response to Referees Reports

Both referees have affirmed the paper and recommend publication subject to some minor revisions that are described below. The author appreciates the referees comments and considers that the minor revisions outlined below significantly improve the paper.

1. Both referees refer to the unnecessary detail in the mathematical derivation in Section 2. Following a suggestion from referee 2, the derivation has been halved in length.

2. Further details of the equipment and the procedure for ŚunwrappingŠ the phase data have been added to Section 4. The phrase Ś, a peak power of 25 KW, a pulse length of 13msec,Š has been added to the description of the transmitter and the following two sentences included in the comments on the phase data. ŚFor presentation purposes it is found that the preferred display is a time series of the amplitude and the accumulated (or ŚunwrappedŠ) phase. The ŚunwrappingŠ of the phase is achieved by working backwards through the phase series, and at each point adding or subtracting a phase change of n2p (for various integers n) according to the condition that the change produces greater consistency in the slope of the phase record.Š

3. Referee 2 suggested that a description of the procedure for determining the position of the orthogonal Śto pointŠ in relation to the beam be included. The following sentences have been added in Section 4.3. Ś In general meteor echoes are received when the orthogonal point on the trail (to point) lies within the radar beam. This situation is readily checked by reference to the accumulated phase plot which shows a characteristic phase decrease with increasing time reaching a minimum just after the meteoroid has past the to point. The absence of this feature in the phase record indicates that the to point lies outside the beam.Š

4. Referee 2 sought clarification of the latter part of Section 4.3 that relates to Figures 8 and 9. The author agrees that the existing description could be improved and the latter part of the second paragraph has been replaced with the following ŚHowever, the phase behaviour of the transform shows some weak coherence in the region 0.5 to 2.5 km behind the head, although the sources are individually too weak to significantly increase the reflectivity. Nevertheless, it is the combination of these weak but coherent sources and the Śhead echoŠ that gives rise to the interference present in the radar amplitude between 0.69s and 0.76s shown in Figure 8.Š

5. Referee 2 has suggested that the mathematical procedure given in Section 5 to include the effect of deceleration on the Fresnel Transform could be outlined rather than detailed. The derivation is now replaced by: ŚIn the situation where the a is not zero we

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replace vt by vt + ¡ at^2, and assuming that $at^2 << vt + y$, some algebraic manipulation leads to a generalized expression for the Fresnel Transform for decelerating meteoroids as follows, Ě..Š

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 695, 2004.

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Interactive Comment