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Radar observations of meteor trails, and their interpretation using Fresnel holography: a new tool in meteor science

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Abstract. A Fresnel transform technique has been developed at Adelaide to analyse radar meteor echoes detected in the transverse mode. The genesis for this technique was the study of the structure of the scattering ionization immediately behind the head of the trail, in order to deduce the degree of fragmentation of the ablating meteoroid. The technique has been remarkably successful in not only giving insight into the fragmentation of meteoroids, but also revealing other significant features of the trails including diffusion, lateral motion of the trail during formation due to wind drift, and phase of the scattered signal in the vicinity of the head of the trail.

A serendipitous outcome of the analysis is the measurement of the speed and deceleration of the meteoroid producing the trail to a precision far exceeding that available from any other method applied to transverse scatter data.

Examples of the outcomes of the technique applied to meteor echoes obtained with a 54MHz narrow beam radar are presented.

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