State-of-the-art meteor observing

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Meteors are an excellent way to sample the local population of small asteroidal and cometary material. Various methods are used to calculate the trajectory, energy, mass and orbit of meteoroids which collide with the atmosphere.

Optical methods, including photographic and video observations, can provide information on how meteoroids ablate in the atmosphere, and from this their chemical and physical properties can be inferred. New observing systems have higher resolution than ever before, allowing details as small as a few meters to be distinguished in some cases (e.g. Weryk et al. 2013), and some optical systems are equipped with spectral detectors which allow the atomic composition of the meteoroids to be obtained. Computer automation of both the observing and data reduction process has become much more practical recently.

Meteor patrol radars are capable of observing thousands of meteor orbits every day, allowing the details of the distribution of meteoroids at 1 au to be found (e.g. Brown et al. 2010). Radars can operate in daylight and through clouds, providing observations when optical methods fail. High power, large aperture radars allow the ionization curves of very small meteors to be used in the same way as optical light curves, and can also produce precise orbits for meteoroids (Kero et al. 2012).

Other methods used to observe meteors, including infrasound, can estimate their position in the atmosphere and their energy, and are particularly useful for very bright fireballs (Ens et al., 2012). Recent advances in meteor observing techniques will be reviewed, including the systematic tracking of meteors with computer guided mirrors and a telescope, and multistation patrol radar observations.

References: Brown et al. 2010, Icarus 207, 66; Ens et al. 2012, JASTP 80, 208; Kero et al. 2012, MNRAS 425, 135; Weryk et al. 2013, Icarus 225, 614.