SEASONAL VARIATION OF THE RADIANT DISTRIBUTION OF SPORADIC METEOROIDS. M. D. Campbell-Brown[1], P. Wiegert[1], [1]Department of Physics and Astronomy, University of Western Ontario, London ON N6A 3K7 Canada, margaret.campbell@uwo.ca, pwiegert@uwo.ca

Introduction: Meteoroids in the millimeter size range represent the highest rate of mass flux onto the Earth. The radiant distribution and orbital characteristics of sporadic meteoroids in this size range have been studied [1] and the classes of bodies which produce sporadic meteors are under investigation (Wiegert et al., abstract in this volume). We want to understand not only which bodies in the solar system contribute to the sporadic meteoroid complex, but also how old the complex is and whether its current form is due simply to the gradual erosion of the parent bodies or whether certain components represent the remnants of a cataclysmic event in the past [2],[3], such as the disruption of a large comet.

The Sporadic Complex: Sporadic meteoroids tend to strike the Earth from certain directions, or apparent sources, which remain fixed with respect to the sun as the Earth moves through its orbit. The six main directional enhancements are in the helion direction (to the left in Fig. 1), the antihelion source (symmetrical to the helion source, on the other side of the apex), the north and south apex sources and the toroidal sources, of which only the north toroidal is visible in the figure due to the latitude at which the observations were made. In addition, there is a ring structure involving a sudden transition from a region of enhanced radiant density, just outside of 55 degrees from the apex, to a region of low radiant density just inside this line.

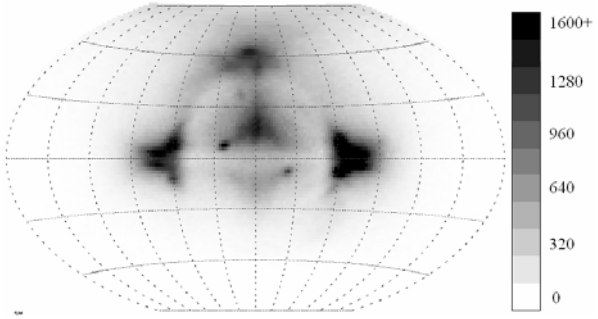

Figure 1 Sporadic meteoroid radiant densities over a full year, as measured with the CMOR radar. The apex of the Earth's way is at the centre of the plot, the sun 90 degrees to the left. [1]

In order to estimate the complex's age, we need not only to know the directional and orbital distribution of the complex, but also to examine how the distribution changes with the solar longitude of the Earth, our observing platform. The nodal variation of each of the sporadic populations can give an idea of the number of parent bodies which contribute and how long it has been since the material was realeased from each.

The classes of bodies which contribute material to the helion, antihelion and apex sources are reasonably clear; the toroidal source and the ring feature are only just beginning to be studied.

Observations: The Canadian Meteor Orbit Radar (CMOR) [4] has been running with orbital capabilities since 2002, and has collected over 2.5 million individual orbits useful for analysis.

This large number of orbits allow the radiant and orbital distribution of sporadic meteors to be studied at different solar longitude intervals. The data were divided into 36 intervals through the year, each covering 10 degrees solar longitude. The size, shape and strength of the helion and antihelion sources change dramatically through the year, due mainly to meteor showers and more diffuse radiant structures. The north toroidal source and the ring of radiants are even more variable, disappearing for months and reappearing, sometimes in conjunction with showers or diffuse radiants. The north apex source is the most stable, remaining nearly constant in shape and size through the year.

Implications: The strong seasonal variation of the toroidal source and ring structure suggest that they are produced by relatively few parent objects and that the populations are not very old, either because they have been recently released or because they have short liftimes compared to the precession cycle. The toroidal source may be largely composed of meteoroids from an extinct comet or comets.

References: [1] Campbell-Brown M. D. (2008) *Icarus*, in press. [2] Olsson-Steel D. (1986) *MNRAS, 219*, 47-73. [3] Whipple F. L. (1955) *ApJ, 121*, 750-770. [4] Jones J. et al. (2005) *P&SS, 53*, 413-421.