THEORETICAL MODELING OF THE SPORADIC METEOR COMPLEX. P. A. Wiegert[1] , J. Vaubaillon[2] and M. D. Campbell-Brown[1], [1]Dept. of Physics and Astronomy, *The* University *of* Western Ontario, London Ontario Canada, [2]Spitzer Space Science Center, California Institute of Technology, Pasadena California USA.

Introduction: The sporadic meteors are those which are no longer associated with particular meteor streams. They are generally presumed to have been shower meteors in the past, but to have been perturbed away from their parents over time by Poynting-Robertson drag and planetary encounters. We examine this hypothesis by examining the results of dynamical simulations of meteors produced by a broad cross-section of known comets, and show that many features of the sporadic meteor distribution as observed by Earth-based meteor radars are reproduced. We also present theoretical arguments that explain the presence of a faint ring of sporadic radiants of radius of 55 degrees centered on the Earth's apex as a result of the Kozai effect on high-inclination meteoroid orbits.

Methods: Simulations of 10^5 meteoroids were performed for a representative subsample of the population of known Jupiter-family comets (JFCs) and Halley-family comets (HFCs). A sample of near-Earth asteroids (including 3200 Phaethon and 2003EH$_1$, associated with meteor showers) were also simulated but were found to contribute little to the sporadic complex.

Discussion: Model radiant maps and velocity distributions of meteoroids associated with the various sporadic sources match observations in the broad sense, thought not all details are reproduced. The radar-observed sporadic complex is shown in Figure 1 [1], that modeled here in Figure 2.

Comet 2P/Encke is found to be the dominant contributor to the helion and antihelion sources by a factor of about 10. The primary contributor to the apex source is 55P/Tempel-Tuttle. Comet 8P/Tuttle is the dominant contributor to the toroidal sources; however this pair of sporadic sources proved the most difficult to model and may represent meteoroids from a comet or comets which no longer exist.

Our model can explain the relative strengths of the apex, helion, anti-helion and toroidal sources with the single assumption that Halley-family comets produce ~100 times more dust than Jupiter-family comets. This could be accounted for simply if HFC nuclei are typically a factor of ~10 larger than JFCs (observations indicate a factor of 2-3 [2]), though different dust-gas ratios or different active lifetimes may play a role. Our model can also explain the different strengths of the helion and antihelion sources, though they have the same parent objects.

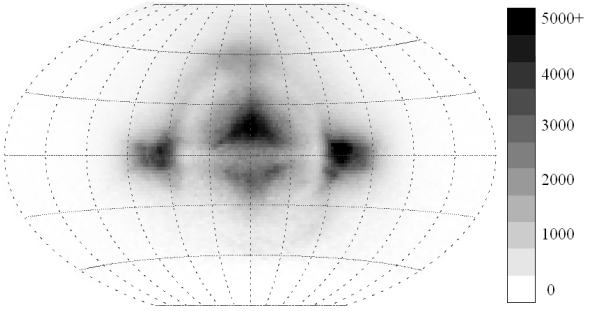

Figure 1: The radar-observed distribution of meteors at the Earth [1].

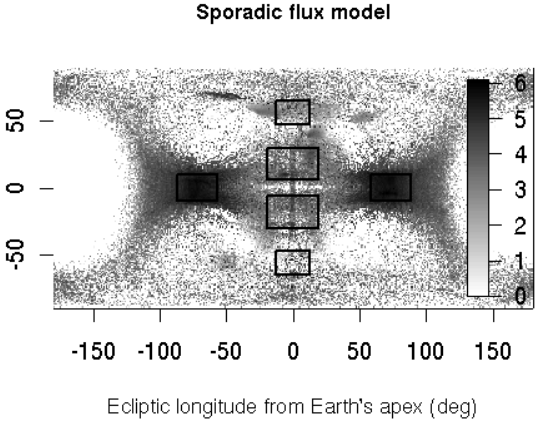

Figure 2: Modeled sporadic meteor flux (logarithmic scale). The locations of the six primary sporadic sources are indicated by rectangles.

References: [1] Campbell-Brown, M. (2008) *Icarus*, in press. [2] Lamy, P. L. et al. (2004), *Comets II,* 223-264.