# THE RADIANTS DISTRIBUTION OF THE DELTA CANCRIDS METEOROIDS

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**Introduction:** The aim of this paper is to refine the coordinates of the Delta Canrcids' (DCA) branches and their drift motion and to study features of radiants distribution and orbit elements for DCA using television observations. The DCA complex is an unconfirmed small meteor shower with 2 branches – Northern (NCC) and Southern (SCC) ones. The shower is observed between January, 1 and January, 31 and its radiant is in the constellation of Cancer. The maximum of activity for the meteors with the minimum registered magnitude of $+3^m$ or higher is 8.6±2 meteors an hour at the solar ecliptic longitude of 298.5°±1.2°. The calculations of spatial density for DCA shows that at the maximum of the shower's activity there is 1 particle heavier than 1 g for a cube with an edge of about 1000 km. For DCA there is no parental body found among comets, and its genetic connections with asteroids are therefore being studied. The observations of DCA were produced using radar and television methods.

**Methods:** The meteoroid orbits of NCC and SCC branches of DCA complex presented in the television catalogues SonatoCo [2] and CMN [3] were used. In the SonatoCo catalogue 111 and 59 meteor orbits for NCC and SCC respectively are presented using the observations taken between 2007 and 2015. The minimum registered magnitude for the meteors was $+3.5^m$, the error of determining geocentric speed was about 1 km/s. The coordinates of the radiant and their diurnal variations for each branch were determined using both the individual radiants' coordinates of the registered meteors and the coordinates averaged on 1° of the solar longitude. For the study of radiants distribution and orbit elements methods of robust analysis were applied.

**Results:** The values of geocentric radiants' coordinates at solar longitude of 298° were obtained: for NCC right ascension = 130.0°±3.1° with diurnal variation = +0.22°, declination 19.8°±2.8° with diurnal variation = –0.03°; for SCC right ascension = 128.2°±6.0° with diurnal variation = +0.11°, declination = 13.3°±2.0° with diurnal variation = –0.06°. For NCC and SCC radiation areas are 7°× 6° and 4°× 3° respectively. For NCC diurnal radiant drift is more reliably determined than for SCC due to the presence of a larger statistical base for its orbits. The study of the dependence of major semi-axes and eccentricities on a meteor's magnitude in the range from $–5^m$ to $+3^m$ has shown that at NCC for weaker meteors the values of major semi-axes and eccentricities decrease by 0.2 AU and 0.01 respectively. For SCC this dependence is poorly expressed.

**Discussion:** The NCC and SCC branches are observed on the same dates, geocentric velocities of the branches' meteoroids almost coincide, but radiants are clearly localized both by right ascension and declination. The meteors' radiants of each branch are distributed evenly with no subradiants detected, and the coordinates dependence on meteors' magnitude is not revealed either. At the same time, the orbits of meteoroids are decreased, in particular for NCC, depending on their mass, which might be caused by the non-gravitational Poynting–Robertson effect due to significant age of the shower. The comparison of orbits produced using television and radar methods and given at [1] also confirms the results obtained by us. The DCA meteoroids have orbital period of about 4 years and are exposed to strong gravitational perturbations from Jupiter. For SCC in the zone of strong resonances 1:1 and 2:1 meteoroids with resonant orbits are not recorded, the NCC meteoroids are not observed only at 1:1 resonance.

**Conclusions:** The radiants for the Delta Cancrids that are consistent with few data obtained by other authors are produced [4]. The values of diurnal variation for radiants are refined, radiation areas are derived [5, 6]. For NCC in magnitude range between $–5^m$ to $+3^m$ there is a decrease in major semi-axes and orbit eccentricities depending on meteors' magnitude [7, 8]. As the radiation area for SCC is smaller than for NCC and the dependence of orbits' size on their mass has not been revealed, one may suggest there are different formation mechanisms for NCC and SCC branches (e.g. secondary disintegration of a parental body) [9].

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**References:** [1] Jenniskens P. 2006 Cambridge, UK: Cambridge University Press. 790. [2] The SonotaCo network (SoNotaco) http://sonotaco.jp/doc/SNM/index.html); Croatian Meteor Network (CMN), http://cmn.rgn.hr/downloads/downloads.html#orbitcat). [3] MMO (IMO, http://www.imo.net/data/visual). [4] Sokolova M., et al. (2016) *Advances in Space Research* 58/4: 541-544. [5] Sokolova M.G., et al. (2018) *Advances in Space Research* 62/8: 2355-2363. [6] Sokolova M.G., et al. 2014. *Advances in Space Research*. 54/ 11: 2415-2418. [7] Sokolova M.G., et al. 2013. *Advances in Space Research*. Vol. 52/7: 1217-1220. [8] Sergienko M. V. et al. (2018) *Meteoritics & Planetary Science* 53/S1: 6162. [9] Sergienko M. V., et al. (2018) *Meteoritics & Planetary Science* 53/S1: 6165.