

The Age and Probable Parent of the Southern Delta Aquariid Meteor Shower

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Introduction

The Souther Delta Aquariids (SDAs), despite being a minor annual shower, it stands out well against the sporadic meteor background, and can be detected from late July to mid-August. The shower has been well detected by by photographic [1], visual and radar meteor surveys [2] and is among the dominant shower in the southern hemisphere. The SDAs presently have a mean radiant position ($\lambda - \lambda_{\odot} \approx 210^{\circ}$ and $\beta \approx -8^{\circ}$, given in a sun-centered reference frame, and mean geocentric speed of $V_g \sim 40.3$ km/s, with the activity profile showing a positive (late) skew.

The stream has been associated with comet 96P/Machholz e.g., [3], [4] and more recently with Marsden group of sunskirting comets e.g., [5], [6]. Moreover, some authors suggested that comet 96P/Machholz and Marsden group of comets, along with the Kracht group and several other small bodies and meteor showers share the same origin, perhaps from a past breakup of a single first progenitor, forming a large complex of interplanetary small bodies e.g., [6], [7]. Furthermore, the differential perturbations by Jupiter has accelerated the evolution of different members of the complex, placing them presently in a different evolutionary stage of their secular Kozai cycle [4].

However, there has not been any detailed study, dedicated to address the observed characteristics of the shower or its origin. Past child-parent associations of the SDAs and a potential parent, are derived mostly from similarity of their mean orbital elements and evolution of the latter, without an attempt to match and explain the observed characteristics of the shower such as, radiant location and drift, activity profile, distribution of the orbital elements as a function of the solar longitude etc. With this study we aim to fill this gap, as well as to obtain an overall picture as to the origin and evolution of the meteoroid complex of comet 96P/Machholz.

For this purpose, we performed detailed numerical

simulations, in order to investigate the most likely age and parent of the SDAs, by direct comparison of the results of our model to the observed characteristics of the shower. Our observational data consists of ~ 1400 TV SDAs observed by the Cameras for Allsky Meteor Surveillance (CAMS) [8], visual observation by the International Meteor Organization (IMO), and extensive detections by the Canadian Meteor Orbit Radar (CMOR). In our simulations, we considered two potential parents of the stream, namely comet 96P/Machholz, and the most notable member of the Marsden group of sunskirting comets - comet P/1999 J6 [6].

We will be discuss our preliminary results of these simulations with an emphasis on the most probable parent and age of the SDA meteoroid stream.

References

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