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# The 2011 Giacobinid outburst: geocentric radiant data derived from Spanish Meteor Network video imagery

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## Abstract

On 2011 October 8 the Earth encountered the dust trails left by comet 21P/Giacobini-Zinner during its XIX and XX century perihelion approaches. The trails were older than in previous 1933 and 1946 historical encounters, and significantly perturbed by Earth's encounters so they finally produced an outburst, but not a storm. We discuss here the geocentric radiants derived from accurately reduced video data recorded from SPanish Meteor Network (SPMN) multistation work.

## 1. Introduction

Big expectation was created with the return to Earth's vicinity of 21P/Giacobini-Zinner's contemporary dust trails on 2011 October 8. The Earth crossed this Jupiter family comet track. Dust trails left by the comet were precisely forecasted through the perihelion approach. A model created by Sato and Horii, and later further developed by Vaubaillon et. al. [2] was validated to fit the 1933 and 1946 storms which reached on the order of 10,000 meteors per hour. Similar success was hopefully expected for 2011 dealing peaks of activity of several hundreds of meteors per hour. Unfortunately the meteor shower did not reach storm category; but the outburst was really remarkable. Despite the lunar interference, the display of bright meteors allowed us to image tens of video meteors from SPMN stations.

We selected bright meteors (over +2 magnitude) and fireballs recorded by small field of view cameras available at different Spanish Meteor Network (SPMN) stations [5]. Such records allowed us to obtain important orbital and radiant information that has been processed using our own software package [6]. From several hundred of recorded meteors, we have obtained up to now accurate orbital and radiant data of twenty meteors. We focus here in discussing the derived geocentric radiants of 14 of these accurately-reduced Giacobinid meteors.

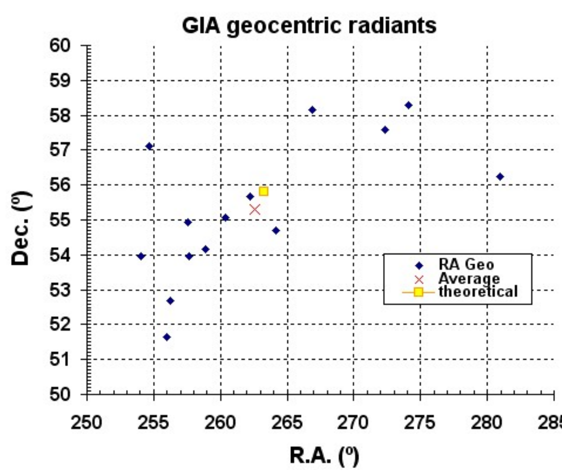


Figure 1: The Giacobinid geocentric radiants compared with the theoretical radiant given in [3]. A few outsiders were removed from the original dataset

## 2. Discussion and conclusion.

Data measurements of the shower measured flux and derived orbital elements of selected meteoroids were previously presented in LPSC [5]. Here we will focus on the geocentric radiant data (Table 1). Geocentric radiant information is essential to test the different theoretical models that are, for example, not considering the perturbations induced in the trail members by previous Earth encounters. The radiant distribution plotted in Fig. 1 shows a significant scatter that seems not caused by observational biases. Consequently, we found significant differences between the measured geocentric radiants and the theoretical values given in [3, 7]. The theoretical radiant values given in [3, 7] for the 1900 dust trail members are virtually identical: RA = 263.3º; Dec = +55.8º. For the 1873-1894 the derived theoretical values were: RA = 263.3º; Dec = +55.4º [7]. SPMN averaged geocentric radiant data fits better the second value probably suggesting that significant mixing among the members of the trails occurred. In any case, it is quite remarkable the derived right ascension drift of $\Delta\alpha$=-0.73º. We think that the drift in the radiant position could be originated by gravitational effect on individual meteoroids during the previous 1933 and 1946 dust trails encounters with Earth. These encounters affected significantly some orbital elements that traduced in the drift in geocentric radiant data.

## References


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| Code | Year | Month | Day | Time (hms) | RA Geo | Dec Geo |
|---|---|---|---|---|---|---|
| SPMN_*184038 | 2011 | 10 | 8,778218 | 18:40:38.0 | 262,23±0,1 | 55,66±0,1 |
| SPMN_*185050 | 2011 | 10 | 8,785303 | 18:50:50.2 | 266,88±0,4 | 58,16±0,4 |
| SPMN_*191104 | 2011 | 10 | 8,799347 | 19:11:03.6 | 274,06±0,3 | 58,3±0,3 |
| SPMN_*191929 | 2011 | 10 | 8,805204 | 19:19:29.7 | 260,37±0,1 | 55,07±0,1 |
| SPMN_*192250 | 2011 | 10 | 8,807525 | 19:22:50.2 | 258,89±0,4 | 54,15±0,4 |
| SPMN_*194759 | 2011 | 10 | 8,824988 | 19:47:59.0 | 264,15±0,1 | 54,69±0,1 |
| SPMN_*194940 | 2011 | 10 | 8,826154 | 19:49:39.7 | 256,01±0,25 | 51,66±0,25 |
| SPMN_*195157 | 2011 | 10 | 8,827748 | 19:51:57.4 | 254,07±0,11 | 53,95±0,1 |
| SPMN_*200452 | 2011 | 10 | 8,833721 | 20:04:52.7 | 256,21±0,1 | 52,7±0,1 |
| SPMN_*201440 | 2011 | 10 | 8,843519 | 20:14:40.1 | 257,66±0,1 | 53,95±0,05 |
| SPMN_*201453 | 2011 | 10 | 8,843673 | 20:14:53.4 | 272,33±0,15 | 57,59±0,05 |
| SPMN_*201849 | 2011 | 10 | 8,846401 | 20:18:49.0 | 280,97±0,48 | 56,24±0,1 |
| SPMN_*203103 | 2011 | 10 | 8,8549 | 20:31:03.4 | 254,63±0,42 | 57,12±0,03 |
| SPMN_*204801 | 2011 | 10 | 8,8666723 | 20:48:00.5 | 257,55±0,3 | 54,92±0,3 |
| **AVERAGE** | | | | | **262,57±0,23** | **55,29±0,15** |

Table1. Radiant position of selected 2011 Giacobinid meteors from the SPMN database. The asterisk (*) corresponds to the label 081011 that is common to all meteors. The last row shows the radiant average.