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SUPPLEMENT

Geminids - the list of photographic orbits

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Abstract. The paper presents a list of 387 Geminids selected from the latest version of the IAU MDC database of photographic orbits. The selection was made by a method of indices described in detail in the paper by Svoreň et al. (2000).

Key words: meteors – photographic – orbits – Geminids

1. Introduction

The latest completed version of the IAU Meteor Data Center catalogue of precise photographic orbits (Lindblad et al., 2005) was used for making a selection of the members of the Geminid meteoroid stream. The meteors with heliocentric velocities greater than 48 $\mathrm{km\,s^{-1}}$ were omitted from this analysis in the light of our previous results (Porubčan et al., 1995). Thus the final set of database consisted of 4526 orbits.

The method of indices was used to acquire a basic data set for the Geminids - totally 387 orbits were selected. A detailed description of the method of indices was published elsewhere (Svoreň et al., 2000 and Kaňuchová et al., 2005).

As input data we used 5 orbital elements incorporated in the Southworth-Hawkins D-criterion (1963): q - the perihelion distance, e - the eccentricity, ω - the argument of perihelion, Ω - the longitude of ascending node and i - the inclination of the plane of meteor orbit to the ecliptic. Next our parameters are α - right ascention and δ - declination, the coordinates of the radiant (which belong to the most accurately known parameters) and v_{g} - the geocentric velocity (a significant parameter characteristic for physically related orbits).

In the first step of procedure the relative ratios, approximated by small integers, corresponding to the reciprocal values of the relative errors of considered parameters, were applied as the basic numbers for the division of the parameters. Next, indices to a meteor according to the interval pertinent to its parameters are assigned on the basis of a division of the observed ranges of parameters. Finally, a philosophy of the method says that a grouping of the meteors with the same indices reflects a similarity among the orbits.

The reader can find some more details and the table listing the mean errors and the numbers of intervals of basic division in the article by Svoreň and Kaňuchová (2005).

Table 1. The ranges of parameters for 387 selected Geminids and the mean orbit.

parameter	q	e	ω	Ω	i	α	δ	v_g
Lowest value	0.085	0.743	318.1	256.8	12.1	107.4	29.3	24.40
Highest value	0.234	0.981	334.4	263.8	43.2	121.7	35.3	44.20
Mean orbit	0.141	0.894	324.6	261.9	23.6			
	±0.016	±0.023	±1.8	±1.0	±3.2			

The list of selected Geminids is given in Table 3. Only the indentification number, date and time of observation and the above-mentioned 8 parameters are incorporated in Table 3.

There are some meteors, marked with an asterix (*), with orbital parameters slightly different from those of typical Geminids in the list. Their separation (except of meteors 103P1 and 126D8) by the method of indices was ambiguous. And, especially, some meteors have a lower eccentricity and a higher perihelion distance than expected (e.g. 166N2, 161N2, 180N2). We decided to keep them in the list being prepared for the next analysis, because we cannot exclude that they form some extra structure in the Geminid stream. The other possibility is, as they were observed by one station (except of 033T2), that some systematic error has occured.

The reader can obtain all the other data characterizing the selected meteors from the electronics version of the IAU MDC databaze (Lindblad et al., 2005). The identification number simplifies identification of meteors in the database.

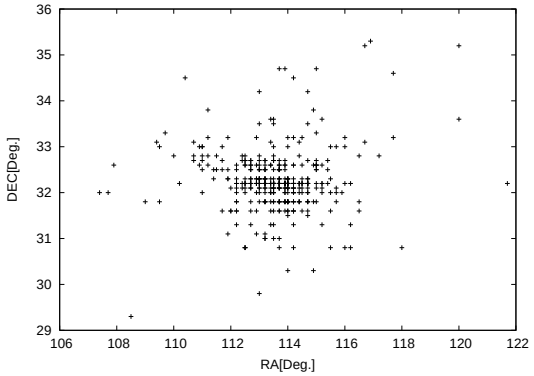

Figure 1. Radiants of 387 selected photographic Geminids.

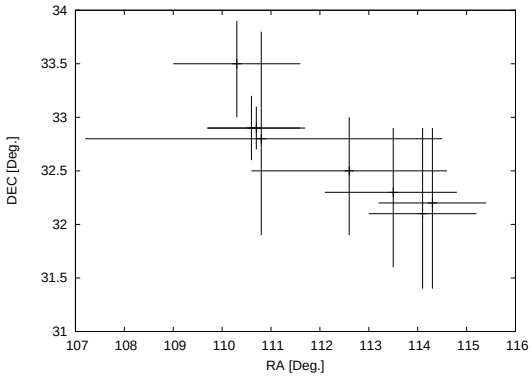

Figure 2. Mean radiants (and root-of-mean-squares of their coordinates) for groups of meteors observed in 1 day intervals. The daily motion of the Geminid radiant is well seen.

2. Statistics of selected Geminids

The selected Geminids cover interval from December 8^{th} to December 15^{th}. Ranges of parameters for 387 Geminids are listed in Table 1 and mean orbit is in the last row. Figure 1 depicts the radiants of 387 Geminids in the equatoreal coordinate system. The daily motion of the mean radiant is well seen in Figure 2; Figures 3 and 4 respectivelly. The relations between the geocentric radiant coordinates α, δ and solar longitude $\lambda_{\odot}$ were derived by the method of least squares. The parameters of related linear equations (shown in Figures 3 and 4) are in Table 2. Our results are in good agreement with those of Porubčan et al. (2004).

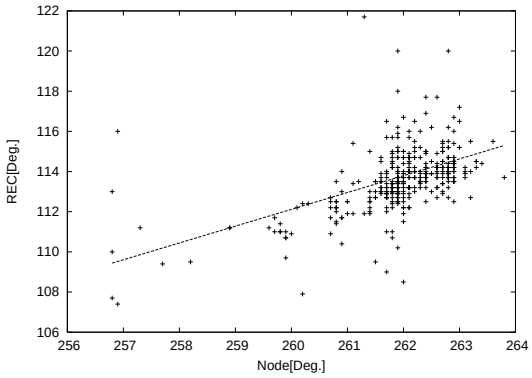

Figure 3. Right ascension of 387 selected Geminids. (Note: $\Omega = \lambda_{\odot}$.)

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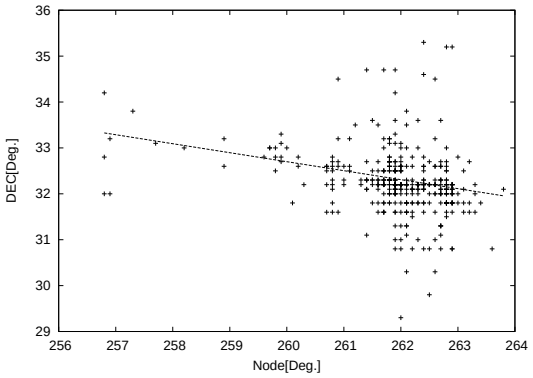

Figure 4. Declination of 387 selected Geminids. (Note: $\Omega = \lambda_{\odot}$.)

Table 2. Daily motion of the Geminid's radiant (2000.0) in the standard form; and in the form with coefficients derived by the method of least squares.

α	δ
113.7+0.837($\lambda_{\odot}$-261.9)	32.4-0.196($\lambda_{\odot}$-261.9)
-(105.5±17.3)+(0.837±0.066)$\lambda_{\odot}$	(83.7±8.9)-(0.196±0.034)$\lambda_{\odot}$

Table 3. Selected Geminids - IN - identification number, $d.t.$ - date (yymmdd.) and time (.ttttt), q - perihelion distance in AU, e - eccentricity, ω - argument of perihelion in degrees, Ω - longitude of ascending node and i - inclination of the plane of meteor orbit to the ecliptic in degrees, α - right ascension and δ - declination of the radiant in degrees, v_{g} - geocentric velocity in km per second.

IN	$d.t.$	q	e	ω	Ω	i	α	δ	v_{g}
083P1	561208.26027	0.148	0.860	326.9	256.8	21.0	110.0	32.8	31.16
081O1	581208.78200	0.136	0.895	325.5	256.8	21.4	107.7	32.0	34.00
082O1	581208.80800	0.122	0.888	329.7	256.8	29.4	113.0	34.2	33.50
084O1*	581208.93600	0.085	0.925	334.4	256.9	37.4	116.0	33.2	36.50
083O1	581208.93600	0.141	0.892	324.8	256.9	20.8	107.4	32.0	33.80
119S1	661209.31578	0.137	0.878	327.2	257.3	25.6	111.2	33.8	32.87
390J1	531209.37006	0.143	0.885	325.1	257.7	23.4	109.4	33.1	33.41
182S1	581210.22500	0.139	0.896	324.7	258.2	24.2	109.5	33.0	34.45
059N2*	771210.73000	0.111	0.937	326.6	258.9	31.7	111.2	33.2	38.40
086O1	581210.86000	0.123	0.911	326.6	258.9	26.2	111.2	32.6	35.60
392J1	521211.19612	0.140	0.898	324.4	259.8	24.2	111.0	32.8	34.63
393J1	521211.21585	0.139	0.894	325.0	259.8	23.4	111.4	32.5	34.14
331H1	521211.25625	0.144	0.893	324.0	259.8	24.1	111.0	33.0	34.29

IN	$d.t.$	q	e	ω	Ω	i	α	δ	v_g
112W1	411211.27000	0.132	0.912	324.6	259.7	26.4	111.0	33.0	35.87
085P1	561211.32955	0.140	0.902	323.9	259.9	24.3	110.7	32.8	34.99
086P1	561211.35014	0.143	0.894	324.1	259.9	23.5	111.0	32.7	34.26
089P1	561211.39393	0.144	0.900	323.4	259.9	24.7	110.7	33.1	34.92
394J1	531211.39574	0.143	0.886	324.9	259.7	23.9	111.7	33.0	33.63
092P1	561211.44678	0.145	0.895	323.6	260.0	24.1	110.9	33.0	34.44
022G1	771211.45000	0.148	0.881	324.5	259.6	22.7	111.2	32.8	33.20
005O4	611211.89400	0.173	0.884	319.2	260.2	20.0	107.9	32.6	33.60
087O1	581211.89600	0.145	0.911	322.1	259.9	25.4	109.7	33.3	35.90
028K1	581212.01400	0.139	0.885	326.0	260.1	21.4	112.2	31.8	33.20
345P1	581212.19545	0.144	0.883	325.1	260.2	23.4	112.4	32.8	33.36
395J1	521212.21300	0.139	0.905	323.8	260.8	23.5	111.4	32.3	35.14
396J1	521212.22909	0.143	0.888	324.8	260.8	21.3	112.2	31.8	33.51
397J1	521212.23334	0.143	0.893	324.3	260.8	23.6	112.2	32.6	34.20
334H1	531212.34620	0.142	0.889	324.8	260.7	23.5	112.5	32.6	33.83
398J1	531212.35211	0.143	0.896	324.0	260.7	23.4	111.7	32.5	34.46
116W1	371212.38000	0.140	0.892	325.0	260.8	22.9	112.5	32.2	34.00
094P1	561212.39112	0.144	0.890	324.4	261.0	23.3	112.5	32.6	33.91
095P1	561212.42000	0.143	0.895	323.9	261.0	22.8	111.9	32.3	34.34
336H1	531212.49241	0.139	0.896	324.8	260.8	22.8	112.2	32.1	34.33
123N2	791212.60000	0.115	0.927	326.8	260.3	27.6	112.4	32.2	37.10
194N2	841212.68000	0.126	0.912	325.9	261.1	26.7	113.4	32.6	35.80
005N2	691212.70000	0.177	0.872	319.5	260.9	23.9	110.4	34.5	33.20
064N2	771212.73000	0.152	0.878	324.0	260.9	19.7	111.7	31.6	32.80
063N2	771212.73000	0.127	0.927	324.1	260.9	27.4	111.7	32.7	37.30
152N2	801212.82000	0.150	0.880	324.1	261.2	24.8	113.5	33.5	33.40
001C1	551212.86271	0.138	0.913	323.2	260.7	24.8	110.9	32.6	35.97
422O6*	721212.86700	0.098	0.899	334.4	261.3	31.2	121.7	32.2	33.42
002C1	551212.89957	0.131	0.903	325.7	260.7	24.3	112.7	32.2	34.89
003C1	551212.92672	0.132	0.908	325.1	260.8	25.9	112.5	32.7	35.54
004C1	551212.94451	0.137	0.909	323.9	260.8	24.5	111.5	32.5	35.55
005C1	551212.95731	0.123	0.915	326.3	260.8	28.0	113.5	32.8	36.15
026O5	661212.96800	0.143	0.888	324.7	261.0	22.4	112.5	32.2	33.69
074D4	641212.97900	0.142	0.895	324.2	261.5	22.9	112.7	32.2	34.30
178B1	901212.98690	0.124	0.918	325.6	260.8	24.0	112.0	31.6	36.12
007C1	551213.07019	0.125	0.915	325.7	260.9	26.9	113.0	32.6	36.10
008C1	551213.07230	0.124	0.913	326.3	260.9	29.1	114.0	33.2	36.10
027O5	661213.12300	0.122	0.901	328.1	261.1	26.8	115.4	32.5	34.64
399J1	521213.14203	0.141	0.895	324.4	261.8	23.4	113.2	32.3	34.34
007E2	911213.16345	0.140	0.890	325.2	260.7	21.2	112.2	31.6	33.67
031I2	801213.16400	0.156	0.880	322.9	261.6	24.3	113.0	33.5	33.50
117W1	501213.17690	0.148	0.891	323.3	261.3	22.2	111.9	32.3	34.04
119W1	501213.23920	0.141	0.900	323.8	261.4	23.4	112.2	32.3	34.80
073W1	501213.29280	0.139	0.896	324.7	261.4	23.6	113.0	32.3	34.42
337H1	531213.31502	0.139	0.894	325.1	261.7	23.7	113.7	32.3	34.16
400J1	531213.31978	0.141	0.904	323.5	261.7	23.3	112.2	32.2	35.08
074W1	371213.33000	0.136	0.902	324.9	261.8	24.1	113.4	32.2	34.90

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IN	$d.t.$	q	e	ω	Ω	i	α	δ	v_g
401J1	531213.34920	0.141	0.896	324.3	261.7	23.1	113.0	32.2	34.39
402J1	531213.36039	0.136	0.903	324.6	261.7	22.4	112.7	31.6	34.85
403J1	531213.36283	0.141	0.897	324.2	261.7	23.2	112.9	32.2	34.49
003I2	791213.41000	0.151	0.891	322.8	261.1	24.3	111.9	33.2	34.30
097P1	561213.41255	0.143	0.899	323.6	262.0	22.8	112.7	32.1	34.64
096P1	561213.41486	0.137	0.915	323.4	262.0	23.8	112.2	32.0	36.01
023G1	771213.42400	0.148	0.868	325.9	261.6	21.8	114.7	32.3	32.00
099P1	561213.42852	0.141	0.901	323.8	262.0	25.7	113.5	33.0	35.09
076W1	371213.43000	0.127	0.924	324.4	261.9	27.0	113.0	32.5	37.00
404J1	531213.43186	0.141	0.896	324.3	261.8	22.9	113.0	32.1	34.40
102P1	561213.43520	0.144	0.891	324.3	262.0	22.5	113.4	32.1	33.94
339H1	531213.43578	0.143	0.900	323.5	261.8	24.2	112.7	32.6	34.91
103P1*	561213.43727	0.120	0.967	321.8	262.0	19.2	108.5	29.3	40.24
024G1	771213.44100	0.142	0.880	325.9	261.6	22.6	114.5	32.2	32.90
025G1	771213.46000	0.148	0.894	323.2	261.7	25.0	112.9	33.2	34.50
340H1	531213.46534	0.144	0.891	324.3	261.8	22.7	113.2	32.2	33.96
104P1	561213.50600	0.143	0.896	323.9	262.1	23.1	113.2	32.2	34.46
105P1	561213.50640	0.141	0.903	323.7	262.1	23.5	112.9	32.2	35.02
118I2	841213.52000	0.134	0.901	325.3	261.9	22.6	113.5	31.6	34.60
406J1	531213.52675	0.141	0.896	324.3	261.9	23.2	113.2	32.2	34.41
003P1	531213.52708	0.138	0.908	323.7	261.9	23.7	112.5	32.1	35.47
002P1	531213.53006	0.142	0.902	323.5	261.9	23.3	112.5	32.2	34.95
066N2	771213.55000	0.149	0.875	325.0	261.7	21.7	114.0	32.2	32.60
067N2	771213.56000	0.160	0.868	323.4	261.8	20.6	112.9	32.3	32.20
068N2	771213.57000	0.148	0.879	324.8	261.8	24.3	114.4	33.1	33.20
069N2	771213.62000	0.142	0.892	324.6	261.8	25.8	114.2	33.2	34.30
154N2	801213.62000	0.122	0.919	326.0	262.0	28.6	114.7	32.7	36.60
039N2	761213.63000	0.125	0.898	327.5	262.1	25.7	116.0	32.2	34.40
006T2	901213.63297	0.134	0.905	324.8	261.5	24.6	113.0	32.3	35.21
040N2	761213.64000	0.152	0.876	324.1	262.1	25.6	114.9	33.8	33.20
071N2	771213.64000	0.144	0.904	322.9	261.8	23.9	112.2	32.5	35.20
156N2	801213.64000	0.158	0.854	325.2	262.1	19.4	114.7	31.8	30.90
155N2	801213.64000	0.149	0.880	324.5	262.1	19.3	113.2	31.1	32.80
007T2	901213.64439	0.139	0.901	324.3	261.5	23.8	112.7	32.3	34.85
041N2	761213.65000	0.157	0.881	322.7	262.1	19.7	112.2	31.6	33.10
072N2	771213.65000	0.123	0.909	327.0	261.8	25.2	114.7	31.8	35.30
157N2	801213.65000	0.125	0.924	324.9	262.1	26.0	113.2	32.0	36.90
074N2	771213.66000	0.154	0.873	324.0	261.9	22.4	113.7	32.7	32.70
073N2	771213.66000	0.155	0.865	324.6	261.9	20.8	114.0	32.2	31.90
176N2	821213.66000	0.156	0.864	324.5	261.6	20.3	113.5	32.1	31.80
159N2	801213.67000	0.166	0.853	323.6	262.1	19.5	113.7	32.2	31.10
158N2	801213.67000	0.153	0.870	324.6	262.1	21.3	114.2	32.2	32.30
053D2	571213.67100	0.134	0.900	325.4	262.0	21.9	113.5	31.3	34.50
075N2	771213.68000	0.125	0.918	325.4	261.9	26.6	113.7	32.3	36.40
125N2	791213.68000	0.131	0.911	324.9	261.4	33.0	115.0	34.7	36.50
160N2	801213.68000	0.129	0.893	327.4	262.1	23.8	115.7	31.8	33.80
018T1	851213.68696	0.149	0.883	324.0	261.8	22.1	113.2	32.3	33.36

IN	$d.t.$	q	e	ω	Ω	i	α	δ	v_g
076N2	771213.69000	0.155	0.871	324.1	261.9	20.5	113.4	32.0	32.30
043N2	761213.70000	0.146	0.878	325.2	262.2	20.7	114.2	31.6	32.70
077N2	771213.70000	0.163	0.863	323.2	261.9	19.1	112.7	31.8	31.80
127N2	791213.70000	0.190	0.822	322.0	261.4	16.6	112.0	32.1	29.10
161N2	801213.70000	0.193	0.805	323.4	262.1	15.5	114.0	31.6	27.80
162N2	801213.70000	0.144	0.884	324.9	262.1	23.7	114.5	32.6	33.50
163N2	801213.70000	0.156	0.873	323.7	262.1	23.0	114.0	33.0	32.80
044N2	761213.71000	0.120	0.920	326.5	262.2	23.0	113.7	30.8	36.10
079N2	771213.71000	0.135	0.887	326.6	261.9	23.8	115.2	32.2	33.50
129N2	791213.71000	0.129	0.918	324.6	261.4	25.8	112.5	32.3	36.40
164N2	801213.71000	0.155	0.877	323.5	262.1	19.1	112.7	31.3	32.70
019T1	851213.71120	0.146	0.891	323.8	261.9	22.4	112.9	32.2	33.98
054D2	571213.71300	0.148	0.884	324.1	262.0	22.1	113.5	32.2	33.40
045N2	761213.72000	0.135	0.887	326.7	262.2	23.4	115.5	32.0	33.40
082N2	771213.72000	0.140	0.889	325.3	261.9	26.3	115.0	33.3	34.10
083N2	771213.72000	0.150	0.875	324.7	261.9	18.7	113.2	31.0	32.40
081N2	771213.72000	0.163	0.854	324.3	261.9	19.8	114.0	32.2	31.10
165N2	801213.72000	0.208	0.792	321.6	262.2	15.2	113.0	32.1	27.30
046N2	761213.73000	0.127	0.904	326.6	262.2	23.6	114.7	31.5	34.80
084N2	771213.73000	0.133	0.903	325.3	261.9	24.6	113.9	32.2	35.00
085N2	771213.73000	0.146	0.871	326.0	261.9	20.6	114.7	31.6	32.10
131N2	791213.73000	0.200	0.799	322.4	261.4	15.6	112.7	32.1	27.60
130N2	791213.73000	0.225	0.764	321.4	261.4	12.2	111.9	31.1	25.50
167N2	801213.73000	0.113	0.929	327.0	262.2	29.1	115.0	32.2	37.40
168N2	801213.73000	0.140	0.875	326.9	262.2	24.6	116.5	32.8	32.60
166N2	801213.73000	0.179	0.835	322.9	262.2	18.9	113.7	32.6	30.00
034N2	751213.74000	0.146	0.893	323.5	261.4	23.7	112.5	32.7	34.30
047N2	761213.74000	0.160	0.852	325.0	262.2	19.2	114.7	31.8	30.80
087N2	771213.74000	0.140	0.896	324.6	261.9	23.4	113.5	32.2	34.40
169N2	801213.74000	0.138	0.885	326.2	262.2	23.2	115.2	32.1	33.30
089N2	771213.76000	0.123	0.926	325.1	262.0	28.4	113.7	32.6	37.30
009C1	551213.77690	0.121	0.916	326.6	261.6	25.5	113.9	31.8	35.98
090N2	771213.78000	0.166	0.880	320.9	262.0	21.6	111.5	32.8	33.40
010C1	551213.79505	0.134	0.908	324.5	261.6	25.9	113.2	32.7	35.61
011C1	551213.79645	0.130	0.915	324.8	261.6	25.6	113.0	32.3	36.06
035N2	751213.80000	0.140	0.893	325.0	261.5	24.0	113.5	32.5	34.20
092N2	771213.80000	0.140	0.887	325.6	262.0	20.1	113.7	31.0	33.30
091N2	771213.80000	0.143	0.884	325.3	262.0	22.8	114.4	32.2	33.30
012C1	551213.80326	0.137	0.897	325.1	261.6	24.5	113.7	32.5	34.52
115D8	821213.80800	0.140	0.902	324.0	261.7	23.5	112.7	32.2	34.90
093N2	771213.81000	0.138	0.878	327.1	262.0	25.8	116.7	33.1	32.90
133N2	791213.81000	0.230	0.784	318.1	261.5	13.3	109.5	31.8	27.10
094N2	771213.82000	0.189	0.825	321.9	262.0	17.9	112.9	32.6	29.40
095N2	771213.83000	0.151	0.874	324.5	262.0	20.5	113.7	31.8	32.50
013C1	551213.83377	0.132	0.910	324.8	261.7	24.2	112.9	32.0	35.56
116D8	821213.84900	0.119	0.907	328.1	261.8	26.4	115.7	32.0	35.10
117D8	821213.85000	0.148	0.895	322.9	261.8	23.6	112.4	32.7	34.50

SUPPLEMENT

IN	*d.t.*	*q*	*e*	ω	Ω	*i*	α	δ	v_g
179B1	901213.85770	0.114	0.906	329.5	261.7	26.0	116.5	31.6	34.71
180B1	901213.85900	0.136	0.910	323.9	261.7	25.2	112.7	32.5	35.74
075D4	641213.86200	0.141	0.895	324.4	262.4	23.1	113.9	32.1	34.30
181B1	901213.86800	0.169	0.895	318.9	261.7	19.1	109.0	31.8	34.28
182B1	901213.87010	0.140	0.896	324.6	261.7	22.3	113.0	31.8	34.28
183B1	901213.87140	0.161	0.889	321.1	261.7	21.5	111.0	32.5	33.97
184B1	901213.87670	0.149	0.896	322.8	261.7	29.3	113.9	34.7	35.23
185B1	901213.87810	0.136	0.912	323.9	261.7	22.7	112.0	31.6	35.64
076D4	641213.87900	0.144	0.894	323.9	262.4	23.3	113.7	32.3	34.30
186B1	901213.88130	0.138	0.897	324.8	261.7	23.6	113.4	32.2	34.49
187B1	901213.89110	0.135	0.907	324.5	261.7	25.2	113.2	32.5	35.45
188B1	901213.89170	0.126	0.902	327.0	261.7	28.1	115.7	33.0	35.03
189B1	901213.89510	0.144	0.884	324.9	261.8	25.2	114.5	33.2	33.66
014C1	551213.89588	0.140	0.903	323.9	261.7	23.8	112.7	32.3	35.00
190B1	901213.89800	0.144	0.897	323.8	261.8	24.3	113.0	32.7	34.62
191B1	901213.90580	0.144	0.893	324.1	261.8	23.0	113.0	32.3	34.20
192B1	901213.90630	0.140	0.910	323.2	261.8	25.5	112.5	32.8	35.77
077D4	641213.91200	0.136	0.905	324.5	262.5	24.4	113.9	32.2	35.20
118D8	821213.91200	0.133	0.907	324.8	261.8	24.9	113.4	32.3	35.40
296B1	911213.91260	0.152	0.882	323.6	261.5	25.1	113.5	33.6	33.60
193B1	901213.92090	0.142	0.900	323.7	261.8	24.9	113.0	32.8	34.95
195B1	901213.93640	0.133	0.910	324.6	261.8	26.0	113.4	32.6	35.74
196B1	901213.94100	0.156	0.904	320.6	261.8	22.9	110.7	32.7	35.20
197B1	901213.94150	0.137	0.896	325.3	261.8	25.0	114.2	32.6	34.45
015C1	551213.94591	0.138	0.904	324.1	261.8	25.3	113.2	32.7	35.24
199B1	901213.96710	0.146	0.892	323.7	261.8	23.3	113.0	32.5	34.16
200B1	901213.96710	0.150	0.905	321.7	261.8	21.8	111.0	32.0	35.12
171B1	901213.96750	0.145	0.891	324.2	261.8	22.9	113.2	32.3	33.99
202B1	901213.97150	0.112	0.923	327.7	261.8	27.5	114.9	31.8	36.69
203B1	901213.97250	0.143	0.893	324.2	261.8	24.2	113.5	32.7	34.29
204B1	901213.97650	0.138	0.897	324.8	261.8	23.1	113.4	32.0	34.39
121D8*	821213.99200	0.093	0.932	331.2	261.9	41.3	120.0	33.6	38.40
205B1	901213.99330	0.131	0.916	324.4	261.9	25.3	112.9	32.2	36.21
207B1	901214.00600	0.144	0.897	323.8	261.9	23.8	113.0	32.5	34.55
208B1	901214.00810	0.141	0.902	323.7	261.9	22.8	112.5	32.0	34.87
209B1	901214.00810	0.137	0.904	324.5	261.9	24.1	113.2	32.2	35.08
210B1	901214.01050	0.139	0.895	324.9	261.9	23.5	113.7	32.2	34.24
211B1	901214.01110	0.161	0.878	322.1	261.9	26.8	113.7	34.7	33.71
212B1	901214.01560	0.135	0.911	324.1	261.9	24.8	112.9	32.3	35.72
213B1	901214.02710	0.160	0.900	320.1	261.9	21.1	110.2	32.2	34.80
298B1	911214.02730	0.137	0.898	324.9	261.6	22.0	112.9	31.6	34.39
173B1	901214.03540	0.132	0.888	327.3	261.9	24.0	115.7	32.1	33.44
299B1	911214.04180	0.136	0.901	324.8	261.6	23.9	113.2	32.2	34.83
214B1	901214.04340	0.138	0.909	323.6	261.9	24.9	112.7	32.5	35.67
174B1	901214.04670	0.142	0.893	324.6	261.9	23.1	113.5	32.2	34.14
215B1	901214.04790	0.139	0.898	324.7	261.9	23.6	113.5	32.2	34.52
216B1	901214.04800	0.144	0.898	323.7	261.9	25.5	113.4	33.1	34.83

IN	$d.t.$	q	e	ω	Ω	i	α	δ	v_g
217B1	901214.05050	0.113	0.909	329.2	261.9	25.4	116.2	31.3	35.03
300B1	911214.05080	0.140	0.893	325.0	261.6	23.3	113.5	32.2	34.11
218B1	901214.05760	0.144	0.895	323.9	261.9	23.7	113.2	32.5	34.43
282B1	901214.05900	0.142	0.897	324.1	261.9	28.9	114.7	34.2	35.07
219B1	901214.05900	0.124	0.911	326.6	261.9	27.3	115.0	32.5	35.69
220B1	901214.06020	0.136	0.901	324.9	261.9	23.5	113.5	32.0	34.75
016C1	551214.06542	0.143	0.891	324.5	261.9	23.7	113.7	32.5	34.06
221B1	901214.06650	0.141	0.891	325.0	261.9	24.3	114.2	32.6	34.01
222B1*	901214.06880	0.097	0.918	332.0	261.9	27.2	118.0	30.8	35.47
017C1	551214.07440	0.127	0.918	325.1	261.9	26.3	113.5	32.3	36.41
223B1	901214.07820	0.144	0.895	323.9	261.9	22.9	113.0	32.2	34.37
224B1	901214.07940	0.123	0.900	327.9	261.9	25.5	115.9	32.0	34.47
301B1	911214.08100	0.141	0.894	324.5	261.7	23.4	113.2	32.3	34.26
226B1	901214.08520	0.137	0.911	323.6	261.9	23.9	112.4	32.1	35.74
227B1	901214.08760	0.140	0.900	324.2	261.9	25.0	113.5	32.7	34.91
228B1	901214.09200	0.134	0.895	326.1	262.0	24.2	114.7	32.2	34.17
229B1	901214.09230	0.139	0.894	324.9	262.0	21.8	113.4	31.6	34.06
230B1	901214.09560	0.145	0.886	324.6	262.0	23.3	113.9	32.5	33.66
018C1	551214.09745	0.140	0.895	324.6	261.9	23.0	113.5	32.1	34.24
231B1	901214.09910	0.136	0.899	325.1	262.0	24.0	113.9	32.2	34.59
232B1	901214.10170	0.129	0.903	326.2	262.0	26.4	115.0	32.6	35.03
233B1	901214.11250	0.137	0.890	325.9	262.0	24.8	115.0	32.6	33.89
234B1	901214.11300	0.145	0.889	324.2	262.0	19.0	112.5	30.8	33.48
236B1	901214.12600	0.138	0.900	324.6	262.0	23.9	113.5	32.2	34.76
237B1	901214.12880	0.146	0.900	322.8	262.0	22.8	112.2	32.2	34.83
238B1	901214.13510	0.154	0.894	322.0	262.0	22.5	111.9	32.5	34.36
239B1	901214.13750	0.140	0.902	323.9	262.0	23.6	113.0	32.2	34.89
240B1	901214.14500	0.136	0.903	324.6	262.0	24.2	113.5	32.2	35.01
342H1	521214.15038	0.139	0.898	324.6	262.8	22.9	114.2	31.8	34.53
242B1	901214.15110	0.129	0.909	325.4	262.0	25.4	114.0	32.2	35.54
241B1	901214.15650	0.141	0.901	323.9	262.0	24.3	113.2	32.5	34.92
243B1	901214.18200	0.133	0.897	326.0	262.0	24.5	114.7	32.2	34.43
302B1	911214.18580	0.142	0.880	325.9	261.8	23.9	115.0	32.7	33.04
244B1	901214.18940	0.139	0.896	324.7	262.1	23.6	113.7	32.2	34.43
155W1	501214.19550	0.145	0.893	323.9	262.3	22.9	113.5	32.2	34.18
245B1	901214.19780	0.142	0.895	324.3	262.1	22.2	113.2	31.8	34.25
080W1	471214.20000	0.139	0.896	324.9	262.1	23.9	114.0	32.3	34.39
247B1	901214.20000	0.137	0.886	326.3	262.1	18.7	114.0	30.3	32.98
248B1	901214.20230	0.140	0.889	325.4	262.1	21.7	114.0	31.6	33.61
249B1	901214.20280	0.128	0.906	326.2	262.1	25.6	114.7	32.2	35.19
250B1	901214.20680	0.129	0.914	324.9	262.1	29.8	114.7	33.5	36.45
251B1	901214.21170	0.144	0.899	323.5	262.1	20.7	112.2	31.3	34.48
252B1	901214.21790	0.131	0.905	325.6	262.1	23.9	114.0	31.8	35.00
253B1	901214.21960	0.135	0.898	325.6	262.1	24.3	114.4	32.2	34.48
082W1	441214.22000	0.142	0.901	323.7	262.9	22.6	113.7	31.8	34.76
254B1	901214.22290	0.137	0.906	324.3	262.1	23.9	113.2	32.1	35.22
343H1	521214.25344	0.143	0.893	324.2	262.9	23.1	114.4	32.1	34.17

SUPPLEMENT

IN	$d.t.$	q	e	ω	Ω	i	α	δ	v_g
345H1	521214.25988	0.142	0.903	323.3	262.9	23.2	113.5	32.0	35.04
152W1	501214.26610	0.145	0.891	324.1	262.4	22.6	113.7	32.1	34.00
349P1	581214.27708	0.138	0.905	324.1	262.4	23.0	113.2	31.8	35.10
157W1	501214.28080	0.138	0.898	324.8	262.4	23.9	114.2	32.2	34.58
084W1	501214.28510	0.144	0.894	324.0	262.4	23.0	113.7	32.2	34.24
086W1	471214.29000	0.132	0.904	325.4	262.2	23.7	114.0	31.8	34.97
085W1	501214.29030	0.141	0.901	323.9	262.4	23.7	113.5	32.2	34.90
088W1	501214.30800	0.148	0.889	323.7	262.4	23.5	113.9	32.6	33.95
087W1	361214.31000	0.138	0.905	324.1	263.1	22.7	113.9	31.6	35.10
151W1	501214.31840	0.147	0.890	323.7	262.5	23.9	113.9	32.7	34.10
350P1	581214.32037	0.143	0.897	323.8	262.4	23.3	113.5	32.2	34.55
154W1	501214.32480	0.142	0.896	324.3	262.5	23.4	113.9	32.2	34.43
156W1	501214.33200	0.139	0.897	324.6	262.5	22.7	113.9	31.8	34.41
150W1	501214.33250	0.142	0.895	324.4	262.5	22.8	113.9	32.0	34.25
407J1	531214.34826	0.141	0.899	324.0	262.7	22.6	113.7	31.8	34.63
408J1	531214.37895	0.142	0.895	324.2	262.8	23.2	114.2	32.1	34.34
346H1	531214.37933	0.144	0.898	323.6	262.8	23.3	113.7	32.2	34.67
090W1	491214.37940	0.141	0.898	324.1	262.8	22.6	113.9	31.8	34.52
091W1	371214.38000	0.145	0.899	323.3	262.9	22.8	113.5	32.0	34.70
092W1	501214.38540	0.137	0.904	324.3	262.5	24.3	113.9	32.2	35.14
409J1	531214.40185	0.140	0.905	323.8	262.8	22.9	113.5	31.8	35.09
410J1	531214.40912	0.142	0.897	324.0	262.8	23.3	114.0	32.1	34.55
348H1	521214.44600	0.144	0.896	323.7	263.1	23.1	114.2	32.1	34.50
062I1	761214.45200	0.122	0.904	327.7	262.9	22.7	116.0	30.8	34.60
111P1	561214.45507	0.141	0.900	323.9	263.1	22.7	114.0	31.8	34.72
349H1	531214.47656	0.142	0.905	323.2	262.9	19.9	112.5	30.8	34.91
352H1	521214.51668	0.142	0.900	323.7	263.2	22.7	114.0	31.8	34.73
353H1	521214.51848	0.134	0.897	325.8	263.2	23.2	115.5	31.6	34.33
135N2	791214.57000	0.143	0.877	326.0	262.3	24.8	116.0	33.0	32.90
097N2	771214.60000	0.136	0.906	324.4	262.8	23.5	114.0	31.8	35.20
137N2	791214.61000	0.146	0.884	324.7	262.3	19.5	113.5	31.0	33.10
138N2	791214.61000	0.150	0.871	325.1	262.3	21.2	114.7	32.0	32.30
177N2	821214.61000	0.147	0.881	324.6	262.5	22.4	114.5	32.2	33.20
098N2	771214.62000	0.126	0.917	325.4	262.8	25.9	114.7	32.0	36.20
026T2	911214.62535	0.141	0.900	323.9	262.2	23.2	113.2	32.1	34.74
027T2	911214.62942	0.145	0.887	324.4	262.2	22.9	114.0	32.3	33.71
028T2	911214.63760	0.140	0.897	324.5	262.2	23.3	113.7	32.1	34.47
011N2	741214.64000	0.137	0.917	323.1	262.6	25.9	113.2	32.6	36.40
029T2	911214.64622	0.141	0.897	324.3	262.3	22.4	113.4	31.8	34.38
012N2	741214.66000	0.154	0.878	323.6	262.6	21.8	114.0	32.3	33.00
178N2	821214.66000	0.136	0.878	327.3	262.6	26.6	117.7	33.2	33.00
031T2	911214.67047	0.146	0.891	323.9	262.3	22.7	113.5	32.2	34.03
032T2	911214.67721	0.141	0.899	324.0	262.3	22.4	113.2	31.8	34.58
138D2*	581214.68000	0.091	0.981	326.4	262.8	43.2	115.5	33.0	44.20
013N2	741214.68000	0.151	0.880	323.9	262.7	22.2	114.2	32.3	33.20
139N2	791214.68000	0.143	0.875	326.2	262.4	29.4	117.7	34.6	33.30
033T2	911214.68201	0.188	0.814	323.3	262.3	19.7	115.2	33.6	28.73

IN	$d.t.$	q	e	ω	Ω	i	α	δ	v_g
034T2	911214.68623	0.141	0.896	324.4	262.3	23.2	113.7	32.1	34.41
140N2	791214.69000	0.142	0.886	325.3	262.4	23.9	115.0	32.5	33.60
036T2	911214.69903	0.141	0.896	324.2	262.3	23.4	113.7	32.2	34.46
035T2	911214.69903	0.141	0.895	324.5	262.3	23.4	113.9	32.2	34.35
037T2	911214.70391	0.143	0.894	324.0	262.3	22.8	113.5	32.1	34.28
014N2	741214.71000	0.132	0.902	325.6	262.7	24.7	115.0	32.1	34.90
015N2	741214.72000	0.136	0.893	325.7	262.7	24.5	115.5	32.3	34.10
142N2	791214.72000	0.111	0.932	327.1	262.4	28.4	115.0	31.8	37.60
038T2	911214.72595	0.144	0.890	324.4	262.3	22.9	114.0	32.2	33.88
018N2	741214.74000	0.165	0.853	324.0	262.7	20.8	115.0	32.6	31.20
016N2	741214.74000	0.156	0.871	323.8	262.7	20.7	114.2	32.0	32.40
017N2	741214.74000	0.139	0.884	326.0	262.7	21.1	115.2	31.3	33.10
143N2	791214.74000	0.143	0.887	325.0	262.4	24.1	114.9	32.6	33.70
039T2	911214.74144	0.142	0.893	324.4	262.4	24.9	114.4	32.8	34.33
040T2	911214.74690	0.139	0.898	324.5	262.4	24.0	114.0	32.3	34.63
041T2	911214.74968	0.143	0.891	324.4	262.4	22.8	113.9	32.1	33.99
179N2	821214.75000	0.234	0.743	321.9	262.7	12.1	114.2	31.3	24.40
042T2	911214.75671	0.136	0.897	325.4	262.4	22.5	114.2	31.6	34.28
019N2	741214.76000	0.146	0.887	324.3	262.7	23.0	114.5	32.3	33.70
145N2*	791214.76000	0.096	0.938	329.9	262.5	28.3	116.2	30.8	37.90
144N2	791214.76000	0.129	0.919	324.6	262.4	37.1	116.9	35.3	37.70
180N2	821214.76000	0.204	0.788	322.9	262.7	13.3	114.2	30.8	26.70
043T2	911214.76049	0.154	0.880	323.3	262.4	18.1	112.5	30.8	32.83
140D2	581214.76200	0.153	0.877	323.8	262.9	21.2	114.2	32.0	32.90
020N2	741214.77000	0.145	0.889	324.2	262.8	22.3	114.2	32.0	33.80
139D2	581214.77300	0.138	0.901	324.5	262.9	24.3	114.5	32.2	34.90
022N2	741214.78000	0.128	0.909	325.8	262.8	25.9	115.2	32.2	35.50
141D2	581214.80100	0.147	0.885	324.2	262.9	21.1	114.2	31.6	33.40
023D6	761214.82500	0.135	0.906	324.5	263.3	23.2	114.5	31.6	35.20
255B1	901214.83840	0.145	0.892	323.9	262.7	20.6	113.4	31.3	33.94
256B1	901214.87870	0.147	0.890	323.8	262.8	22.7	114.0	32.2	33.97
123D8	821214.89100	0.124	0.927	324.8	262.8	25.3	113.7	31.6	37.10
257B1	901214.90020	0.119	0.915	327.2	262.8	27.8	116.2	32.2	36.07
258B1	901214.90160	0.150	0.891	323.1	262.8	23.2	113.7	32.5	34.19
259B1*	901214.90540	0.128	0.894	327.5	262.8	35.8	120.0	35.2	35.23
260B1	901214.90860	0.139	0.899	324.6	262.8	22.1	114.0	31.5	34.52
125D8	821214.92800	0.138	0.905	324.0	262.9	24.0	114.0	32.1	35.20
261B1	901214.93030	0.145	0.899	323.2	262.8	22.1	113.2	31.8	34.64
262B1	901214.93500	0.143	0.887	324.8	262.8	24.2	115.2	32.6	33.81
303B1	911214.93600	0.135	0.901	325.1	262.5	18.0	113.0	29.8	34.26
124D8	821214.94600	0.141	0.902	323.8	262.9	23.9	114.0	32.2	35.00
264B1	901214.94610	0.138	0.899	324.7	262.8	24.5	114.7	32.3	34.76
263B1	901214.94610	0.142	0.899	323.9	262.8	23.1	113.9	32.0	34.66
304B1	911214.94750	0.135	0.906	324.6	262.6	23.0	113.7	31.6	35.11
265B1	901214.94970	0.142	0.893	324.6	262.8	23.5	114.7	32.2	34.14
266B1	901214.95180	0.145	0.888	324.5	262.8	21.9	114.4	31.8	33.63
026O1	571214.95200	0.142	0.899	323.9	263.3	23.3	114.5	32.0	34.70

SUPPLEMENT

IN	$d.t.$	q	e	ω	Ω	i	α	δ	v_g
267B1	901214.95200	0.147	0.897	323.1	262.8	23.8	113.7	32.5	34.67
268B1	901214.95230	0.142	0.895	324.2	262.8	22.9	114.2	32.0	34.30
305B1	911214.95440	0.160	0.882	321.8	262.6	26.8	114.2	34.5	34.01
306B1	911214.96340	0.149	0.901	322.1	262.6	23.7	112.7	32.6	35.03
307B1	911214.96580	0.153	0.859	325.9	262.6	16.9	114.9	30.3	30.92
126D8*	821214.96700	0.103	0.957	326.2	262.9	32.7	114.7	32.1	40.50
269B1	901214.96980	0.144	0.894	324.1	262.8	22.2	114.0	31.8	34.18
308B1	911214.97890	0.139	0.902	324.2	262.6	24.0	113.9	32.2	34.94
270B1	901214.98300	0.138	0.902	324.4	262.9	24.2	114.4	32.2	34.93
309B1	911214.98880	0.131	0.913	324.8	262.6	25.5	114.2	32.2	35.89
311B1	911214.99210	0.148	0.889	323.6	262.6	22.5	113.7	32.2	33.92
271B1	901215.00220	0.135	0.898	325.5	262.9	24.7	115.4	32.2	34.54
272B1	901215.00670	0.139	0.908	323.7	262.9	23.2	113.5	31.8	35.39
025B1	831215.00820	0.162	0.881	321.5	262.7	24.3	113.4	33.6	33.72
273B1	901215.00970	0.131	0.910	324.9	262.9	25.6	114.7	32.2	35.71
312B1	911215.01030	0.136	0.904	324.6	262.6	24.5	114.2	32.2	35.10
274B1	901215.01960	0.136	0.902	324.7	262.9	23.4	114.4	31.8	34.89
275B1	901215.02200	0.139	0.900	324.4	262.9	23.0	114.2	31.8	34.68
276B1	901215.02820	0.142	0.900	323.7	262.9	22.5	113.7	31.8	34.69
313B1	911215.02900	0.142	0.891	324.7	262.6	22.8	114.4	32.0	33.93
277B1	901215.03310	0.149	0.887	323.6	262.9	31.0	116.7	35.2	34.68
314B1	911215.03320	0.138	0.900	324.6	262.6	23.6	114.2	32.0	34.75
315B1	911215.03430	0.151	0.883	323.7	262.6	19.1	113.2	31.0	33.13
316B1	911215.04000	0.150	0.893	322.8	262.7	21.9	113.0	32.0	34.20
279B1	901215.07460	0.125	0.902	327.3	263.0	25.2	116.5	31.8	34.66
317B1	911215.08190	0.134	0.905	325.0	262.7	24.6	114.5	32.1	35.19
280B1	901215.08860	0.134	0.901	325.4	263.0	24.4	115.2	32.0	34.79
281B1	901215.09030	0.122	0.907	327.2	263.0	29.0	117.2	32.8	35.53
318B1	911215.09060	0.139	0.902	324.3	262.7	23.6	114.0	32.0	34.89
319B1	911215.09230	0.141	0.897	324.2	262.7	23.6	114.2	32.2	34.49
320B1	911215.09840	0.146	0.894	323.4	262.7	20.0	112.9	31.1	34.09
026B1	831215.10440	0.143	0.897	324.0	262.8	23.2	114.0	32.1	34.50
321B1	911215.12030	0.129	0.910	325.5	262.7	27.5	115.4	32.7	35.79
322B1	911215.12410	0.148	0.893	323.3	262.7	23.8	113.9	32.6	34.33
034B1	841215.12850	0.136	0.894	325.8	263.6	20.9	115.5	30.8	33.89
109E1	791215.13200	0.151	0.903	321.6	262.8	23.9	112.7	32.7	35.20
323B1	911215.13410	0.142	0.894	324.5	262.8	22.4	114.2	31.8	34.13
324B1	911215.14700	0.144	0.894	324.1	262.8	22.2	113.9	31.8	34.15
347P1	581215.15395	0.140	0.929	321.4	263.2	26.4	112.7	32.7	37.48
325B1	911215.16890	0.140	0.905	323.8	262.8	24.4	113.9	32.3	35.23
074I2	821215.17700	0.150	0.895	322.6	263.1	23.4	113.7	32.5	34.50
326B1	911215.19590	0.146	0.889	324.0	262.8	22.6	114.2	32.1	33.89
099S1	581215.27064	0.142	0.899	323.8	263.4	22.7	114.4	31.8	34.62
146W1	491215.36970	0.149	0.903	322.0	263.8	23.0	113.7	32.1	35.15
146N2	791215.60000	0.161	0.872	322.7	263.3	20.9	114.2	32.2	32.60

3. Access to the data in the digital form

The list of selected Geminids published in Table 3 is available in a digital form as a plain ASCII file from the web address:
`http://www.astro.sk/caosp/Eedition/FullTexts/vol36no3/pp181-193.dat/`.

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