Meteor Streams and disintegration of comets

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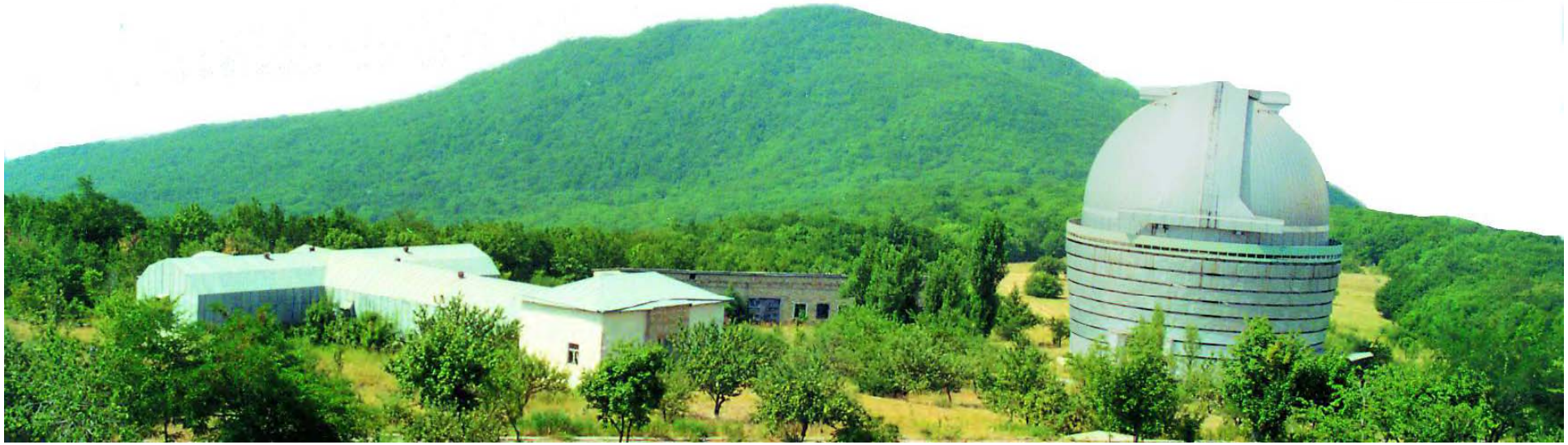


Outline of the work

1. New hypothesis on origin of sun-grasing comets
2. Prediction of unknown meteor streams destroying proto-comet nucleus
3. Distribution of splitting comet' parameters relative to planes of predicted meteor streams
4. Distribution of comet outbursts parameters relative to planes of predicted meteor streams
5. Conclusions and perspective investigations

Classification of sungrazer comets

The total number of sungraser comets makes 1960 (2011):

- *Kreutz comets (N=1678)*

q = 0.006a.e.; e =1; ω = 80^0; Ω = 0^0; i = 144^0

- *Meyer group (N=109)*

q = 0.036a.e.; e =1; ω = 57^0; Ω = 73^0; i = 73^0

Classification of sungrazer comets

- **Kracht group** of sungrasers *(N=36)*

q = 0.045a.e.; e =0,98; ω = 59^0; Ω = 44^0; i = 13^0

- **Marsden group** *(N=33)*

q = 0.050a.e.; e =0.98; ω = 24^0; Ω = 79^0; i = 27^0

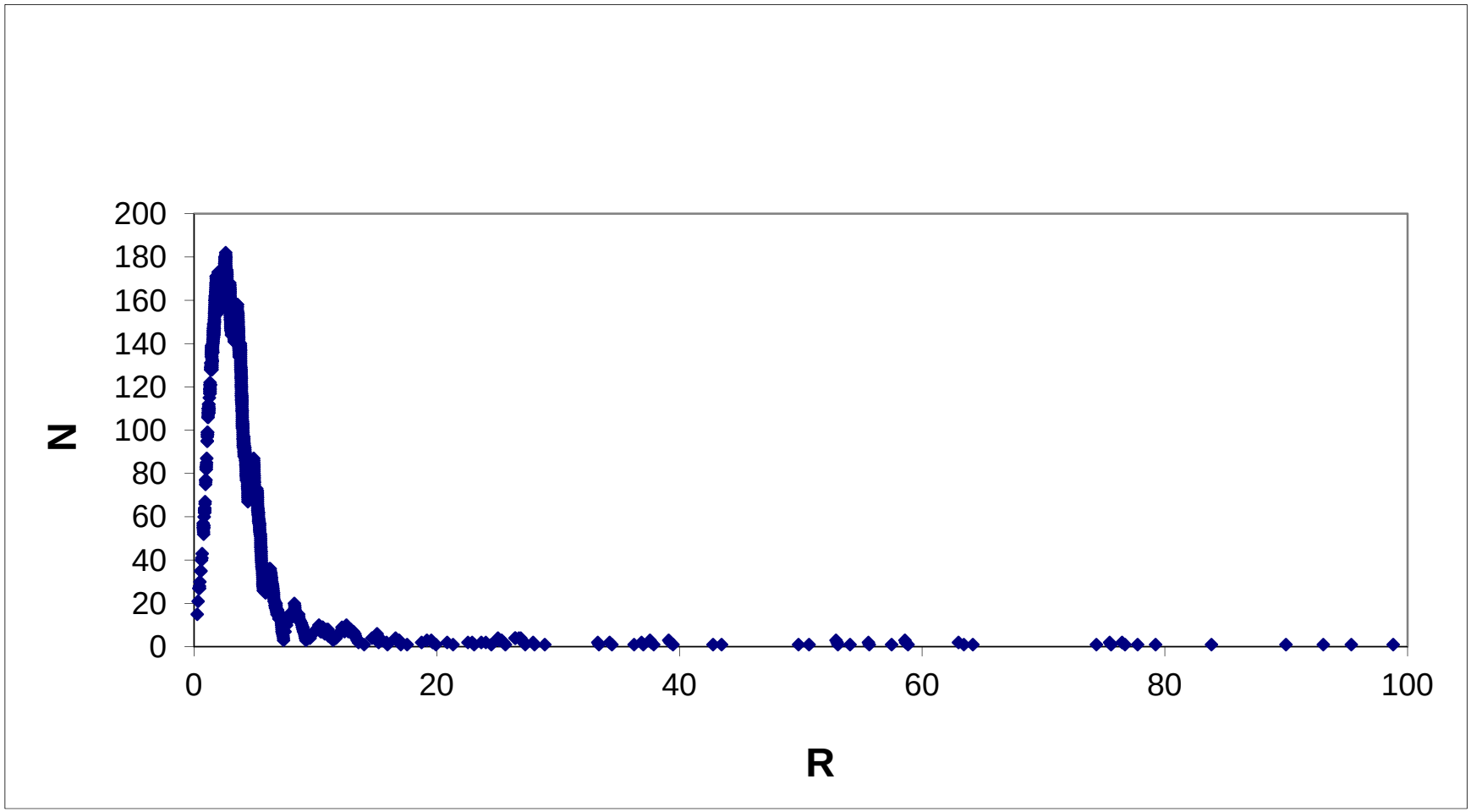
Analyze of perihelion distribution of Kreutz comet group

Perihelion of Kreutz comets are concentrated near two planes:

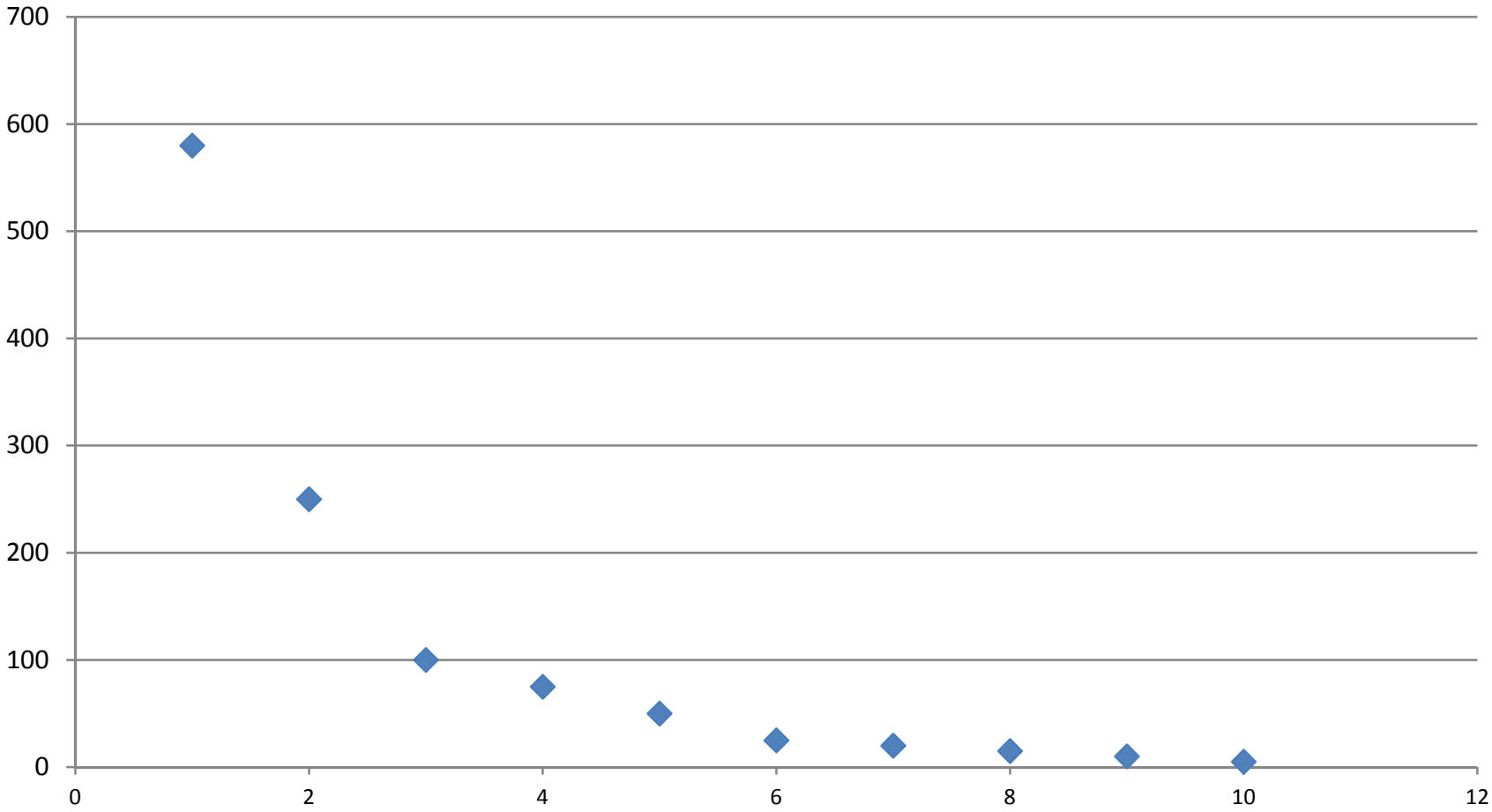
$I_c = 142^0.12; \quad \Omega_c = 351^0.32 \qquad (1)$

$I_c = 76^0.34; \quad \Omega_c = 267^0.15 \qquad (2)$

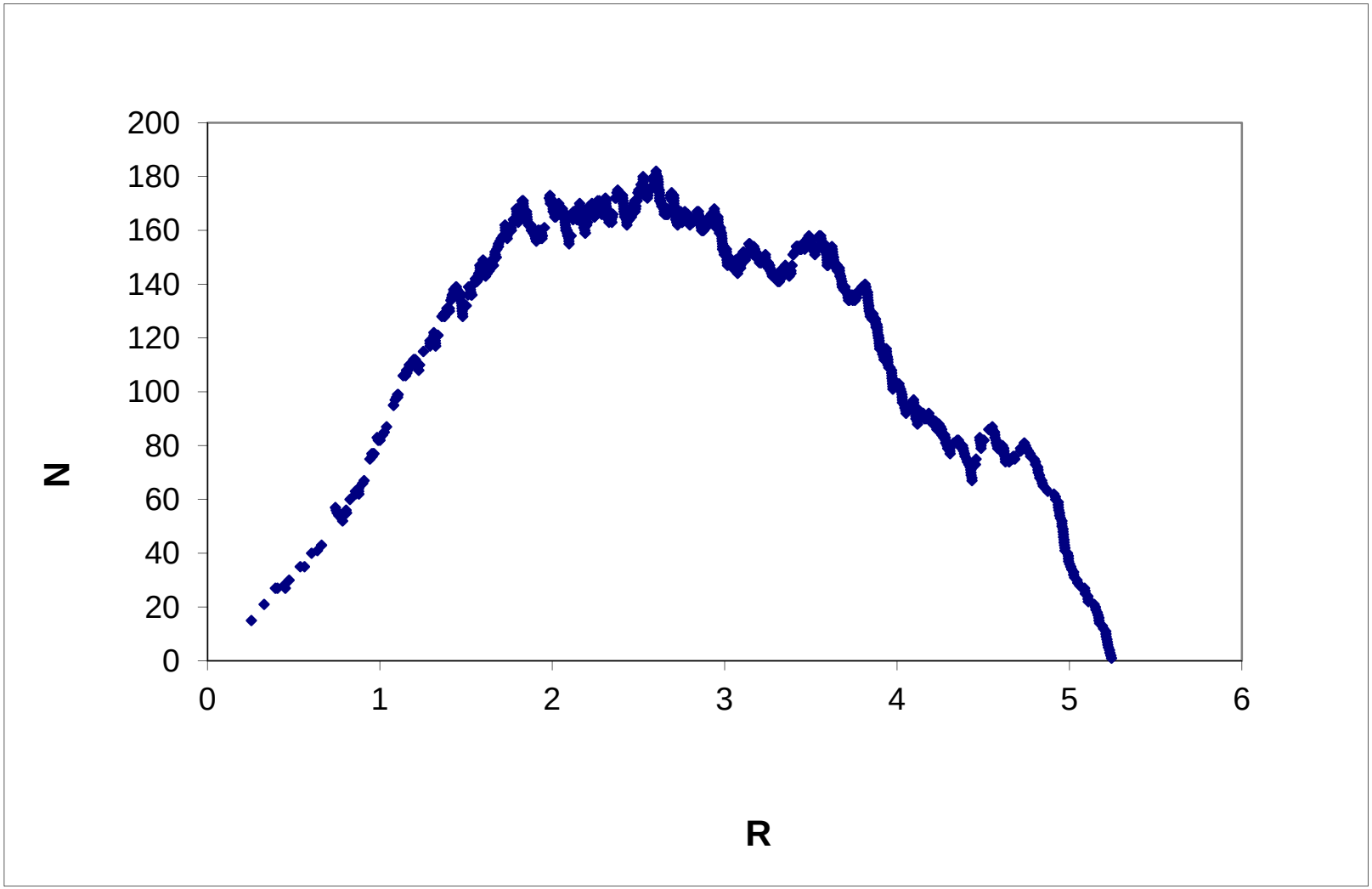
Distribution of distant nodes of Kreutz comets relative to the plane ($I_c = 76^0.34$; $\Omega_c = 267^0.15$) up to 100 a.e.



Approximately distribution of distant nodes of LPC

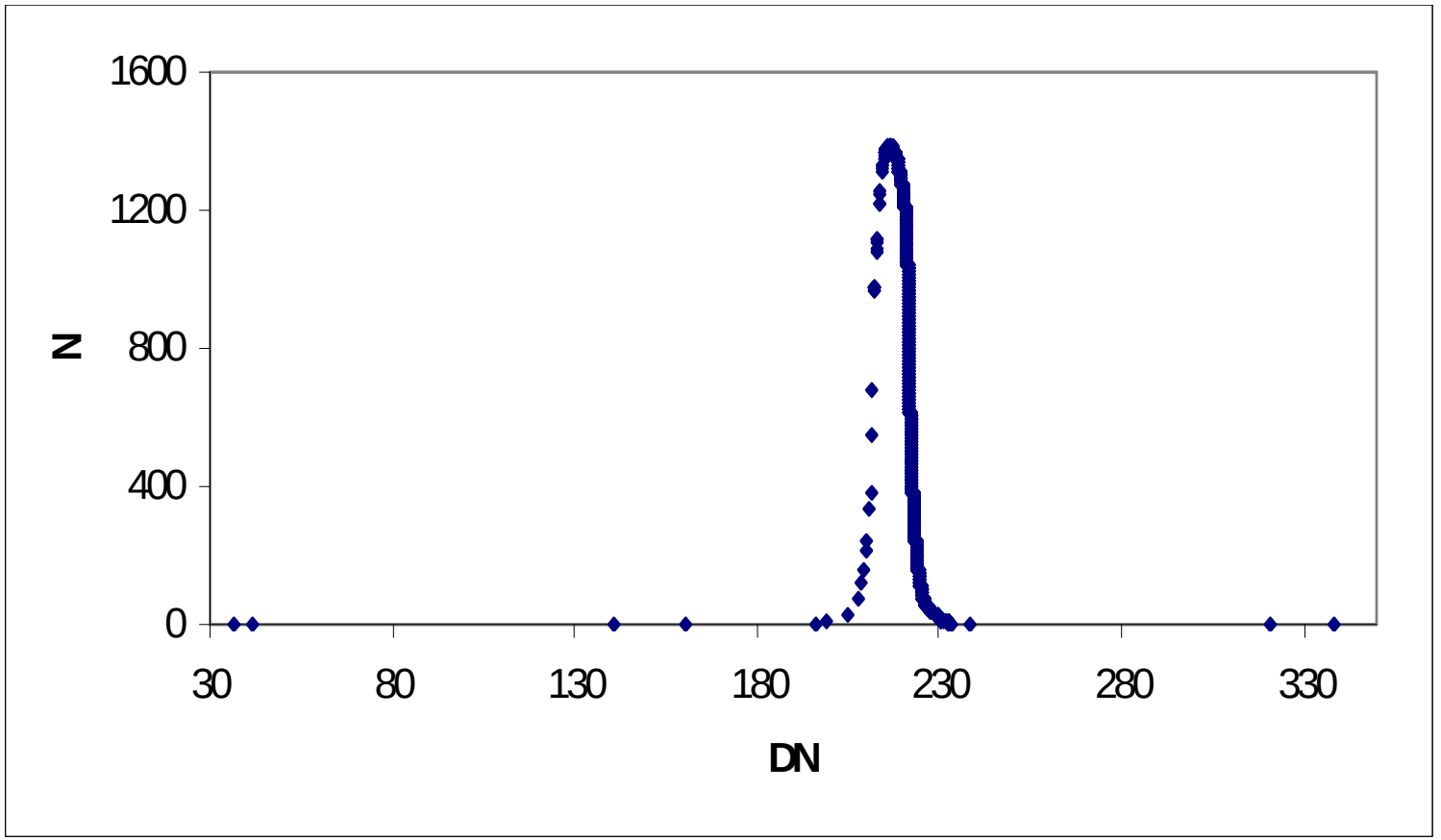


Distribution of distant nodes of Kreutz comets regarding to the plane ($I_c = 76^0.34;$ $\Omega_c = 267^0.15$) in the interval up to 5.3 a.u.



WHAT IS THE PLANE (2)

Distribution of longitudes of distant nodes (DN) of Kreutz comets relative to the plane ($I_c = 76^0.34;$ $\Omega_c = 267^0.15$)



New hypothesis about the origin of the Kreutz family comets

Huge proto-comet nuclei, appearing in inner part of the solar system at first, has fallen into unknown meteor stream. It has got a lot of cracks. These cracks in a combination with tidal influence of the Sun have led to disintegration of proto-comet nuclei on to finer fragments. Fragments have fallen in the same meteoric stream at their next returning to perihelion and have got sets of impacts and cracks which lead to their secondary splitting, etc.

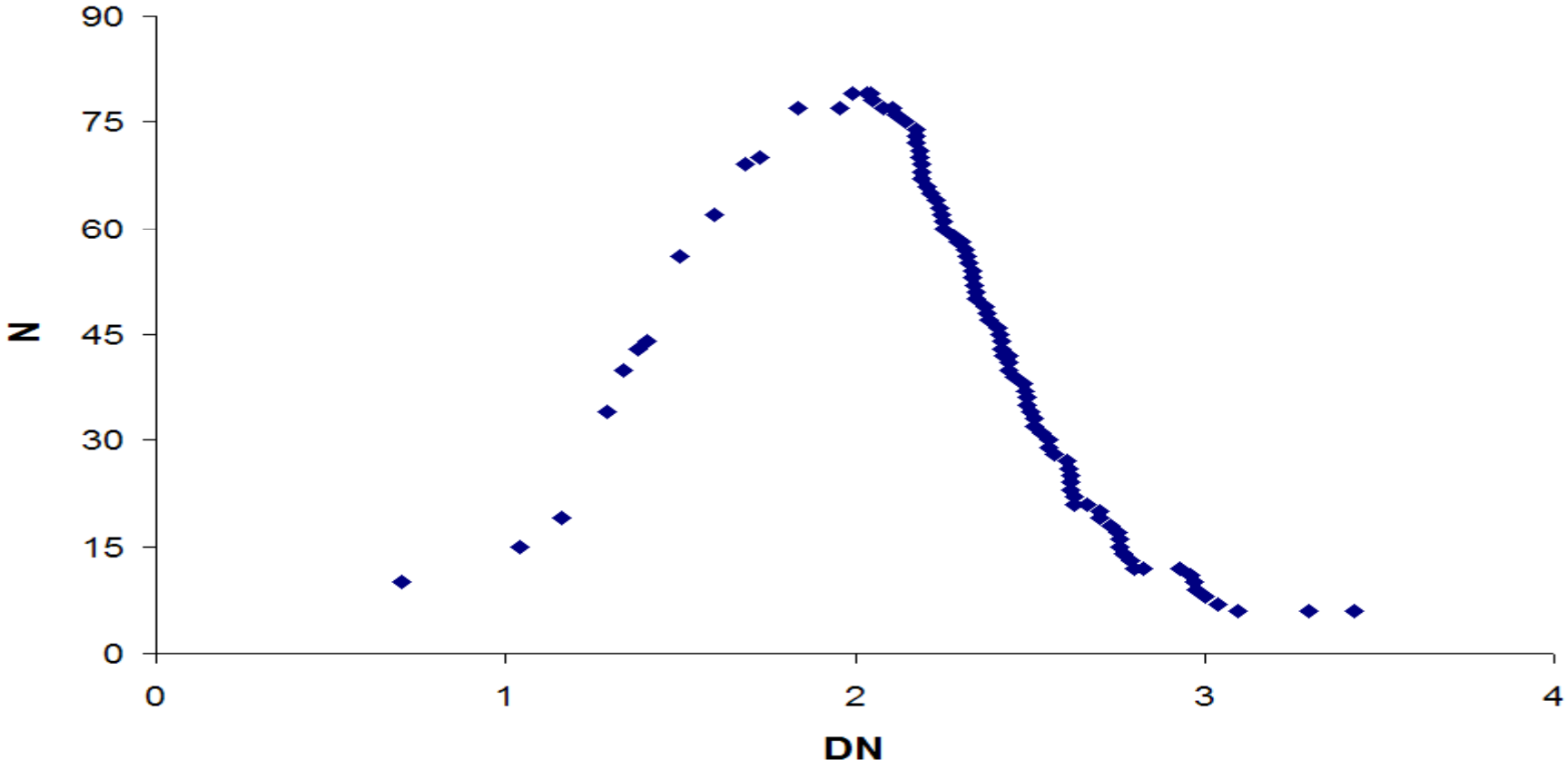
Analysis of perihelion distribution of Meyer comet group

Perihelion of Meyer comets are concentrated near two planes:

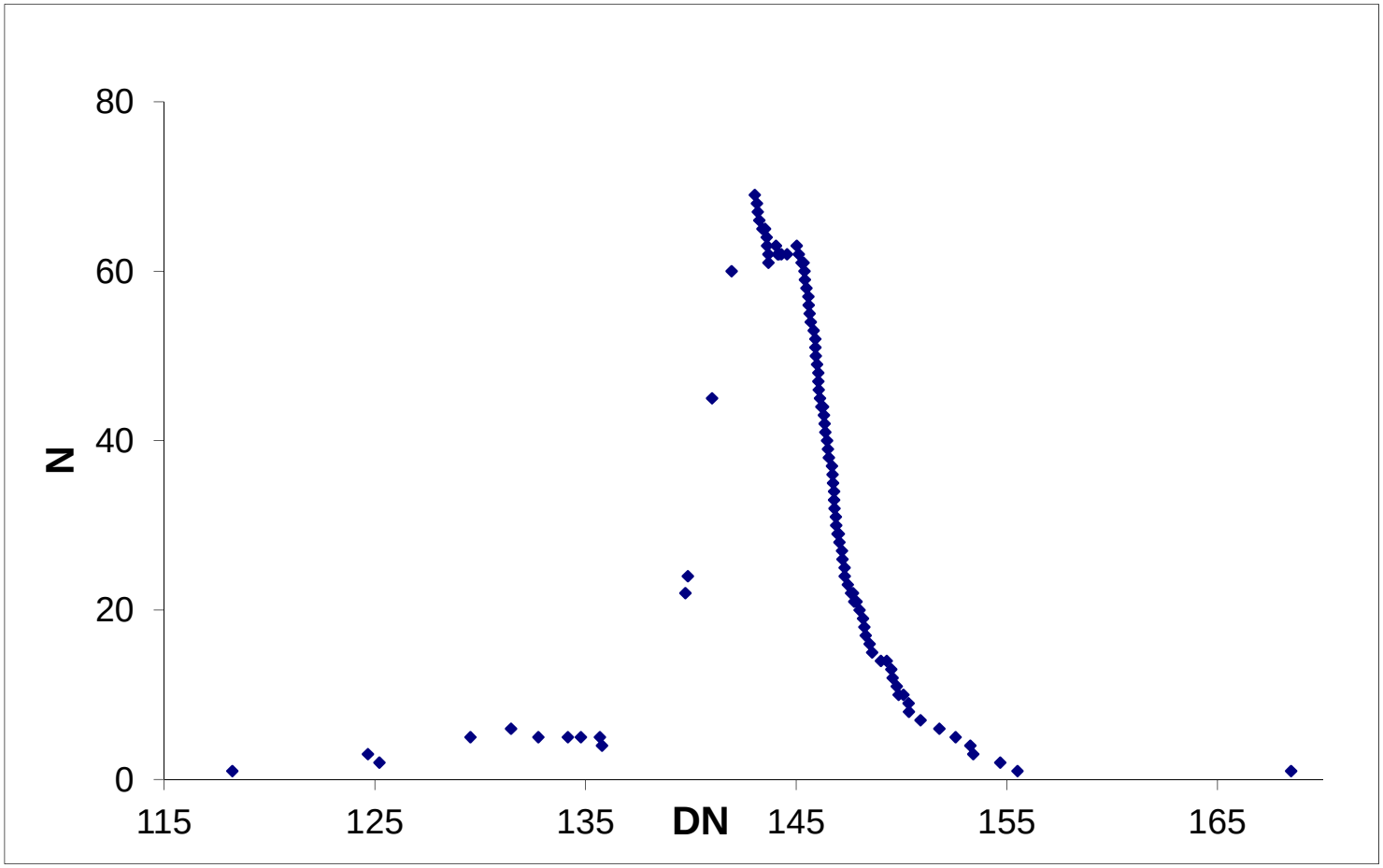
$I_c = 54^0.4; \quad \Omega_c = 351^0.9$ *(3)*

$I_c = 84^0.6; \quad \Omega_c = 106^0.3$ *(4)*

Distribution of distant nodes of Meyer comets regarding to the plane ($I_c = 84^0.7$; $\Omega_c = 106^0.0$) in the interval up to 4 a.u.



Distribution of longitudes of distant nodes (DN) of Meyer comets relative to the plane ($I_c = 84^0.7$; $\Omega_c = 106^0.0$ **)**



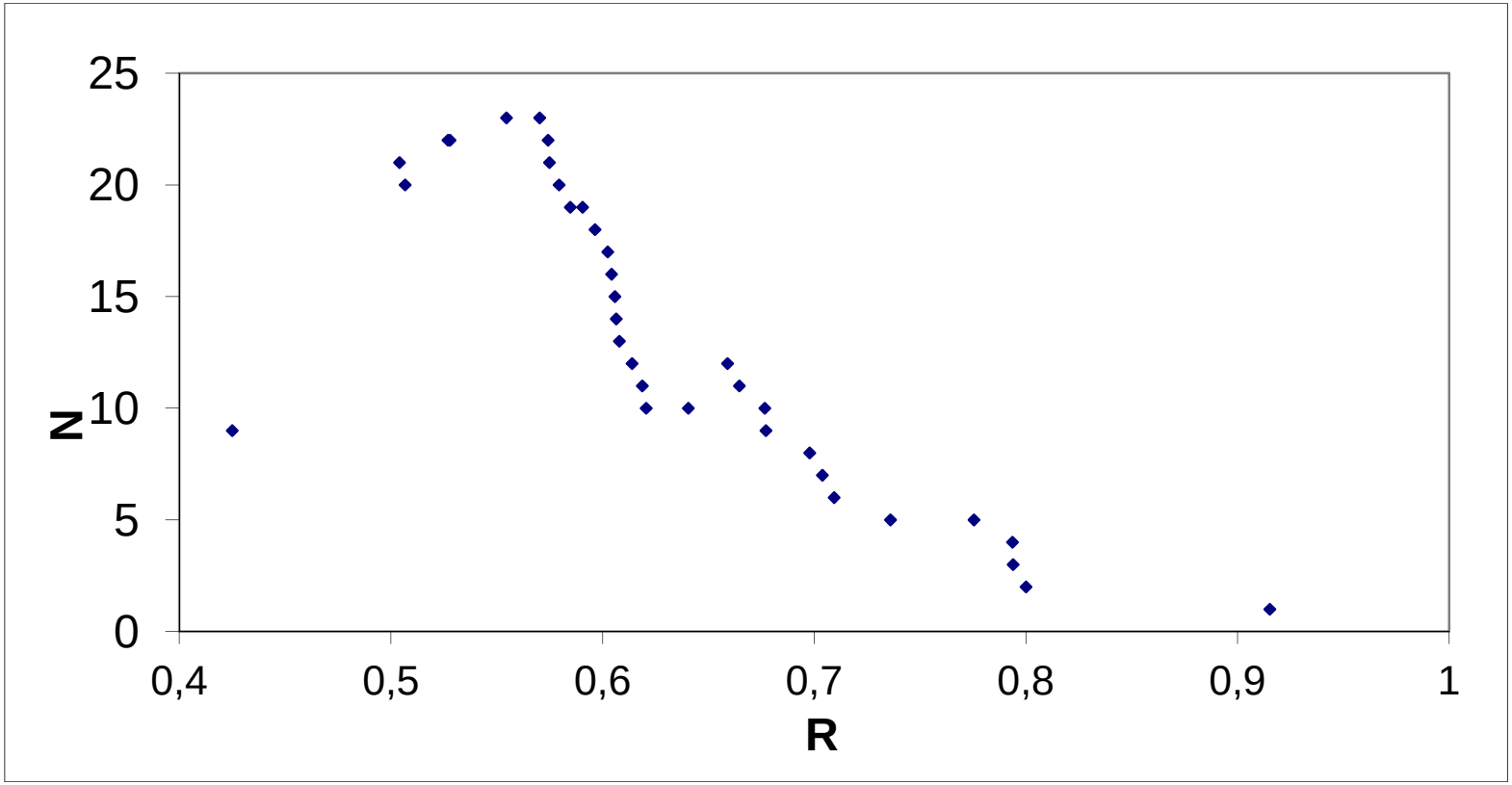
Analysis of perihelion distribution of Kracht comet group

Perihelion of Kracht comets are concentrated near two planes:

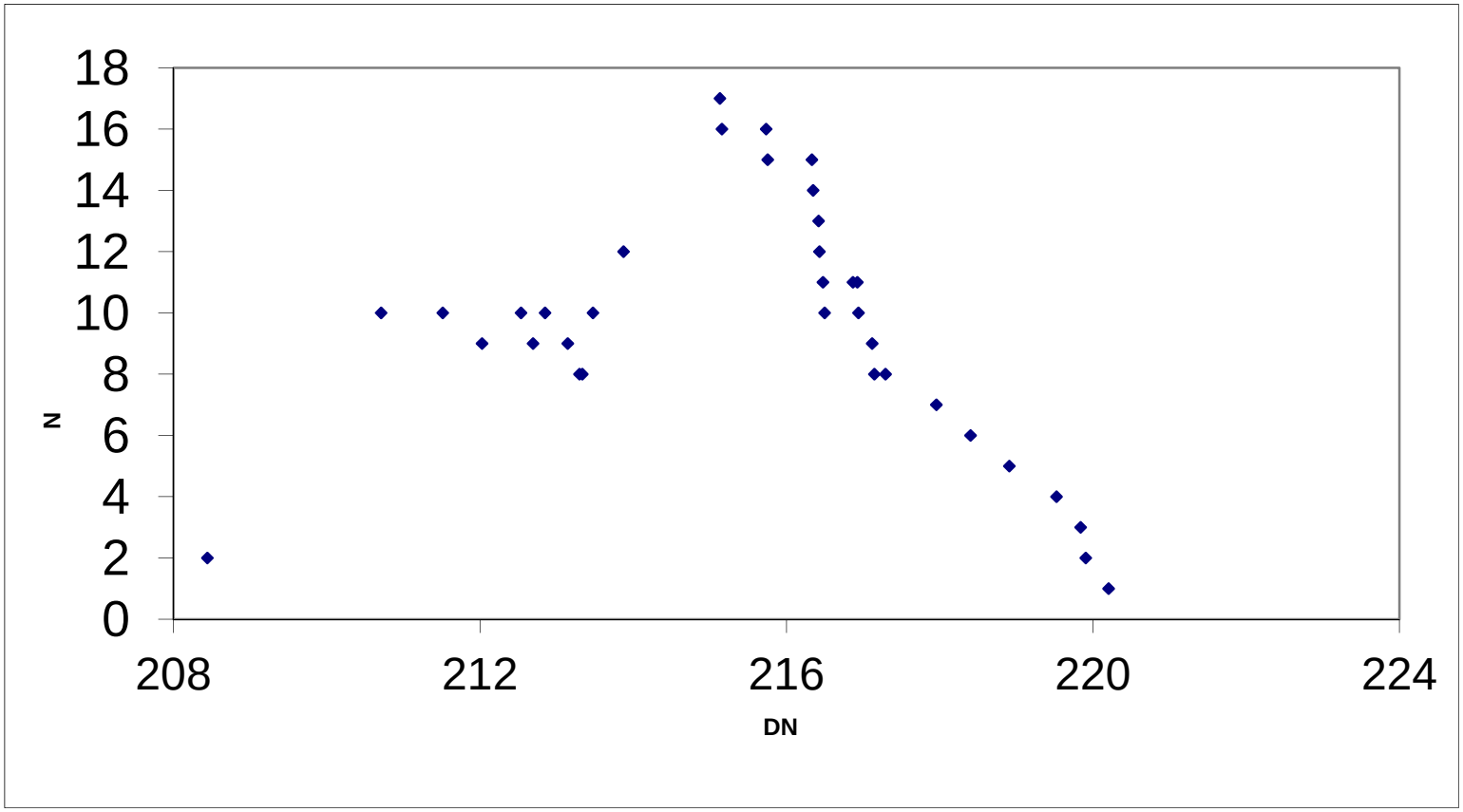
$$I_c = 24^0.08; \quad \Omega_c = 104^0.51 \qquad (5)$$

$$I_c = 15^0.18; \quad \Omega_c = 54^0.74 \qquad (6)$$

Distribution of distant nodes of Kracht comets relative to the plane ($I_c = 24^0.08; \quad \Omega_c = 104^0.51$ **)**



Distribution of distant nodes (DN) longitudes of Kracht comets regarding to the plane ($I_c = 24^0.08$; $\Omega_c = 104^0.51$ **)**



ПРОИСХОЖДЕНИЕ КОРОТКОПЕРИГЕЛИЙНЫХ КОМЕТ

А.С.Гулиев

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Detected zones on base of data of splitting comets

Zone 1:

$I_p = 76^0.34$; $\Omega_p = 267^0.15$; 1.5 a.e. ≤ r ≤2.5 a.u.

Zone 2:

$I_p = 84^0.68$; $\Omega_p = 106^0.03$; 1.5a.e. ≤ r ≤2.5 a.e.

Zone 3:

$I_p = 14^0.93$; $\Omega_p = 54^0.26$; 0.4 a.e. ≤ r ≤ 0.6 a.u.

Data of 118 split comets: source

Data of 118 split comets discovered up to 2012 have been used in our work:

- Vsekhsvyatsky S.K., Physical characteristics of comets. Moscow, Publishing company «Fizmatgiz», 575 c
- Ibadinov X.I. Disintegration of comet cores. Doctoral thesis, 1998, Moscow, SRI, RAS, 296P.
- Guliyev A.S., Nabiev Sh.A. Comets- twins. 2006, Azerbaijani Astronomical Journal, № 1-2, pp.5-9.
- Boehnhardt H. Comet splitting – observations and model scenarios. Earths, Moon, Planets. 2005, 89, pp.91-115.
- Marsden B.G. and Williams G.V., 2008, Catalogue of Cometary Orbits, 17 th edition. SAO, Cambridge
- MPEC sirculars: 2008-2012

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Distribution of parameters of splitting comets in three zones

- We have calculated the numbers of distant nodes for all 118 comets relative to the selected plane and have found number of nodes (N) corresponding to the selected interval from in zones 1-3. We have also used the method of testing to demonstrate of excessiveness of N.

Testing of splitting comet data

	Ω											
I	**0**	**30**	**60**	**90**	**120**	**150**	**180**	**210**	**240**	**270**	**300**	**330**
0												
9,59												
19,47												
30												
41,81												
56,44												
90												

Testing of splitting comet data

- Data of 67 comparison planes have been used the next stage of calculations. On the base of calculating data we have determined following parameters: n - midrange value of distant nodes on other 67 planes; σ - rms deviation; t - normalized difference (t = (N –n)/σ) and α - confidential probability of t.

Testing for the zone 1

Zone 1 - distant nodes:
N=20; n=14.4478; σ =3.87; t = 1.43; α = 0.85.

Zone 1 - nearest nodes:
N=29; n=22.63; σ =3.54; t = 2.36; α = 0.99.

Testing for Zone 2

Zone 2 - distant nodes:
N=15; n=11.36; σ =3.02; t=1.21; α = 0.75.

Zone 2 - nearest nodes
N=40; n=34.72; σ = 2.71; t=1.95; α = 0.97

Testing for zone 3

Zone 3 - nearest nodes

N=9; n=5.64; σ =1.49; t=2.24; α = 0.99.

Zone 3 - distant nodes

N=3; n=0.49; σ = 0.75; t=3.36; α = 0.99

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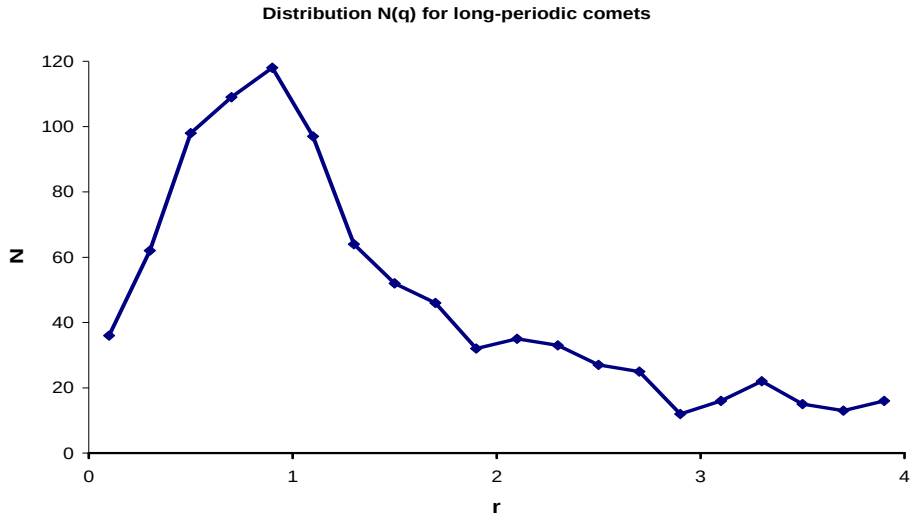
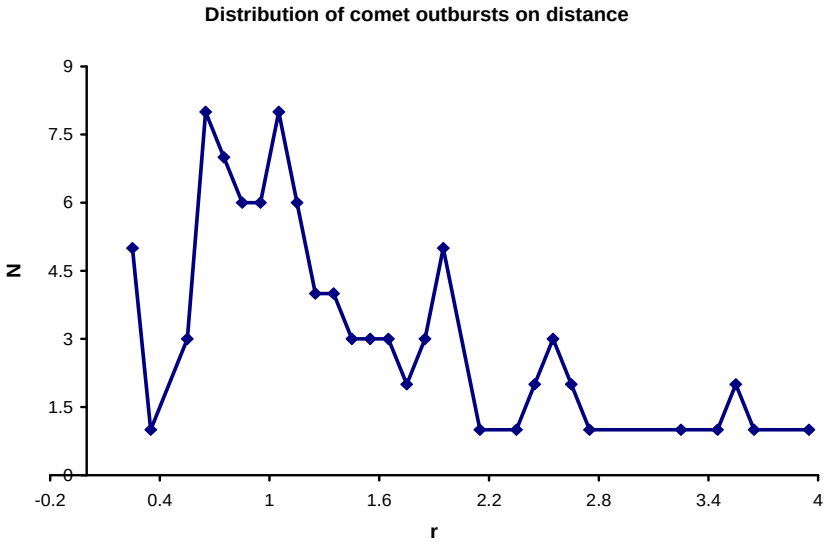
Comet outbursts

One of consequence from considered mechanism might be the following: in zones 1,2 and 3 number of comet outbursts have to be more than in other ones. For checking of this consequence we have compared the distribution of q and r (distant where comet outbursts have been observed).

Comet outbursts

If outbursts happen only due to solar radiation influence (consequently they happen in perihelion zones), two distributions have to be very similar. If there are other reasons, not connected to the Sun, these distributions must be different. For checking of described above consequence we have made the list of comet outbursts at the beginning of calculations. The list contains 131 cases of comet outbursts. Outbursts of some comets are found by us when plotting light curves of 40 comets discovered after 1990.


Distribution N(q) for long-periodic comets
120
100
80
60
40
20
0
N
0
1
2
3
4
r


Distribution of comet outbursts on distance
9
7.5
6
4.5
3
1.5
0
N
-0.2
0.4
1
1.6
2.2
2.8
3.4
4
r

Conclusions and perspective investigations

- In considered zones 1,2 and 3 numbers of distant and nearest nodes of LPC (N) have significant advantage over n
- In the considered zones 1,2 and 3 number of comet outbursts is excessive
- Results of our work show that meteor streams take party significant role in the disintegration and collapse of comet nucleus.
- Comet data and the most meteor streams have to be considered within the framework of the solved task in this work

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THANK YOU FOR ATTENTATION