Examples of 20 intergrams of data distributions (Appendix to the paper "Characterization of asymmetric distributions by intergrams instead histograms") by Ts. B. Georgiev, 2021, Bulg. Astron. J. 36

Table 1. Data about the examples and their statistics: 1 – Identification code of the example, 2 – number of the data points, 3 – number of the intergram points, 4, 5 – minimal and maximal data values, 6 – median standard deviation, 7, 8 – skewness and kurtosis of the distribution, 9, 10, 11 – gradients of the center-, width- and asymmetry- functions.

ident.	n	m	min	max	S_M	P_1	P_2	G_C	G_W	G_A
1	2	3	4	5	6	7	8	9	10	11
#00	522	387	8.58	11.64	0.06	0.63	0.01	0.03	0.11	0.33
#01	886	657	1.00	359.40	0.83	0.68	-0.07	1.18	1.20	1.49
#02	313	248	4.30	266.10	0.63	1.12	0.22	0.57	1.29	1.05
#03	645	478	1.00	303.46	0.72	0.81	-0.01	1.12	1.44	1.41
#04	394	313	31.54	415.77	0.38	1.53	0.36	0.44	0.69	1.40
#11	639	506	9.57	17.43	0.07	-0.34	0.14	-0.00	0.15	-0.23
#12	639	506	9.71	21.63	0.15	0.13	-0.11	0.07	0.25	0.63
#13	639	506	1.00	45.43	0.76	2.16	0.44	1.20	1.41	2.13
#14	639	506	7.39	277.62	0.65	1.72	0.31	0.79	1.49	1.22
#19	121	96	1.00	5.51	0.32	1.65	0.28	0.45	0.72	1.72
#20	729	577	2.34	7.79	0.13	-0.07	0.08	-0.01	0.27	-0.95
#01l	886	701	0.00	2.56	0.22	-1.18	0.17	-0.18	0.56	-1.22
#02l	313	248	0.00	2.50	0.11	-1.73	0.34	-0.15	0.37	-1.77
#03l	645	478	0.00	2.48	0.23	-0.99	0.10	-0.16	0.61	-0.88
#04L	394	313	1.75	4.55	0.16	0.26	-0.08	0.05	0.24	0.54
#13l	639	506	0.00	1.66	0.70	0.29	-0.13	0.19	-0.50	-0.04
#14l	639	506	0.87	2.44	0.22	0.10	-0.10	0.04	0.37	-0.38
#17l	76	62	18.00	24.78	0.08	0.58	-0.07	0.07	0.14	1.73
#18l	76	62	2.13	4.11	0.16	0.69	-0.07	0.15	0.29	1.39
#07l	275	218	0.07	0.50	0.41	1.06	0.10	0.33	0.84	0.88
#15l	257	204	2.25	6.09	0.12	0.97	0.19	0.06	0.26	0.40

Table 2. Comparisons between the prognostic high values for 1% of the studied population: E(CF), by the cumulative function or histogram (Georgiev, 20201) and E(IG), by the linear fit of the largest leg of the intergram (this work). 1 – identification code of the example, 2 – estimation by linear cumulative function beside logarithmic ordinate or by quadratic histogram shape in log-log coordinates, 3 – estimation by linear or quadratic fit of the large leg of the intergram (see the examples below), 4 – Note; *) – estimations by quadratic fit.

Ident.	E(CF)	E(IG)	Note
1	2	3	4
#01	414	390	Monthly Wolf number
#02	2240	2200	Weekly visiting number
#03	346	325	Six-monthly Wolf number
#04	328	330	Flux in B light
#11	*17.4	*17.2	Surf. brightness in B abs.mag
#12	*22.2	*22.6	Luminosity in B abs.mag
#13	35	36	Diameter, kpc
#14	243	242	Rotat. velocity, km/s
#13L	*63	40	log-diameter, kpc
#14L	*347	316	log-rot. velocity, km/s
#19	6.4	6.1	Body density, g/cm^3
#17L	*28.6	*25.1	Body log-mass, kg
#18L	*56 000	*17 800	Body diameter, km
#15L	631 000	525 000	Number of habitants

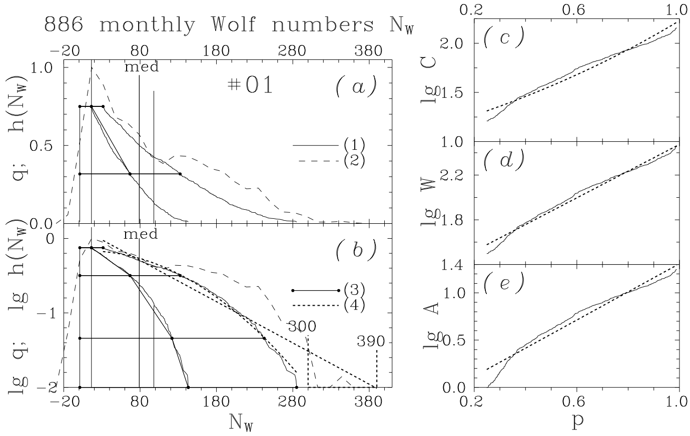

Fig. 1. Intergrams of the monthly Wolf number N_W for the solar cycles 18–24, 1944–2018 (NASA), along linear (a) and logarithmic (b) ordinate. The relevant series of this Wolf number is shown in the main text, in Fig. 1g (top). The lines show: (1) – intergrams as well as vertical markers of the mode, median an average value, (2) – histograms $h(N_W)$ and lg $h(N_W)$, (3) – intergram skeleton, (4) – fits. The prognostic high value for 1% of the population (1%PHV), is $N_W = 300 - -390$. The diagrams (c), (d) and (e) represent the intergram fictions lg $C(p)$, lg $W(p)$ and lg $A(p)$ as well as their linear fits. Fig. 1ab and 3b show clearly the deficit of high Wolf numbers. (See Eq. 1 and Figs. 1–3 in the main text).

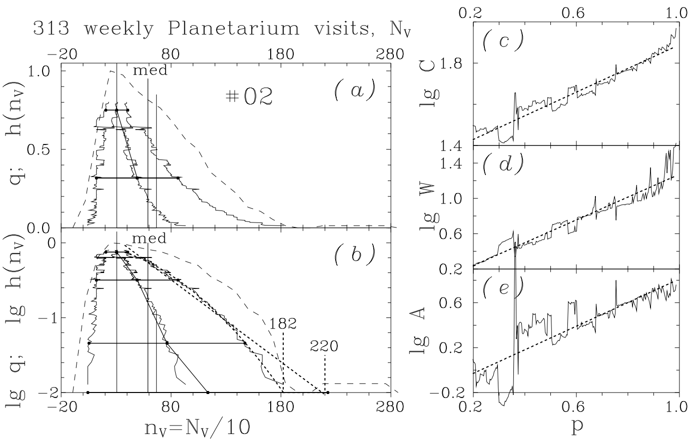

Fig. 2. Weekly visiting numbers N_V of the Smolyan Planetarium for 6 years, 2013–2018. The value $n_V = N_V/10$ is used here. The series of the visiting numbers is shown in the main text, in Fig. 1g (bottom). Here 1%PHV is $N_V = 1820 - -2200$ (See for details Fig. 1, here.)

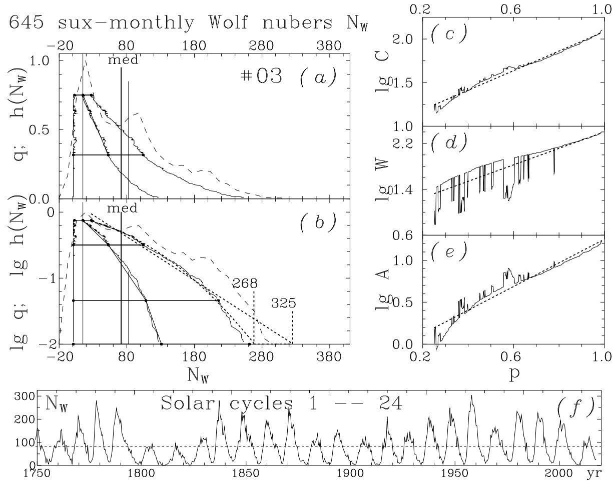

Fig. 3. Wolf numbers N_W averaged by 6 months for the years 1749-2018 for all cycles 1–24 (NASA). The series of this Wolf number is shown in the diagram (*f*). Here 1%PHV of the Wolf number is 268 –325, while in #01, in Fig. 1, due to the higher resolution 1%PHV of the Wolf number is 300 – 390. The deficit of high Wolf numbers is higher. (See Fig. 1.)

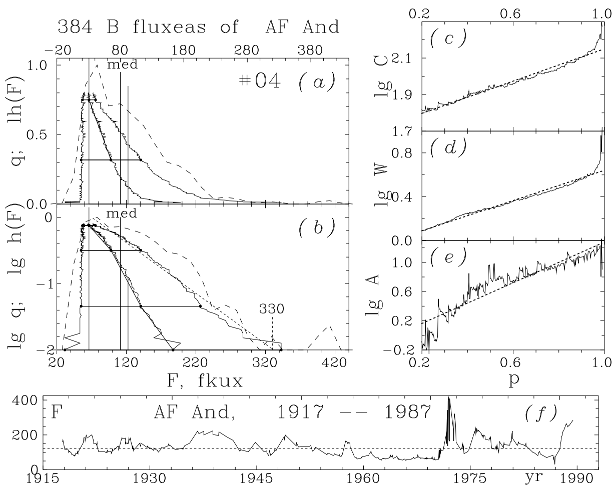

Fig. 4. B-flux of the LBV AF And in 72 years, 1917–1989 (Ganchev et al., 2017). The series of the flux is shown in the diagram (*f*). The transfer from magnitudes to fluxes is realized like for Fig. 3 in the main text. The positive tail of the diagram 4*b* shows the excess of high fluxes, due to the eruption in 1970–1980. (See for details Fig. 1.)

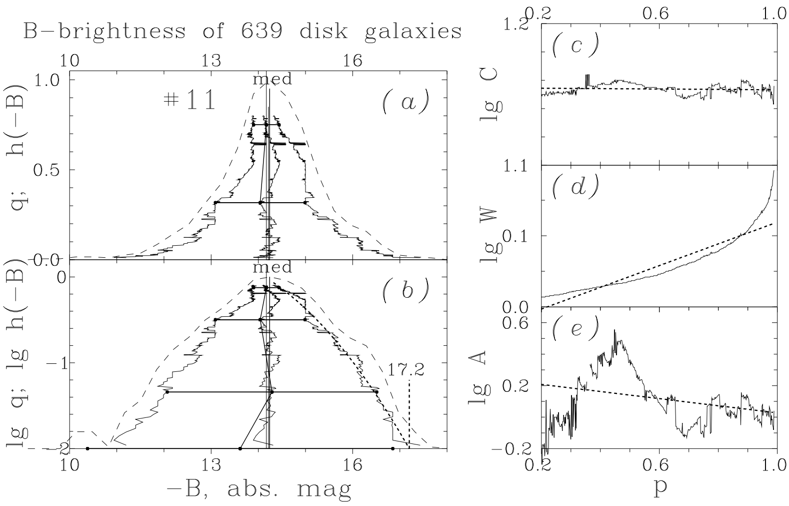

Fig. 5. Mean surface brightness of disk (starforming) galaxies in B abs.mag/kpc^2. The galaxies have morphological types Sab–Ir, inclination angle 30^o–85^o and distance up to 16 Mpc. (HyperLEDA.) The value $-B$ is used to ensure larger numbers for higher brightnesses. Here 1%PHV is $B = -17.2$ abs.mag/kpc^2.(See also the main text.)

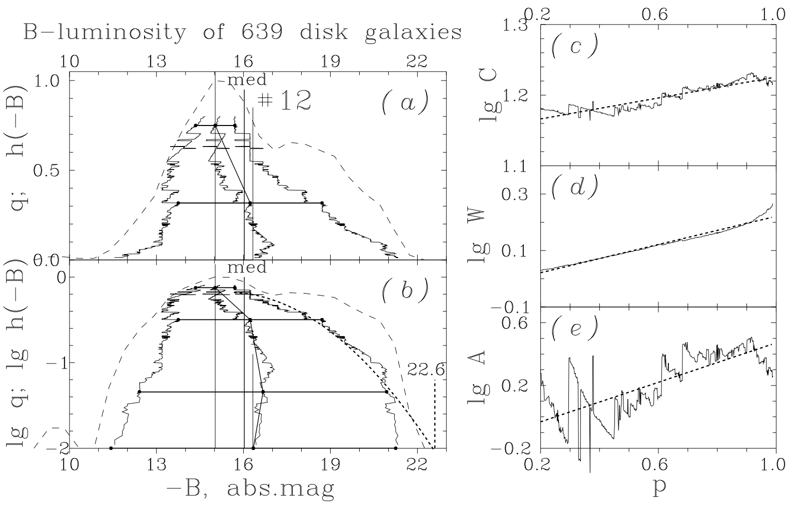

Fig. 6. Total B abs.mag of disk galaxies. The value $-B$ is used to ensure larger numbers for higher luminosities. Here 1%PHV is $B = -22.6$ abs.mag. The largest leg of the intergram, as well as in #11, follows quadratic shape. It seems the most luminous galaxies are absent. (See Fig. 5.)

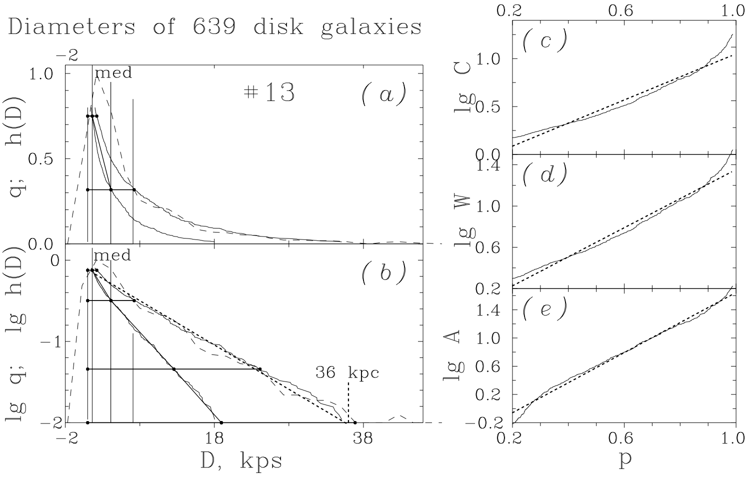

Fig. 7. Diameters D in kpc of 639 disk galaxies. Note the long linear shape of the largest leg of the intergram in (*b*). Here 1%PHV is $D = 36$ kpc, but a few galaxies are larger. (See Fig. 5.)

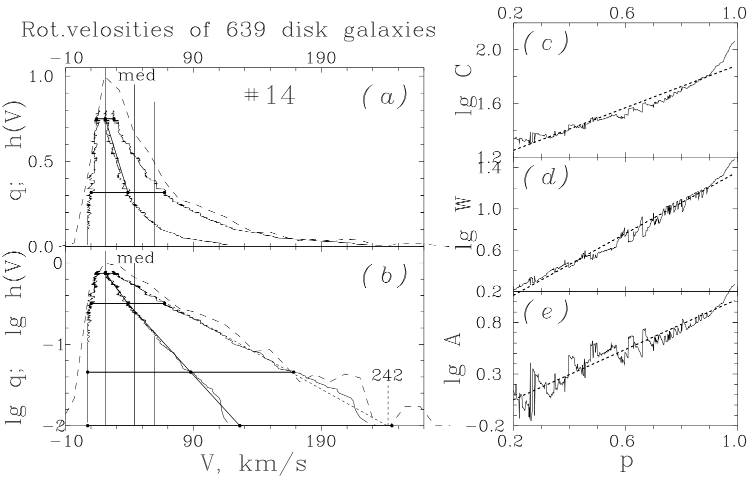

Fig. 8. Amplitudes V in km/s of the rotation velocities of 639 disk galaxies. Note the long linear top leg in (*b*). Here 1%PHV is $V = 242$ km/s but a few galaxies rotate faster. (See Fig. 5.)

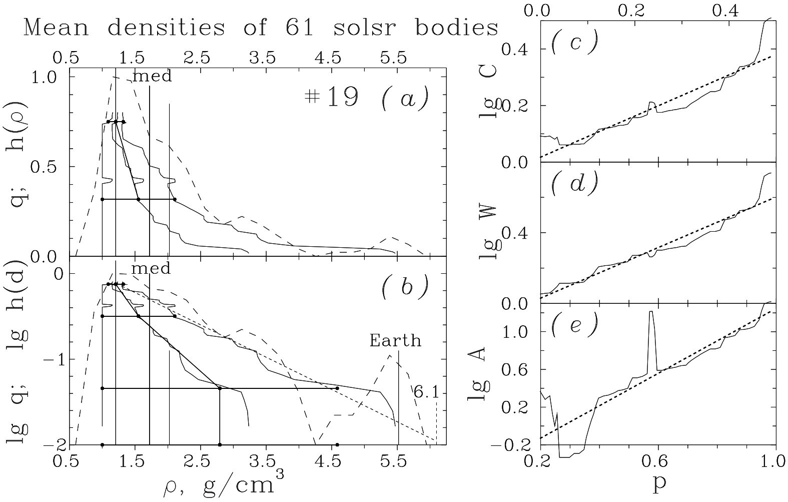

Fig. 9. Mean density ρ in g/cm^3 of solar bodies larger than 130 km and more dense than 0.8 g/cm^3 (data by NASA). Note the broken top leg and the broken skeleton in (*b*). Here 1%PHV is $\rho = 6.1$ g/cm^3 while for the Earth $\rho = 5.5$ g/cm^3. In this case the quadratic fit occurs concave and useless.

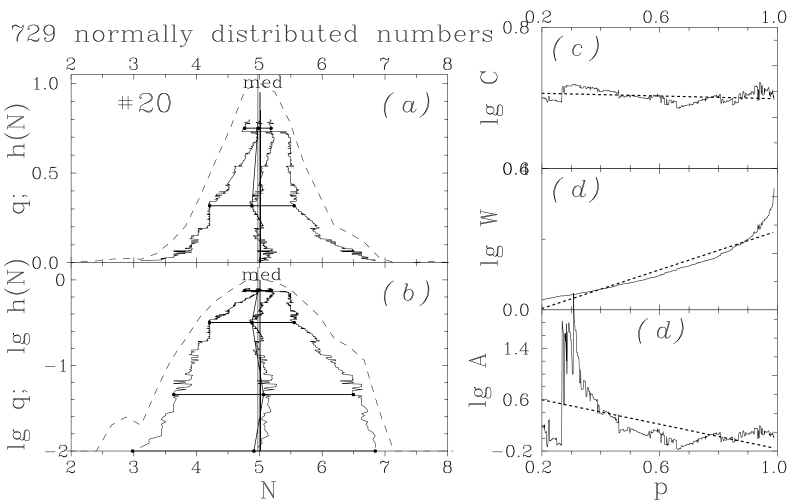

Fig. 10. Simulated random numbers with normal distribution. Classic algorithm, described by Forsyte et al. (1977) and translated by the authors from FORTRAN to C language, is applied. Note the complicated behaviour of the asymmetry in the simulated normal distribution and the negative tail.

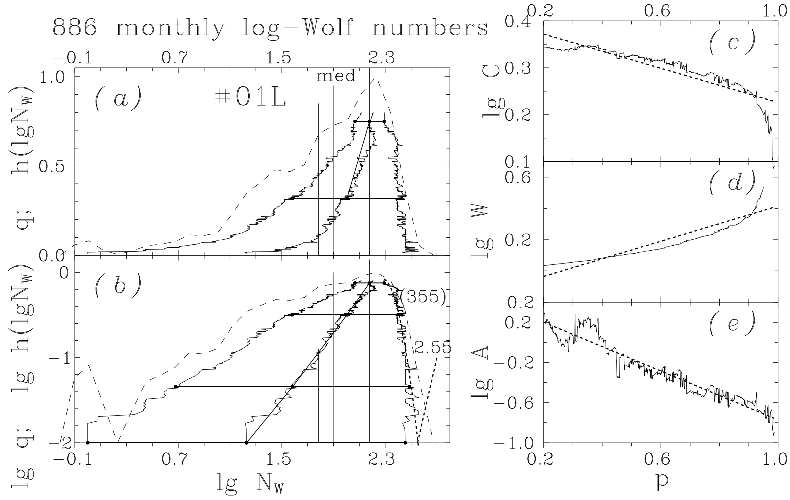

Fig. 11. Logarithm of the monthly Wolf number, lg N_W. (See Fig. 1.) Here 1%PHV is lg $N_W \approx 2.55$ or $N_W \approx 400$.

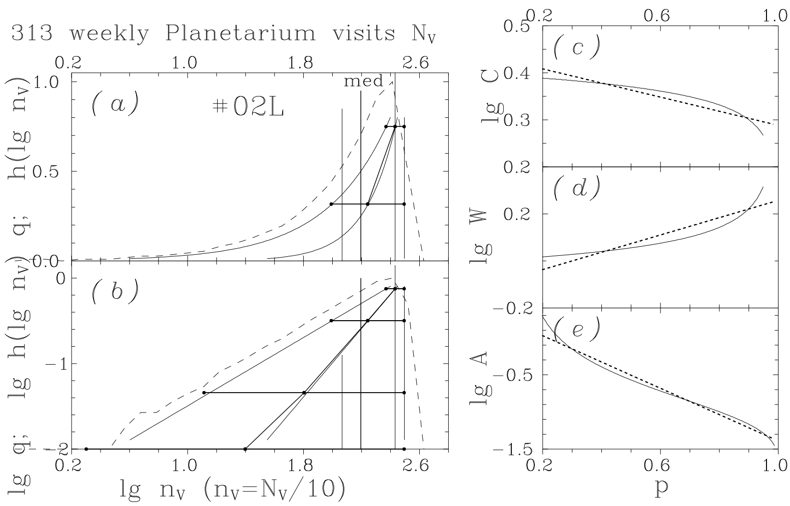

Fig. 12. Logarithm of the weekly visiting number of the Planetarium, lg N_V. (See Fig. 2.) Here 1%PHV is lg $n_v = 2.5$ or $N_V = 3200$.

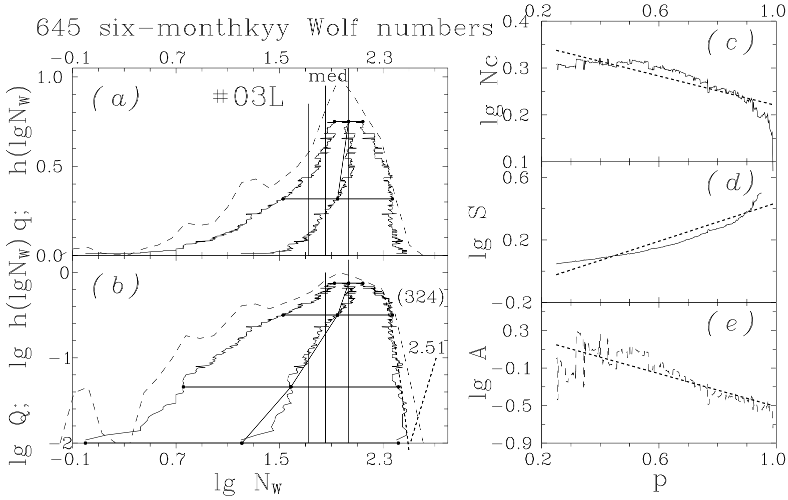

Fig. 13. Logarithm of the Wolf numbers, lg N_W, of all observed solar cycles, averaged by 6 months. (See Fig. 3.) Here again 1%PHV is $N_W \approx 400$.

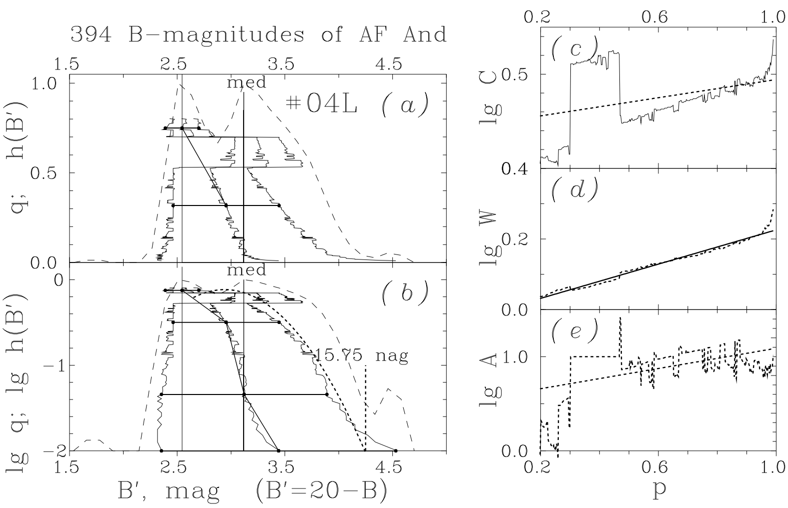

Fig. 14. B magnitudes of the LBV AF And. Mode, median and average magnitudes are 16.4 mag, 16.25 mag and 16.11 mag, respectively. The positive asymmetry and bimodallity of the distribution is due to the eruptions in 1970–1980. (See Fig. 4.) Here 1%PHV is 15.75 mag.

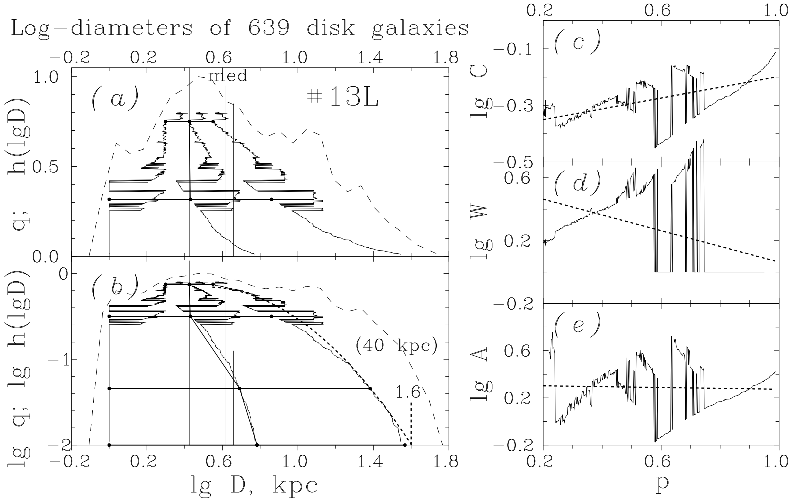

Fig. 15. Log-diameters lg D in kpc of 639 disk galaxies. Note the bad intergram due to the multimodal data distribution. The largest leg of the intergram follows quadratic shape with 1% PHV 40 kpc. (See Fig. 5.)

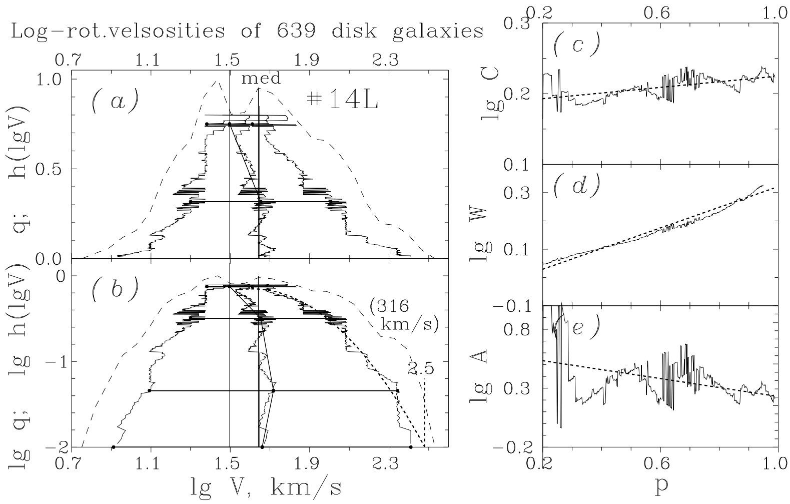

Fig. 16. Log-amplitudes of the rotation velocities lg V of 639 disk galaxies. Note the bad intergram due to the multimodal data distribution.The largest leg of the intergram follows quadratic shape with 1% PHV 316 km/s. (See Fig. 5.)

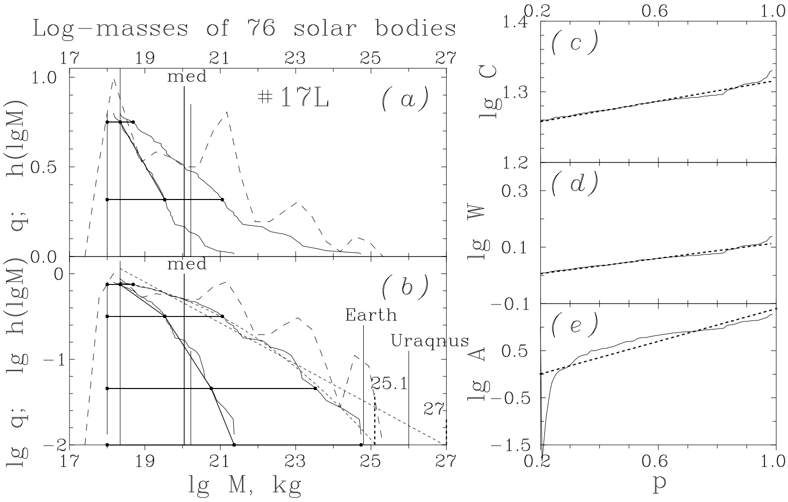

Fig. 17. Log-masses of bodies in the Solar System without the Sun and the giant planets. Here 1%PHV is lg M = 25.1 − 27 , while the Earth, Uranus and Jupiter have has 24.8, 26 and 27.3, respectively. In Paper 1/2, Fig. 15, with participants of the giant planets, the prognosis is very high, 28.7 – 28.6.

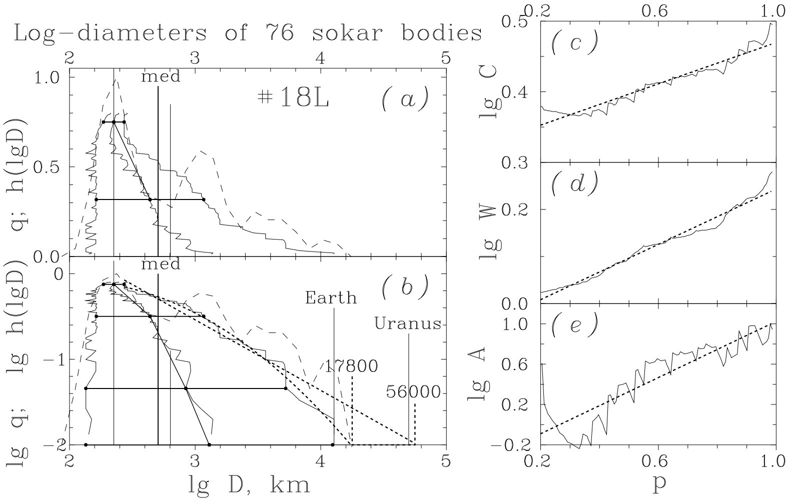

Fig. 18. Log-diameters of bodies in the Solar System without the Sun and the giant planets. Here 1%PHV is D = 17800 − 56000 km, while the diameters of the Earth and Uranus are 12 756 and 51 118 km. In Paper 1/2, Fig. 16, by the CPF and the histograms it is 100 000 – 32 000 km.

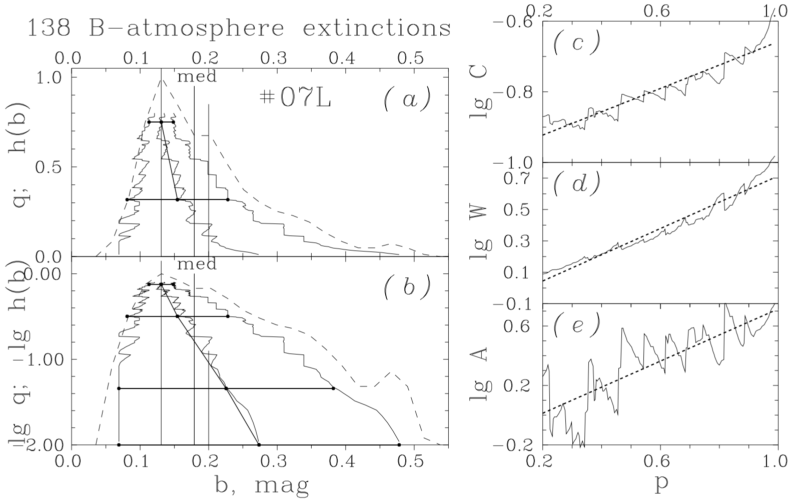

Fig. 19. Atmosphere extinction in B light over the Rozhen Observatory in the beginning of 21-th century (Dimitrov, 2007). The mode is 0.13 mag. The typical photometric error is 0.004 mag.

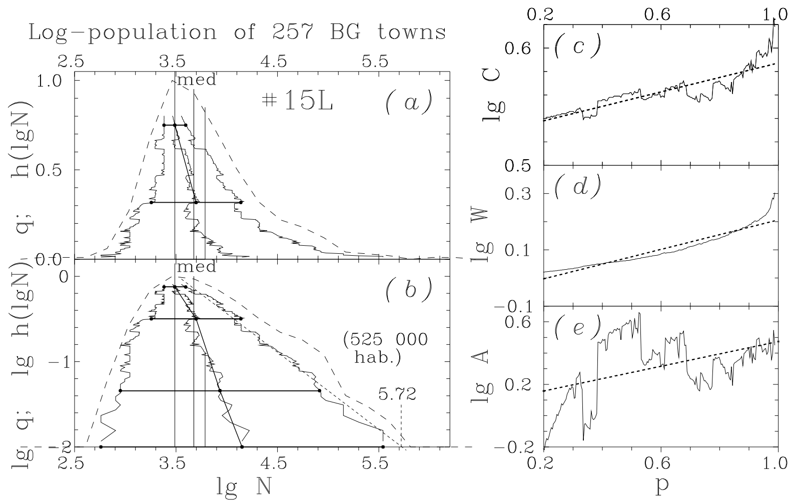

Fig. 20. Log-inhabitants in all 257 BG towns in the end of 2019. Here 1%PHV is 525 000 habitants, while in Paper 1/2 the result is 631 000 - 251 000.

References

Dimitrov, D., 2009, Private communication
Forsyte, G., Malkom, M., Mollar C., 1977, *Computer Methods for Mathematical computations*, Prentione-Hill, Inc.
Gantchev, G., Valcheva, A., Nedialkov, P., Ovcharov, E. 2017, Bulg. Astron. J., 26, 16
Georgiev, T. 2121, Publ. Astron. Soc. Bulgaria., 1 & 2, http://astro.shu-bg.net/pasb/index_files/page0001.htm