Institute of Solar-Terrestrial Physics
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Optical instability of an earth atmosphere

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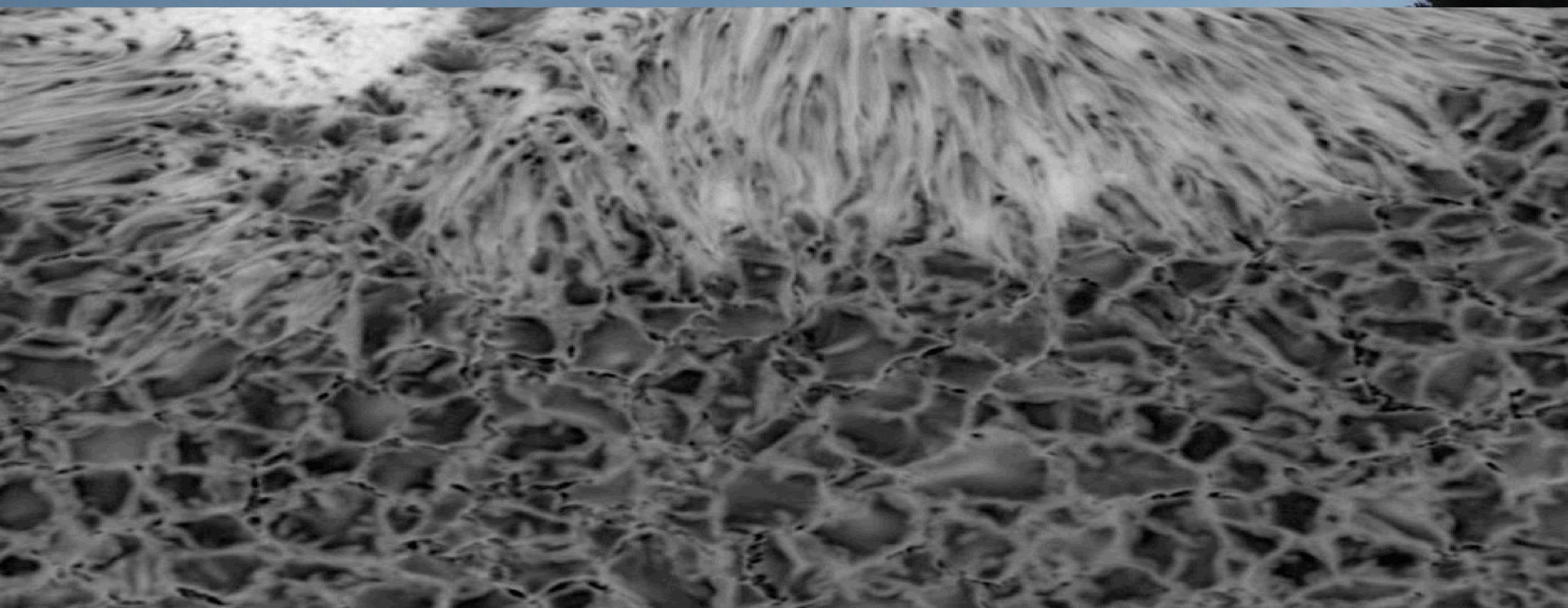
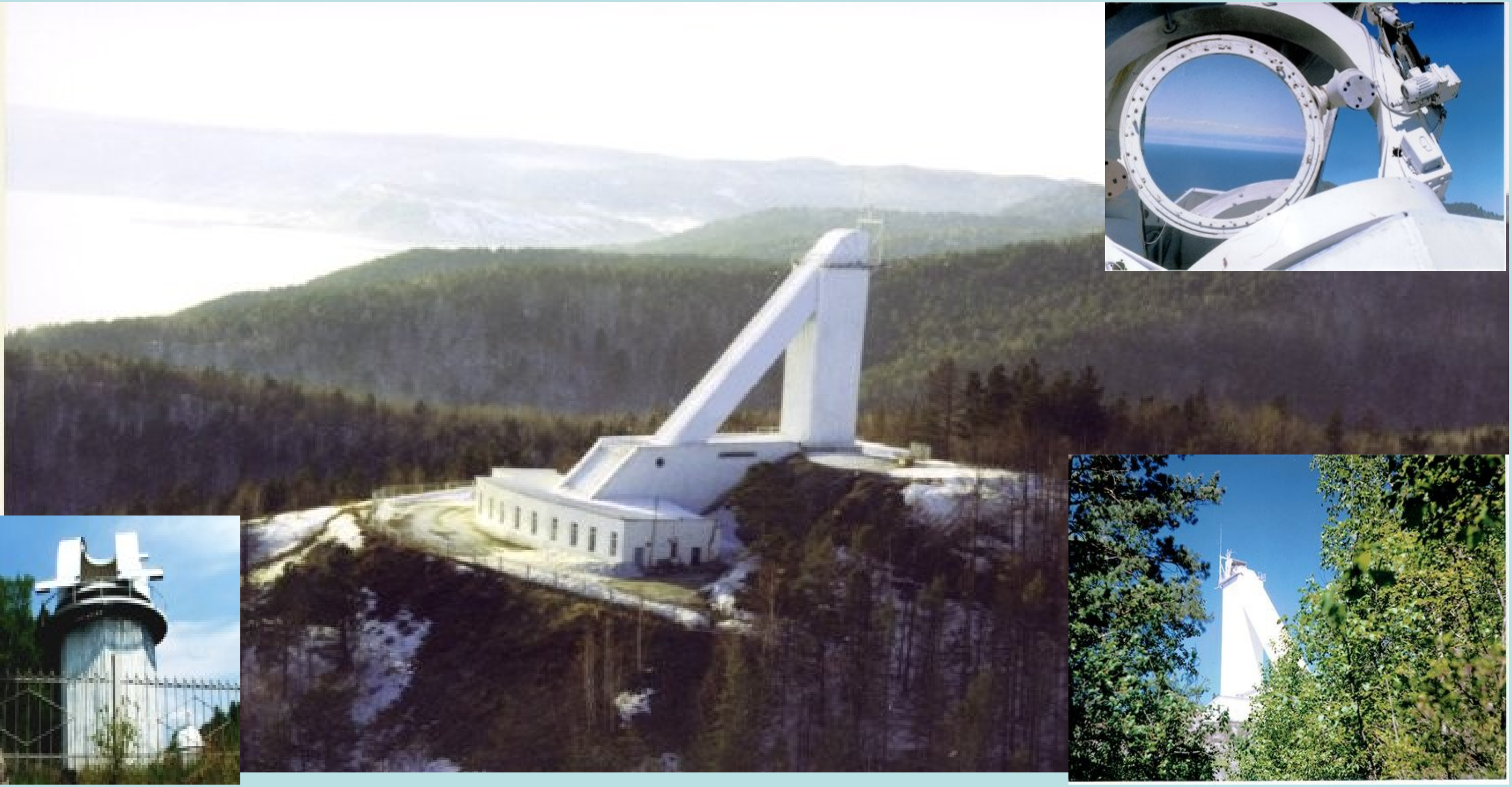


The Baikal Astrophysical Observatory (BAO) on the south shore of Lake Baikal, 70 km far from Irkutsk.
BAO is noted for its remarkable astroclimatic regime due to an antihunt action of big water area and local anticyclon upon air environment.

Main instrument at Baikal observatory - the Large Solar Vacuum Telescope (LSVT), intended for studies of fine structure of solar atmosphere.



LSVT consists of siderostat, installed on the height of 25m from the ground, lens objective 760mm and focal length of 40m, vacuum tube. Spatial resolution of the telescope is 0,2“. Spectrograph, spectral resolution of 0.007 angstrom. The CCD camera with 1024x1024

Sayan Solar Observatory is located in the mountains at 2000m altitude.

This is due to the specific character of the observatory's main objectives which require very good seeing for polarization observations and solar corona observations.

Main objectives: Measurements of solar magnetic fields;

Spectral observations of solar active features and dynamic processes in the solar atmosphere.

Fig.1. Сезонные изменения качества изображения и интегральных значений дисперсии показателя преломления

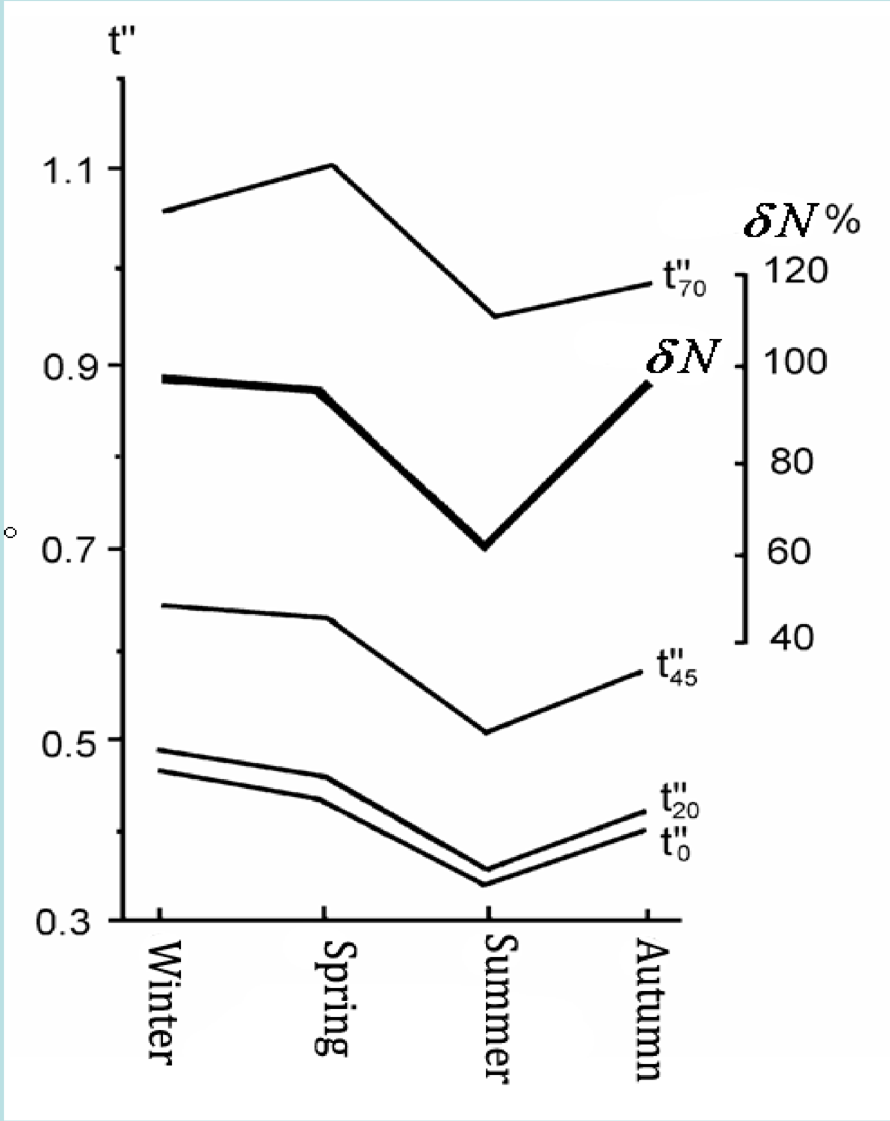


Fig.2. Distribution $(\partial N_R - \partial N_i) \cdot 100\%$ *(Winter, 850 hPa)*

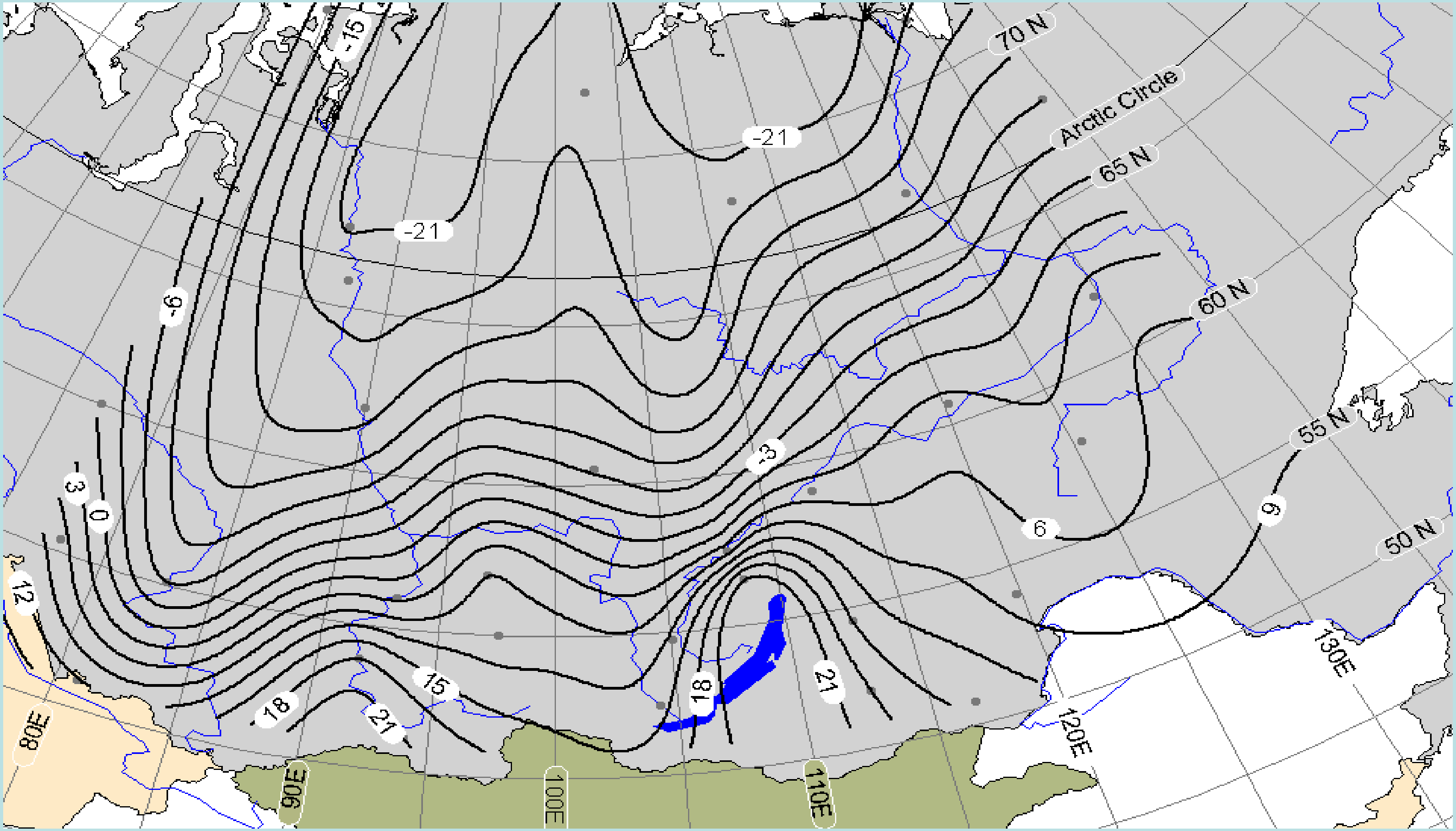


Fig.3. Distribution of δN 1950 – 2009, january, 700 hPa

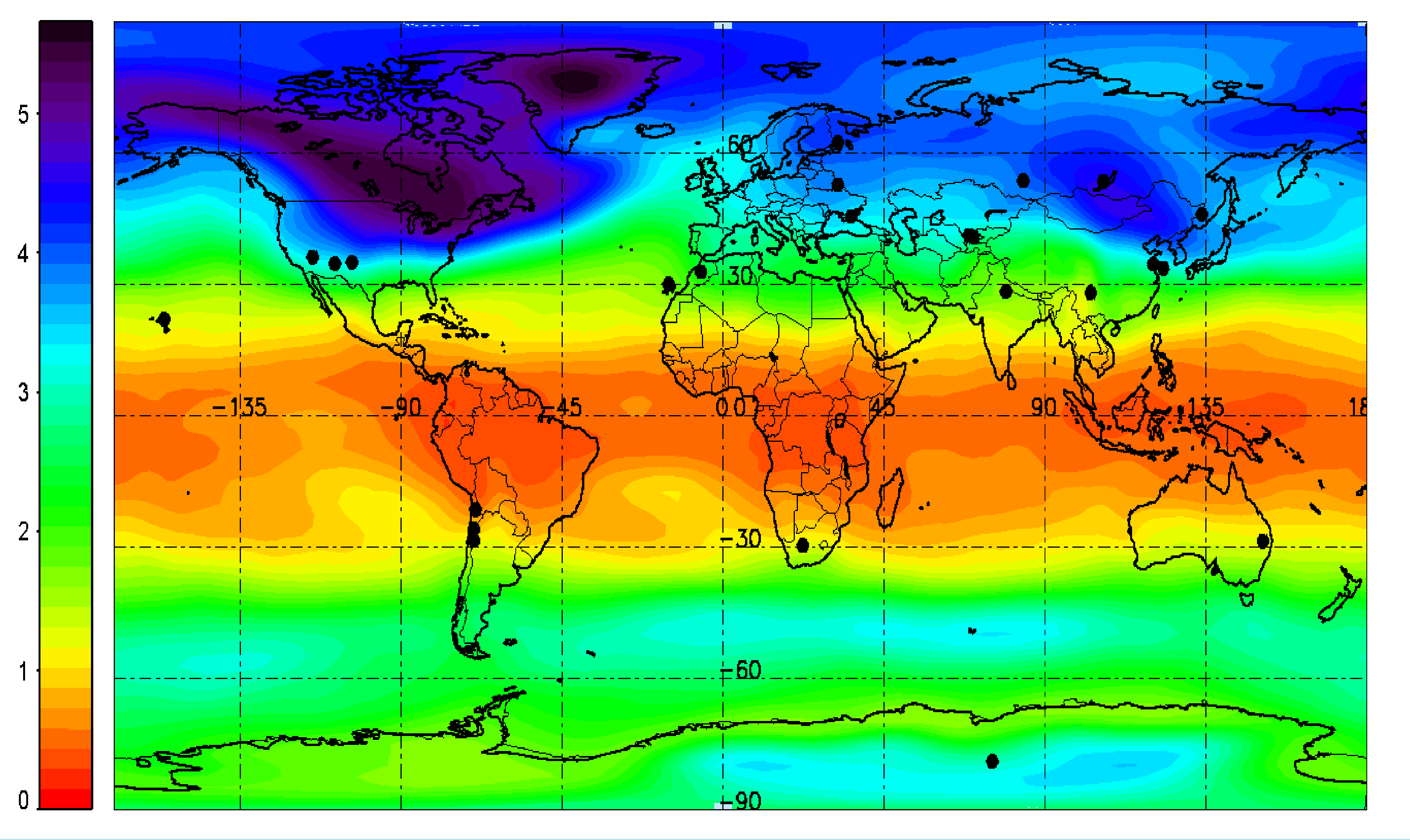


Fig.4. Distribution of δN 1950 – 2009, july, 700 hPa

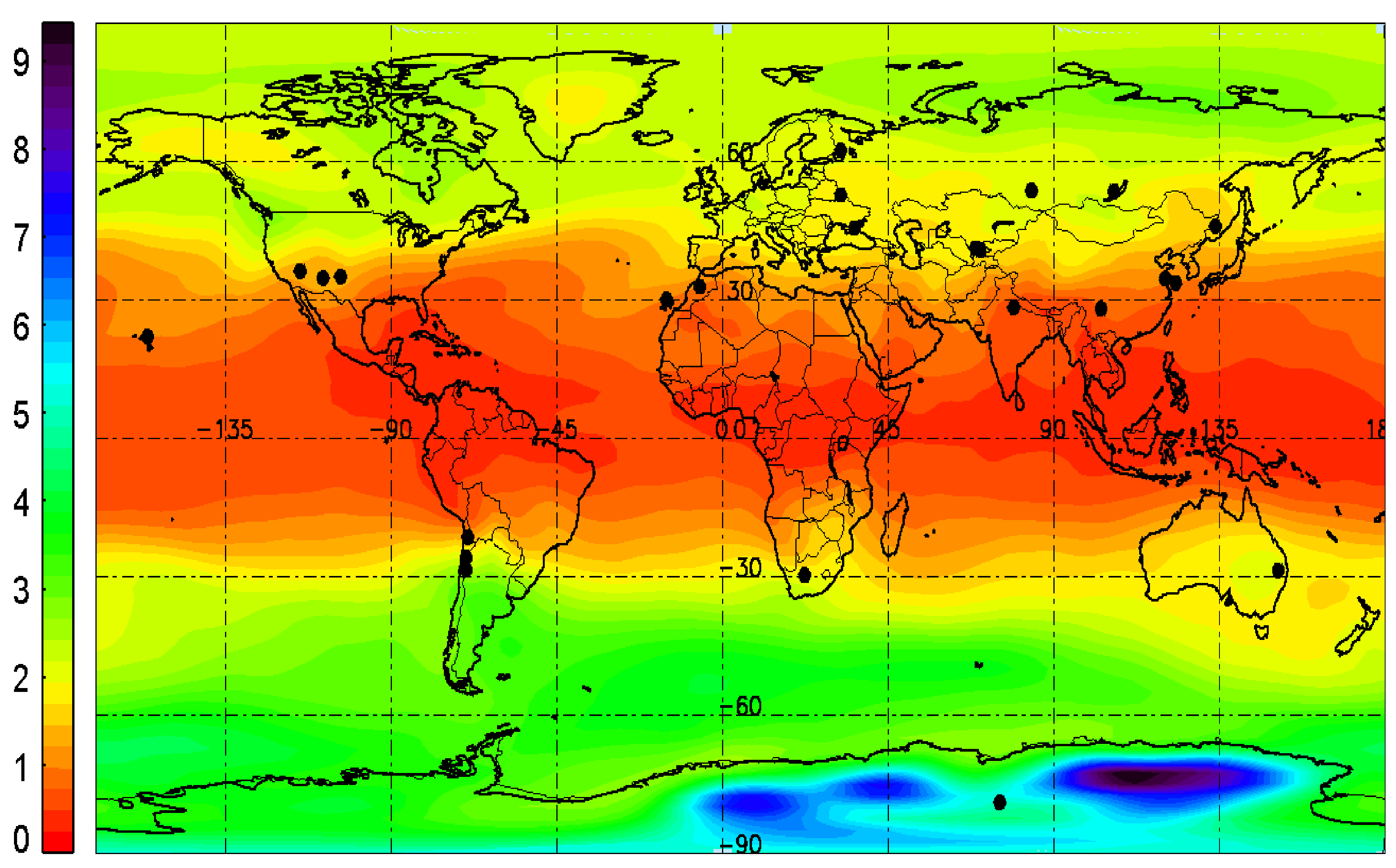
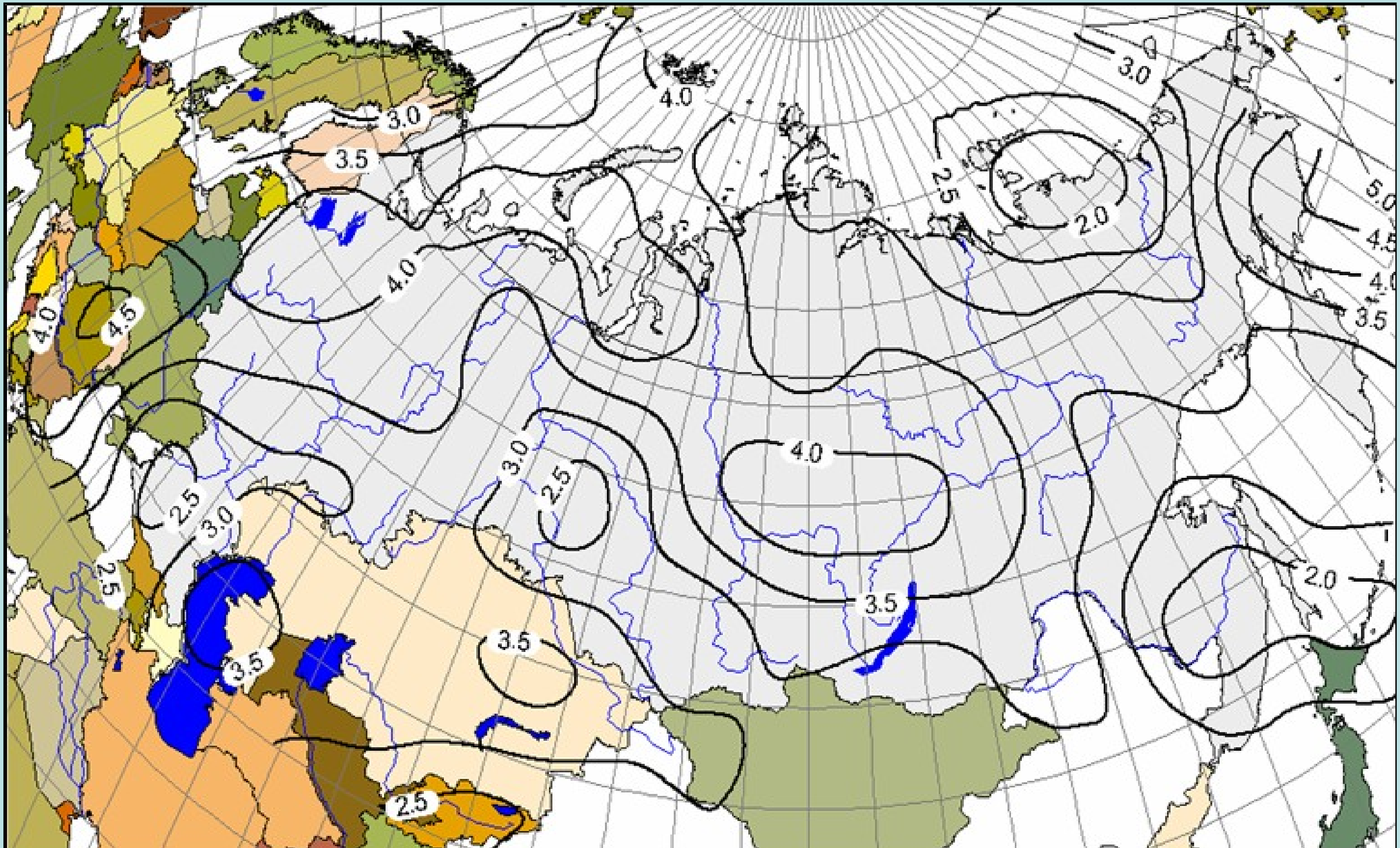


Fig.5. Distribution of δN ,700 hPa, 1991 – 2009 (annual variations)



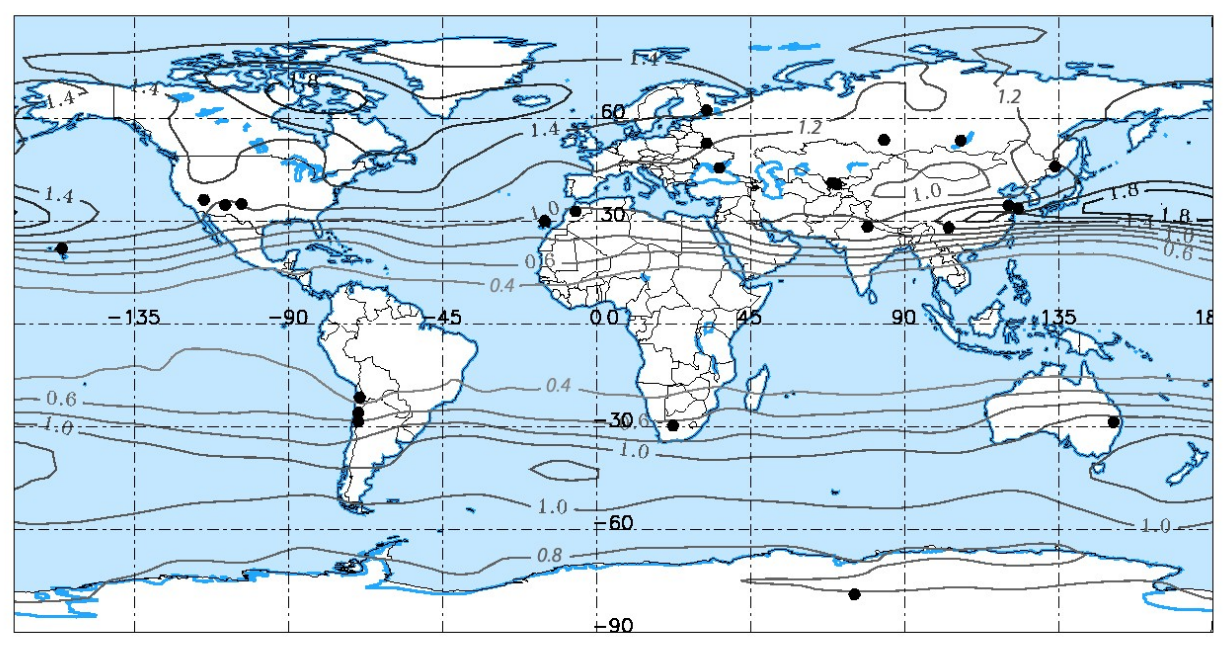
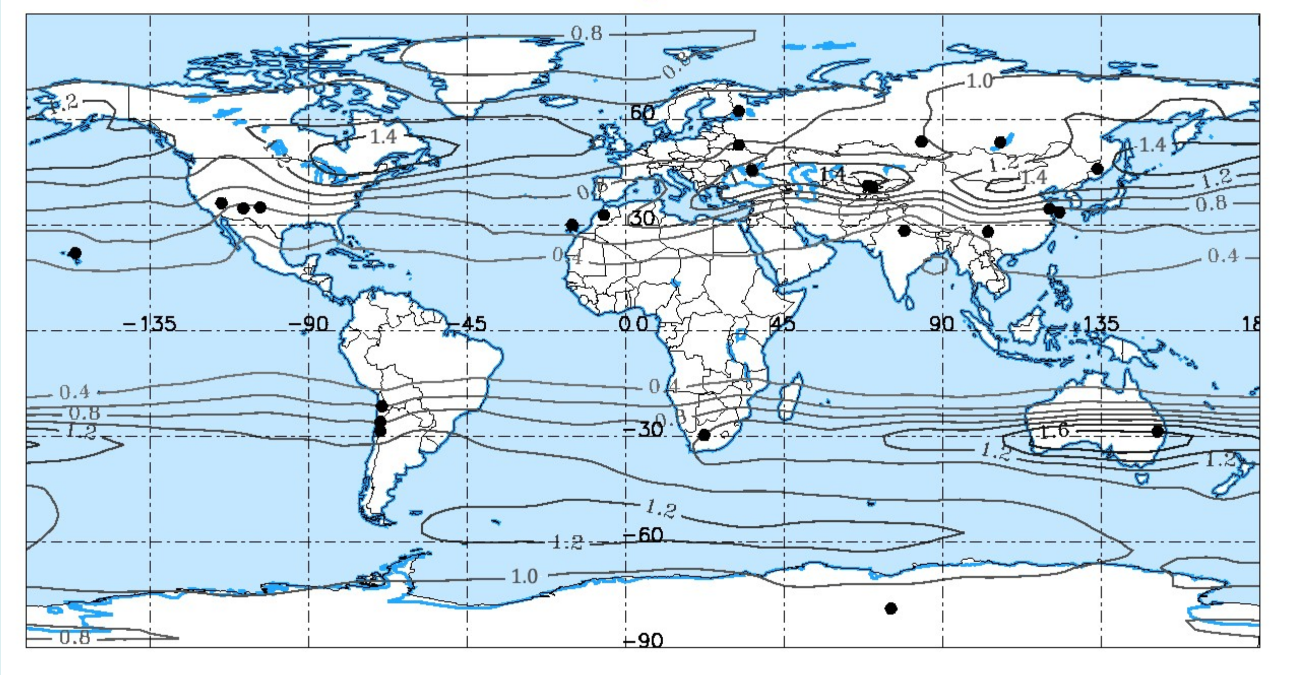


Fig.6. Distribution of δN
1950 – 2009, january,
300 hPa

Fig.7. Distribution of δN
1950 – 2009, july
300 hPa



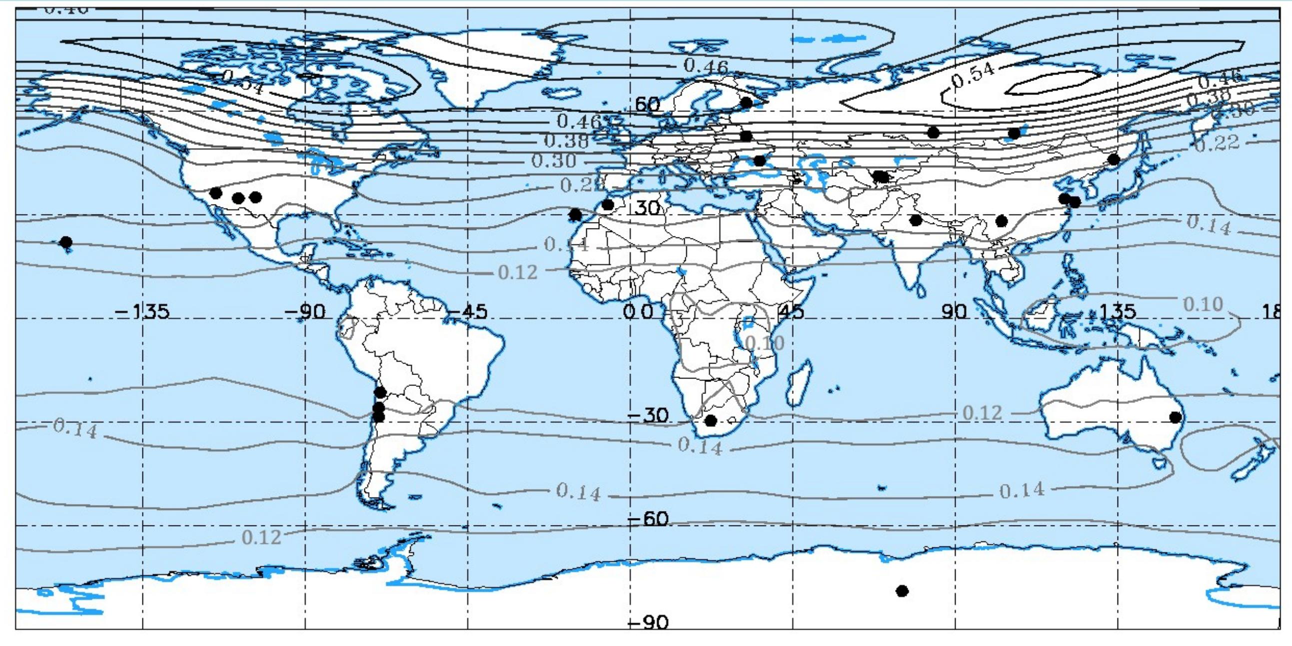


Fig.8. Distribution of δN 1950 – 2009, january, 50 hPa

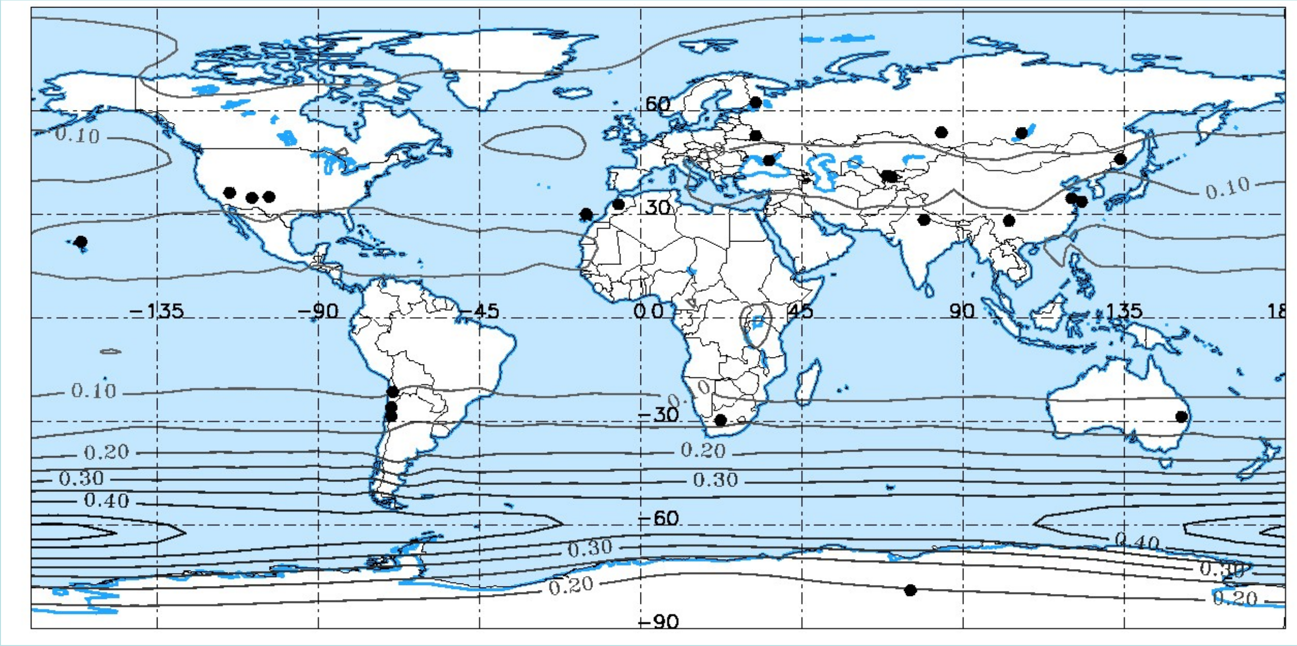


Fig.9. Distribution of δN 1950 – 2009, july, 50 hPa

Observatory	Geographic coordinates; altitude above sea level (m)	January									July								
		1000 mb (~ 0 км)	850 mb (~ 1.5 км)	700 mb (~ 3 км)	500 mb (~ 5 км)	300 mb (~ 9 км)	200 mb (~ 12 км)	100 mb (~ 16 км)	50 mb (~ 20 км)	Mean	1000 mb (~ 0 км)	850 mb (~ 1.5 км)	700 mb (~ 3 км)	500 mb (~ 5 км)	300 mb (~ 9 км)	200 mb (~ 12 км)	100 mb (~ 16 км)	50 mb (~ 20 км)	Mean
1. Mauna Kea (Hawaii)	19° 49' N, 155° 28' W; **4205**	**0.78**	1.20	1.22	1.15	0.93	0.64	0.45	0.13	0.81	**0.40**	0.85	0.91	0.73	0.46	0.29	0.36	**0.05**	0.51
2. CTIO Cerro Tololo Inter-American Obs. (Chili)	29° 15′ S, 70° 44′ W; **2215**	0.98	1.61	1.08	0.85	0.57	0.43	0.35	0.10	0.75	1.97	2.64	2.40	1.56	0.85	0.76	0.45	0.12	1.34
3. ESO (VLT) Cerro Paranal (Chili)	24° 37′ S, 70° 24′ W; **2635**	1.01	**1.02**	**0.86**	**0.66**	**0.46**	**0.31**	0.28	0.09	**0.59**	2.26	2.27	1.95	1.22	0.75	0.57	0.40	0.11	1.19
4. ESO La Silla Obs.(Chili)	29° 05′ S, 70° 44′ W; **2400**	2.16	2.96	1.75	1.36	0.97	1.03	0.48	0.20	1.36	0.60	0.71	0.57	0.58	0.53	0.37	0.32	0.06	0.47
5. La palma Obs. (Canary Islands)	28°40′ N, 17°52′ W; **2400**	2.64	3.48	3.58	**3.30**	**1.63**	**1.88**	**0.81**	0.51	2.23	1.00	2.19	2.16	1.90	1.14	1.48	0.29	0.08	1.28
6. NLST (Indian Astronomical Observatory)	34°08′ N, 77°33′ E; **4517**	**9.06**	**5.22**	4.04	2.87	1.19	1.56	0.76	**0.52**	**3.15**	3.70	3.51	2.35	1.78	0.99	**1.50**	0.26	0.07	1.77
7. Siding Spring Obs. (Australia)	31°16′ S, 149° 03′ E; **1165**	2.38	2.34	1.27	1.06	1.12	0.81	0.56	0.13	1.21	2.46	2.16	2.02	**2.02**	**1.71**	0.90	**0.58**	0.13	1.50
8. SALT, SAAO (Sutherland, South Africa)	32°22′ S, 20°48′ E; **1783**	2.19	3.01	1.49	0.96	0.73	0.58	0.38	0.12	1.18	2.53	3.41	2.29	1.67	1.01	0.98	0.44	0.15	1.56
9. RIDGE A (Antarctica)	81°5′ S, 73°5′ E; **4053**	4.33	3.76	3.27	1.47	0.74	0.61	**0.18**	**0.08**	1.81	**6.07**	**5.33**	**4.57**	2.01	0.87	0.84	0.41	**0.19**	**2.54**
10. NSO Sacramento Peak (USA)	32°22′ N, 116° 51′ W; **2800**	4.14	3.85	2.99	1.99	1.14	1.32	0.62	0.21	2.03	1.86	1.68	1.23	0.54	0.51	0.34	0.30	0.07	0.82
11. NSO Kitt Peak (USA)	32°18′ N, 110° 35′ W; **2095**	5.94	3.84	2.59	1.78	1.17	1.23	0.55	0.19	2.16	1.17	1.04	0.71	0.61	0.59	0.36	0.43	0.06	0.62
12. Big Bear (California, USA)	33° 07′ N, 116°51′ W; **2067**	2.46	3.59	2.74	1.96	1.25	1.40	0.62	0.21	1.78	1.77	1.72	1.08	0.78	0.64	0.42	0.34	0.06	0.85
13. ISON-Ussuriysk Observatory (Russia)	43°41 N, 132°09 E; **274**	4.94	4.84	3.93	2.94	1.32	1.29	0.44	0.21	2.49	1.80	1.93	1.50	1.29	1.30	0.84	0.57	0.10	1.17
14. Large Vacuum Solar Telescope (Irkutsk, Russia)	51°50′ N, 104°53′ E; **650**	5.90	5.06	**4.59**	3.01	1.05	1.47	0.60	0.35	2.75	2.76	2.66	2.22	1.28	1.12	1.03	0.37	0.09	1.44
15. Altai Optical Laser Center	51°21′ N, 82°09′ E; **385**	6.45	4.71	3.86	2.52	1.07	1.51	0.57	0.36	2.63	2.82	2.77	2.16	1.39	0.98	1.12	0.35	0.10	1.46
16. Pulkovo Obs. (Russia)	59°46′ N, 30°19′ E; **75**	6.41	4.45	4.04	3.20	1.39	1.72	0.80	0.50	2.81	2.46	2.45	1.96	1.63	1.06	1.44	0.29	0.08	1.42
17. Main Astronomical Obs. (Ukraine)	50°21′ N, 30°29′ E; **213**	5.75	4.39	3.75	2.72	1.20	1.70	0.59	0.36	2.56	2.39	2.34	1.80	1.39	0.96	1.21	0.36	0.10	1.32
18. Crimean Astrophysical Observatory (Ukraine)	44° 43′ N, 34° 00′ E; **600**	3.33	4.00	3.28	2.27	1.08	1.49	0.45	0.26	2.02	1.90	2.46	1.85	1.20	1.31	0.75	0.45	0.12	1.26
19. Majdanak Obs. (Uzbekistan)	38° 67′ N, 66° 89′ E; **2593**	3.92	3.30	2.68	2.07	1.04	1.17	0.43	0.22	1.85	1.92	1.85	1.64	1.25	1.05	0.42	0.44	0.12	1.09
20. Sanglok Obs. (Tadjikistan)	38°15′ N, 69°13′ E; **2300**	3.92	3.30	2.68	2.07	1.04	1.17	0.43	0.22	1.85	1.92	1.85	1.64	1.25	1.05	0.42	0.44	0.12	1.09
21.Yunnan Astronomical Obs. (Yunnan, China.)	25° 44′ N, 102° 01′ E; **2014**	1.34	1.15	1.14	1.45	1.10	0.56	0.49	0.21	0.93	0.54	**0.51**	**0.48**	**0.42**	**0.37**	**0.26**	**0.22**	0.07	**0.36**
22. Purple Mountain Obs. (Nanjing, China.)	32°03′ N, 118°46′ E; **267**	4.09	3.81	2.70	1.91	1.61	0.84	0.51	0.19	1.96	1.29	1.48	0.95	0.71	0.65	0.40	0.40	0.09	0.75
23. Shanghai Astronomical Obs. (Shanghai, China)	31°13′ N, 121°28′ E; **100**	3.63	4.06	2.36	1.84	1.52	0.69	0.51	0.17	1.85	0.93	1.13	0.74	0.64	0.58	0.40	0.36	0.07	0.61

Fig.10.Vertical structure δN

Conclusion

- The offered method enables to analyze a large-scale distribution of optical instability in territory of globe, to determine new places with the least values of refractive index fluctuations.
- The method gives additional opportunities to plan of actions which exceed interests of astronomers


Thanks for attention