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СИНХРОНИЗМ КАК СУЩНОСТНОЕ СВОЙСТВО КЛИМАТИЧЕСКОЙ СИСТЕМЫ ЗЕМЛИ

Temperatures and Wolf's numbers. Are they related? Yes, but …

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INTRODUCTION

On the Earth, reasoning from experience, natural and climatic processes are significantly initiated and controlled by external forcing. It has a complex structure, but the Sun is a major contributor, acting directly and adjusting the other cosmic influences. Strengthening of the Sun's magnetic field is accompanied by an increase in the number of dark areas in the chromosphere, named sunspots. A linear combination of the sunspot numbers and sunspot groups has been chosen as a comprehensive indicator of solar activity. It has no physical dimension and is called Wolf’s number.

Based on observations, we can draw conclusions about the consistency of the Sun’s forcing and certain climatic processes. It is well known that the cyclic motions in the solar system are manifested in the unceasing change of seasons, in daily warming and nocturnal cooling. These changes reflect a stability that partially characterizes the climate for a certain time interval. Other facts: the high correlation coefficients of the intensity of cosmic rays, the solar radio flux density, and series of Wolf’s numbers.

Discussions are underway about how climate in general and the temperature particularly are

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The classic phenomenological approach involves
the formalization of empirical data.
Having theorized the observed facts, the principle is formulated:
“external forcing inherently initiates and synchronizes elementary processes in the geospheres”.

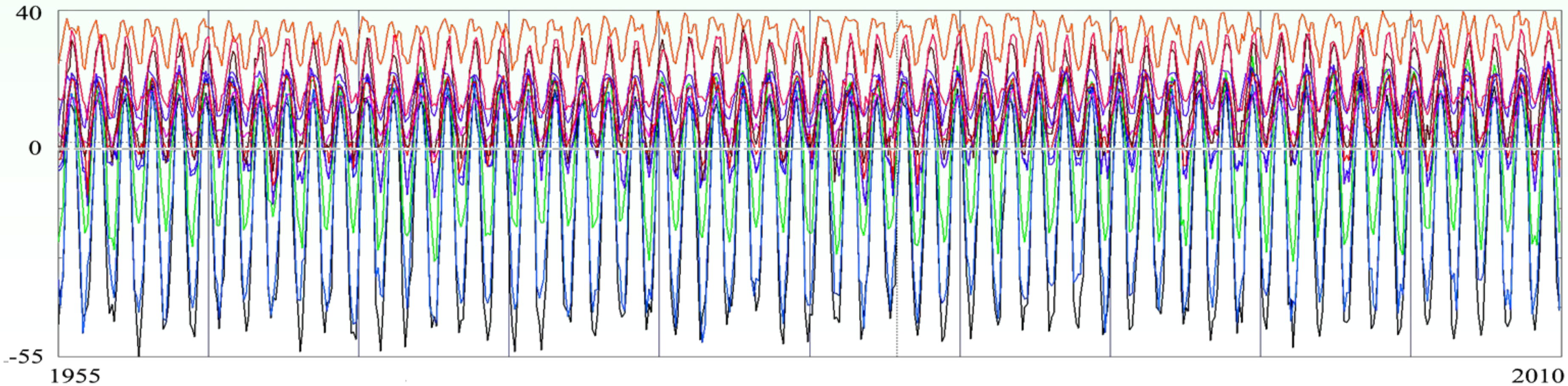
This principle is supported by a formal definition:
“synchronicity of processes is manifested in the coincidence of their essential signs”,
which it is necessary to define reasonably.

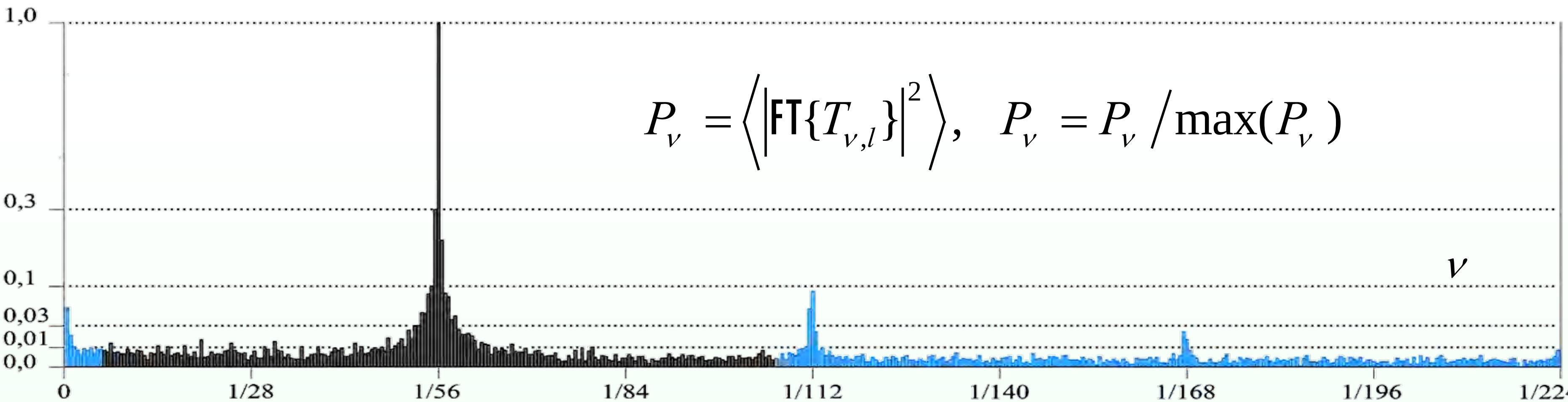
Thus, the synchronism is selected as an essential factor of solar–terrestrial relations.

Part I.
CLIMATE CLASSIFICATION by ANALYSIS of PHASES of the TEMPERATURE SERIES

Analysis of the data series of the surface temperature from weather stations of Northern Hemisphere will be performed with use of Analytic Signal. The climatic classes are allocated by comparing the phase of the temperature series with an estimated phase during iterations. This computing technology is first applied to study of the climate processes. The new approach is informative and corresponds to the known concepts of the climate geography. It follows that phasing and synchronicity are essential features of climate processes on the Earth.

SPECTRAL DENSITY of 818 TEMPERATURE SERIES, [1955, 2010]





Power scale with index ½ is used along ordinate-axis. Black color marks interval, which used to calculate the phase.

ANALYTIC SIGNAL

$$W(\tau)=T(\tau)+iV(\tau) \qquad V(\tau)=\frac{1}{\pi}\,\text{v.p.}\int_{-\infty}^{\infty}\frac{T(s)}{\tau-s}ds \qquad W(\tau)=\varepsilon(\tau)\exp i\varphi(\tau)$$

$$\varepsilon(\tau)=\sqrt{T^2(\tau)+V^2(\tau)} \qquad \varphi(\tau)=\operatorname{arctg}\frac{V(\tau)}{T(\tau)}$$

$$T(\tau)=\varepsilon(\tau)\cos\varphi(\tau)$$

$$\left\langle WW^*\right\rangle=\left\langle \varepsilon^2\right\rangle$$

The temperature can be varied without inflow of additional energy, but by redistribution of available energy within the system, changing e.g. the phase of the temperature oscillation.

ИТЕРАЦИОННЫЙ АЛГОРИТМ ГРУППИРОВКИ

#1. Формирование матрицы среднемесячных температур –

$\left\| T_{k,\tau} \right\|; \quad k=1,2,\ldots,N; \quad \tau = 1,2,\ldots,\Pi$.

#2. Вычисление главных значений фаз –

$i := 0; \quad {}^{i}\varphi_{k,\tau} := \mathrm{arctg}\left(\underset{\tau}{\mathrm{H}}\left[T_{k,\tau} \right] \big/ T_{k,\tau} \right)$.

#3. Вычисление непрерывных фаз –

if $\left| {}^{i}\varphi_{k,\tau+1} - {}^{i}\varphi_{k,\tau} \right| \geq \pi; \quad {}^{i}\varphi_{k,\tau+1} := {}^{i}\varphi_{k,\tau+1} + 2\pi$.

#4. Удаление линейных составляющих фаз –

${}^{i}\varphi_{k,\tau} := {}^{i}\varphi_{k,\tau} - {}^{i}\varphi_{k,1} - ({}^{i}\varphi_{k,\Pi} - {}^{i}\varphi_{k,1})(\tau - 1) \big/ (\Pi - 1)$.

#5. Вычисление текущих фаз –

${}^{i}\varphi_{j,\tau} := \overline{{}^{i}\varphi_{k,\tau}} : \quad \left\langle {}^{i}\varphi_{j,\tau}, {}^{i}\varphi_{k,\tau} \right\rangle > r_s; \quad j = 1,2,\ldots,N$.

#6. if $\left| {}^{i}\varphi_{j,\tau} - {}^{i-1}\varphi_{j,\tau} \right| < \varepsilon$, **#7**; else ${}^{i-1}\varphi_{j,\tau} := {}^{i}\varphi_{j,\tau}$, $i := i+1$, **#5**.

#7. $i :=$ end; $\quad n := 1$.

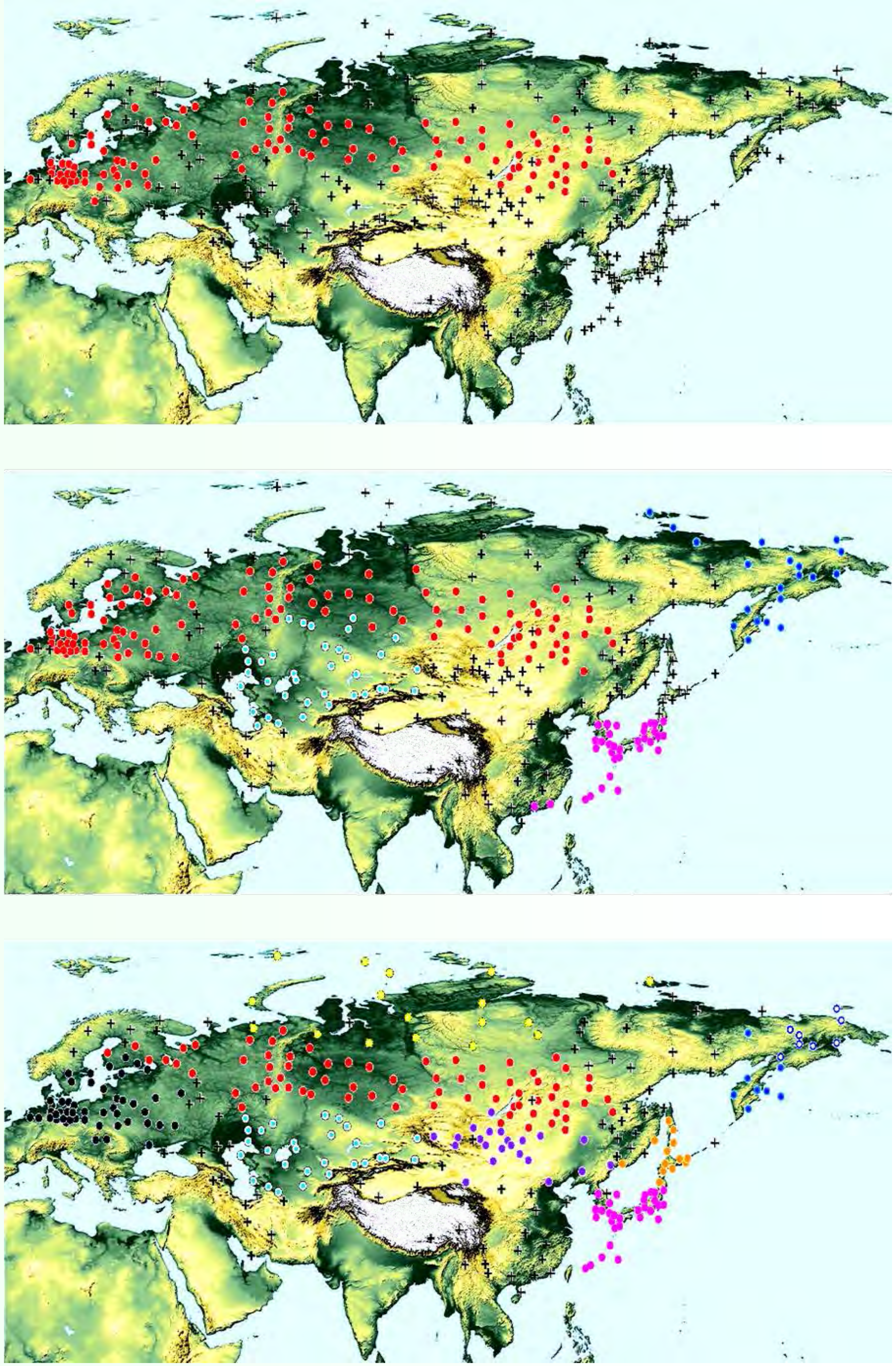
#8. Формирование типовых фаз –

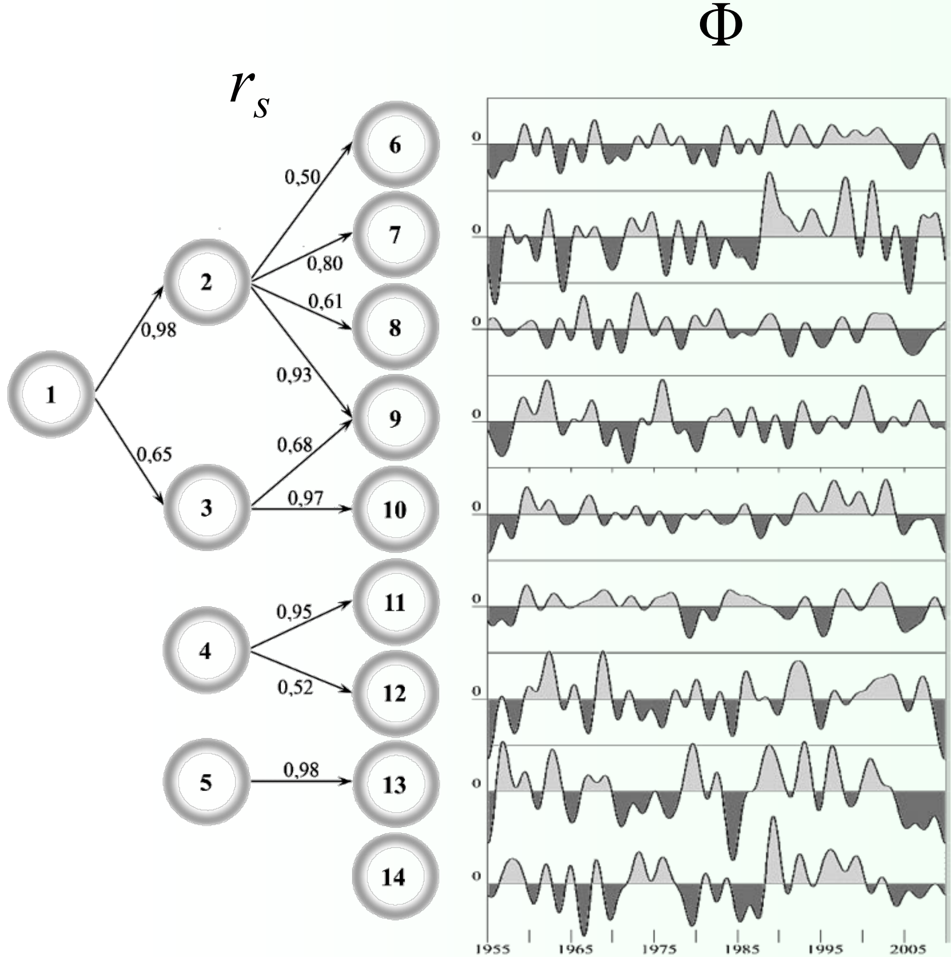
$\{l\} \subset \{j\} : \quad \left| \varphi_{j,\tau} - \varphi_{k,\tau} \right| < \varepsilon \; ; \; \Phi_{n,\tau} := \overline{\varphi_{j,\tau}} : \quad j \in \{l\}; \; \{k\} := \{k\} \setminus \{l\}; \; \{j\} := \{j\} \setminus \{l\}$.

#9. if $\{k\} = \varnothing$, **#10**; else $n := n+1$, **#8**.

#10. Вычисление коэффициентов корреляции –

$r_{n,k} := \left\langle \Phi_{n,\tau}, {}^{0}\varphi_{k,\tau} \right\rangle$; stop.




Φ
r_s
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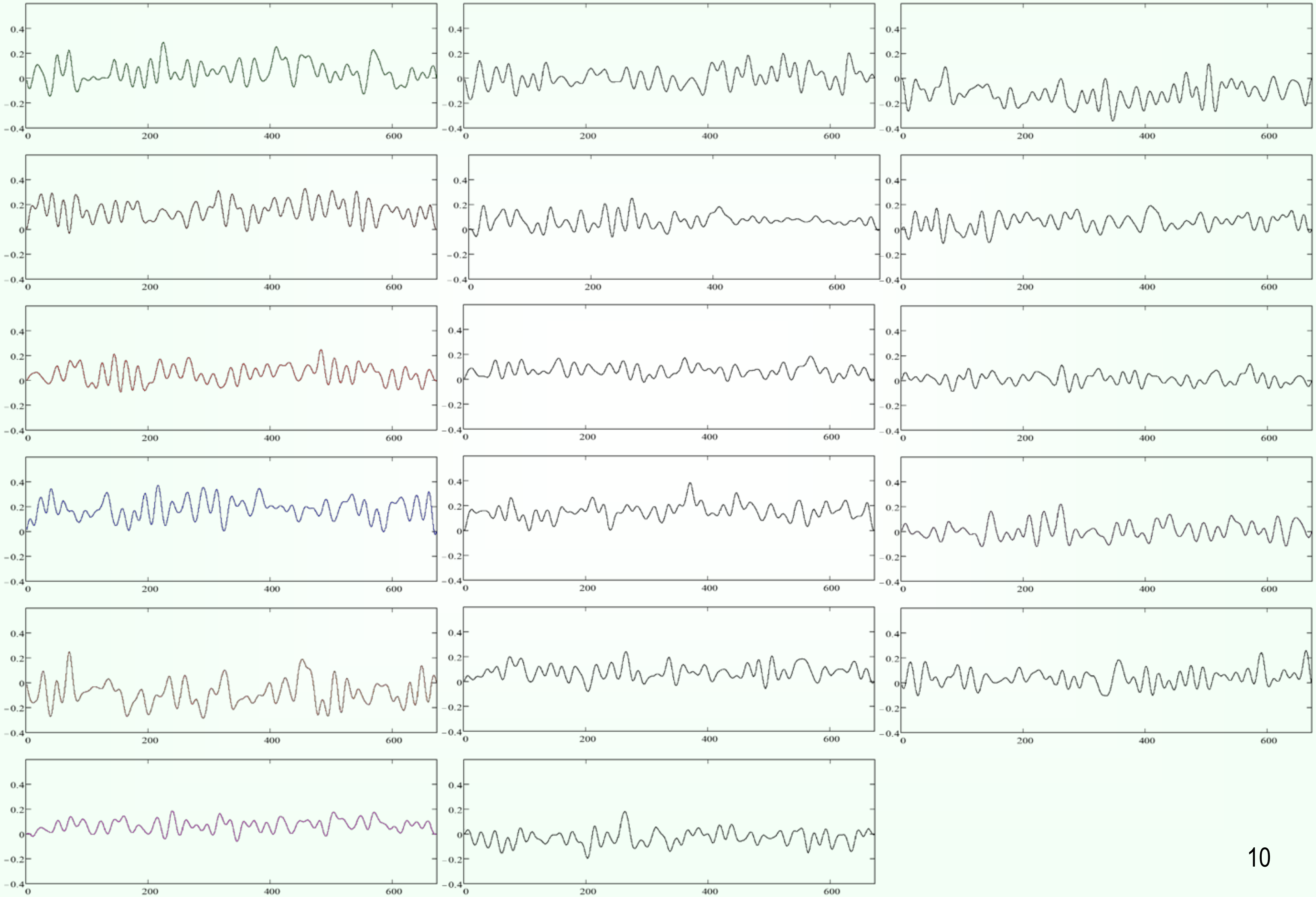
0,95
0,52
0,98
0
1955
1965
1975
1985
1995
2005

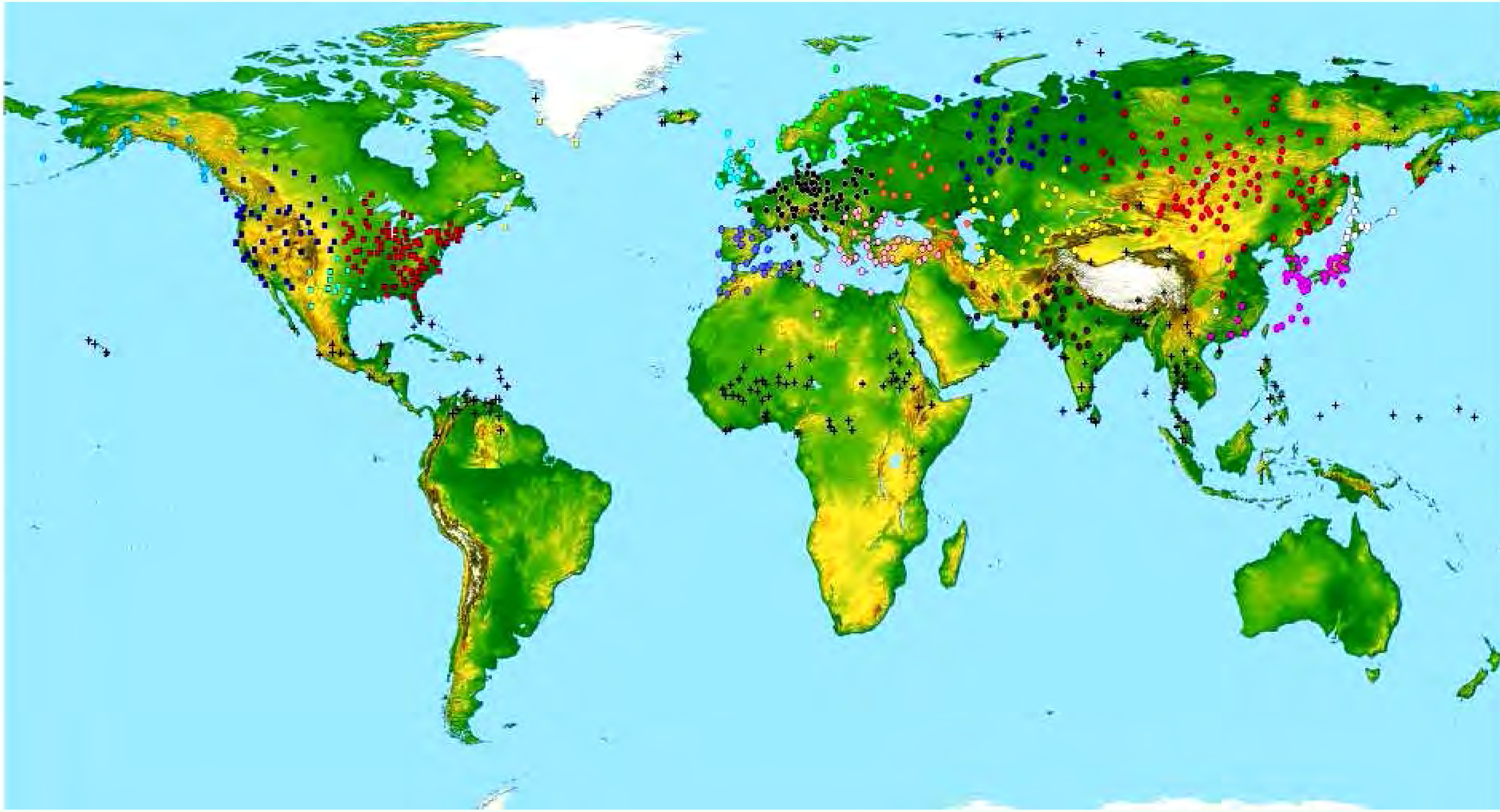
17 TYPE-PHASES of NORTHERN HEMISPHERE



CORRELATIONS of TYPE-PHASES

1	1																
2	0.01	1															
3	0.30	0.14	1														
4	-0.16	-0.07	0.01	1													
5	0.33	-0.12	0.06	-0.21	1												
6	0.12	0.03	0.42	-0.05	0.27	1											
7	**0.56**	-0.01	0.05	-0.01	**0.39**	0.26	1										
8	0.39	0.13	**0.40**	0.29	-0.01	0.16	**0.43**	1									
9	0.20	**-0.38**	0.18	-0.14	0.10	0.39	0.18	0.06	1								
10	0.03	0.09	0.09	0.14	-0.04	0.12	0.02	0.17	0.05	1							
11	-0.12	0.03	**0.62**	0.14	0.14	**0.51**	0.07	**0.34**	**0.31**	0.13	1						
12	-0.06	-0.18	0.11	0.12	0.26	0.21	0.01	-0.02	0.18	0.09	0.21	1					
13	-0.05	-0.08	0.16	0.10	**0.44**	0.25	**0.36**	0.10	0.02	-0.08	**0.39**	0.05	1				
14	0.09	0.04	-0.01	0.32	**-0.43**	0.01	**0.35**	**0.61**	0.04	0.21	0.04	-0.14	-0.16	1			
15	0.26	-0.25	-0.13	0.03	0.17	0.05	0.26	0.03	0.48	-0.15	0.02	**0.33**	0.08	0.01	1		
16	-0.01	-0.18	0.08	0.01	0.11	0.22	0.01	-0.12	0.23	0.09	0.09	**0.55**	0.10	-0.12	0.22	1	
17	-0.03	-0.07	-0.07	-0.01	-0.09	-0.06	-0.03	-0.07	0.14	0.09	-0.01	0.09	-0.23	0.04	0.08	0.11	1
n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

CLIMATE CLASSES of NORTHERN HEMISPHERE [1955, 2010]



Part II.
DECOMPOSITION of the TEMPERATURE SERIES and WOLF's NUMBER SERIES on EXTREMAL COMPONENTS

It is considered the temperature series on 818 weather stations of the Northern Hemisphere and the Wolf numbers for the period from 1955 to 2010. Components of the series, acting in opposite directions and having extremal properties, are introduced. It is confirmed the presence of various connections between the solar activity and the temperature. Conditions of occurrence of the connections are discovered. The developed approach is advisable to apply for analysis of observation and to analytical transformation.

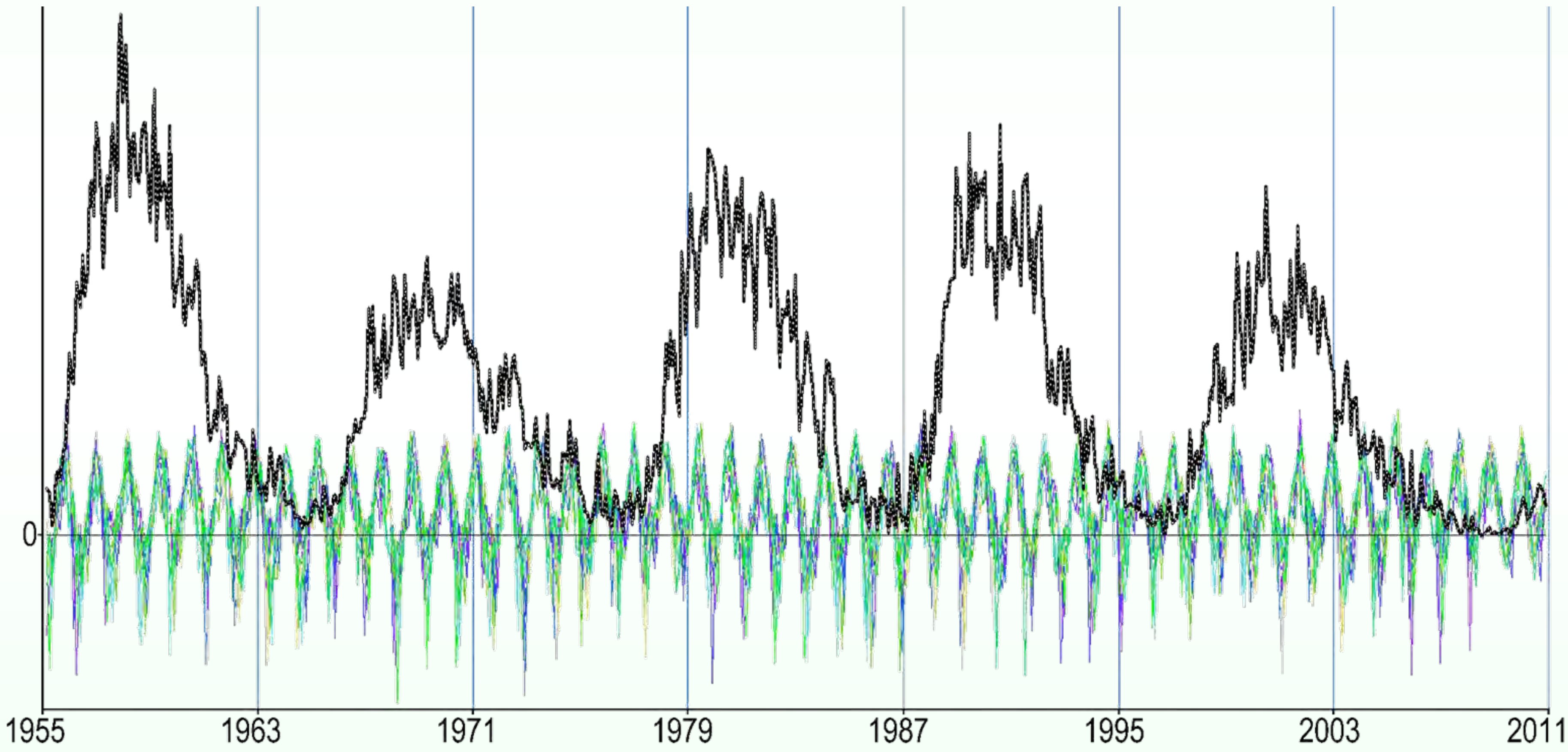
In origin natural and climatic processes may be a manifestation of a complex set of factors. This is their fundamental difference from the processes in technical systems that are specifically designed for the implementation of useful factors. For these reasons, the representation of the climate system using traditional physical quantities is not obvious and can not be effective sometimes.

It is discovered that extremal components of temperature and solar activity are immanent more to the system under study. Physical cause of utility of the extremal components is consequence that global flux of solar energy can concurrently increase and decrease the local temperature.

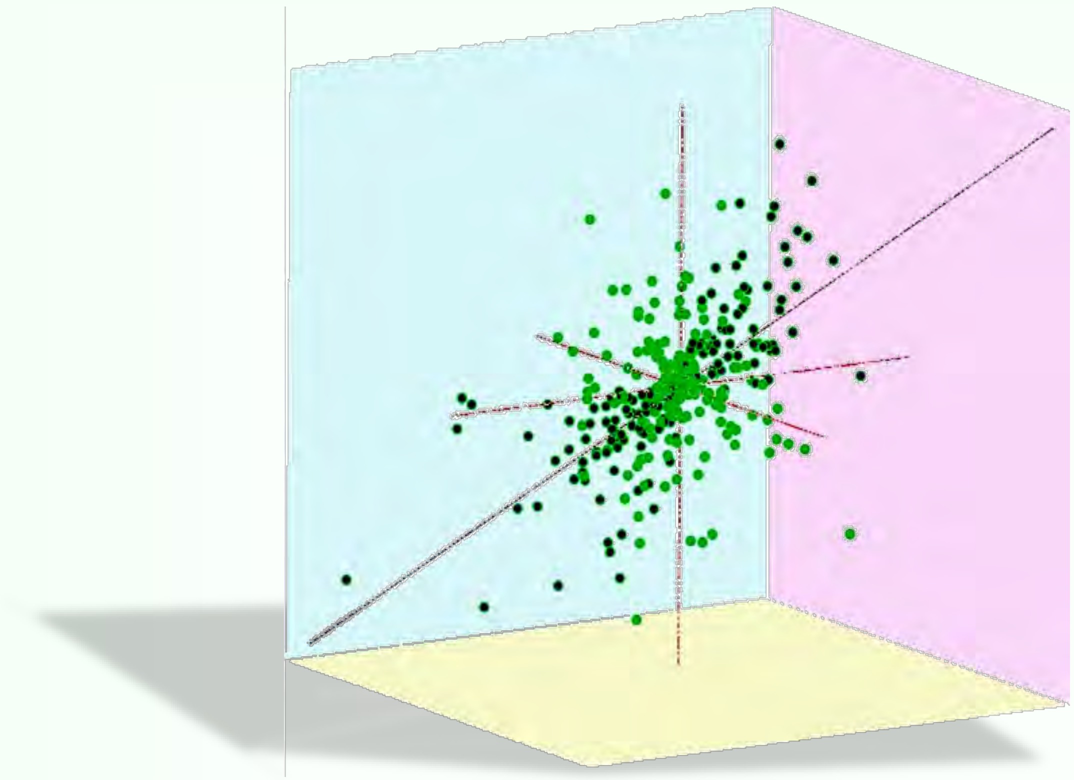
WOLF’s NUMBER & TEMPERATURE SERIES [1955, 2010]

818 weather stations of Northern Hemisphere

http://www.cru.uea.ac.uk/cru/data/temperature/station-data/ station-data.zip **http:\\www.gao.spb.ru**



ESSENTIAL SIGNS of SYNCHRONICITY



The Fourier coefficients have coincident signs only in two symmetrical octants (cones)

ALGORITHMS BASED on the ESSENTIAL SIGNS

$$x_{k,l};\quad l \in G;\quad k,\nu \in [0,\ N-1]$$

$$X_{\nu,l} = \frac{1}{N}\sum_{k=0}^{N-1} x_{k,l}\, e^{-i2\pi\nu k/N} \qquad M_\nu = \Omega_\nu \sum_l \operatorname{sign} X_{\nu,l}$$

COMMON FILTRATION

$$Y_{\nu,l} = \begin{cases} X_{\nu,l}, & |M_\nu| = \Omega_\nu \cdot N \\ 0, & |M_\nu| < \Omega_\nu \cdot N \end{cases}$$

MAJORIZING FILTRATION

$$Y_{\nu,l} = \begin{cases} X_{\nu,l}, & \operatorname{sign} X_{\nu,l} = \operatorname{sign} M_\nu \\ 0, & \operatorname{sign} X_{\nu,l} \neq \operatorname{sign} M_\nu \end{cases}$$

.

COMMON SIGNAL

$$y_{k,l} = \sum_{\nu=0}^{N-1} Y_{\nu,l}\, e^{i2\pi\nu k/N}$$

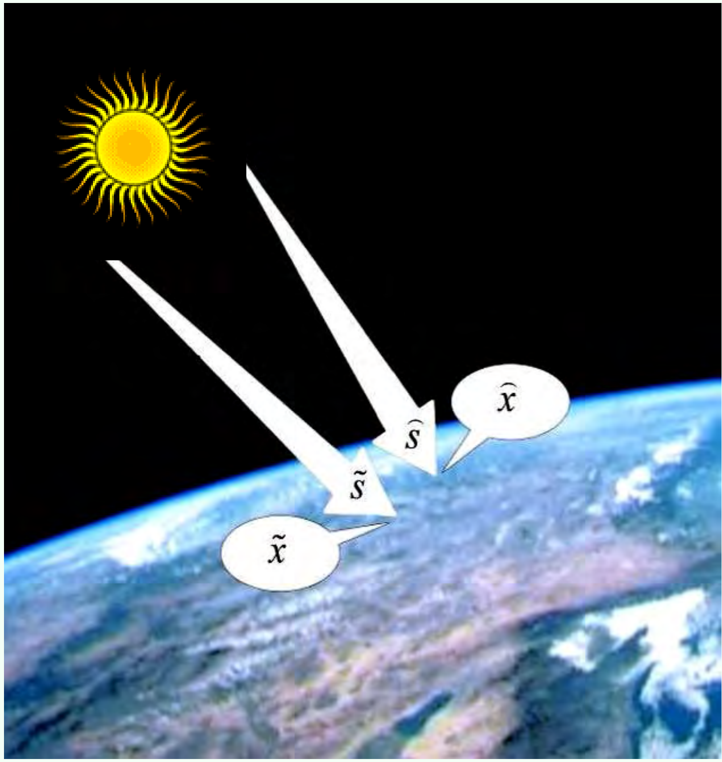
CRITERIA CONSISTENCY

$$C(G,l) = \frac{1}{(b-a)N}\sum_{\nu=a}^{b} h\left(\operatorname{sign} Y_{l,\nu} \times \Omega_\nu \sum_l \operatorname{sign} Y_{l,\nu}\right)$$

SELECTED SET DECOMPOSITION ⇒ CS-, NS-COMPONENTS ↓

CS-, NS-COMPONENTS

$$H_{\nu,l} = \begin{cases} 1, & \text{sign} S_\nu = \text{sign} X_{\nu,l} \\ 0, & \text{sign} S_\nu \neq \text{sign} X_{\nu,l} \end{cases}$$



$$\widehat{S}_{\nu,l} = \begin{cases} S_\nu, & H_{\nu,l} = 1 \\ 0, & H_{\nu,l} = 0 \end{cases}, \quad \widehat{s}_{k,l} = \sum_{\nu=0}^{N-1} \widehat{S}_{\nu,l}\, \mathrm{e}^{-i2\pi\nu k/N}$$

$$\tilde{S}_{\nu,l} = \begin{cases} 0, & H_{\nu,l} = 1 \\ S_\nu, & H_{\nu,l} = 0 \end{cases}, \quad \tilde{s}_{k,l} = \sum_{\nu=0}^{N-1} \tilde{S}_{\nu,l}\, \mathrm{e}^{-i2\pi\nu k/N}$$

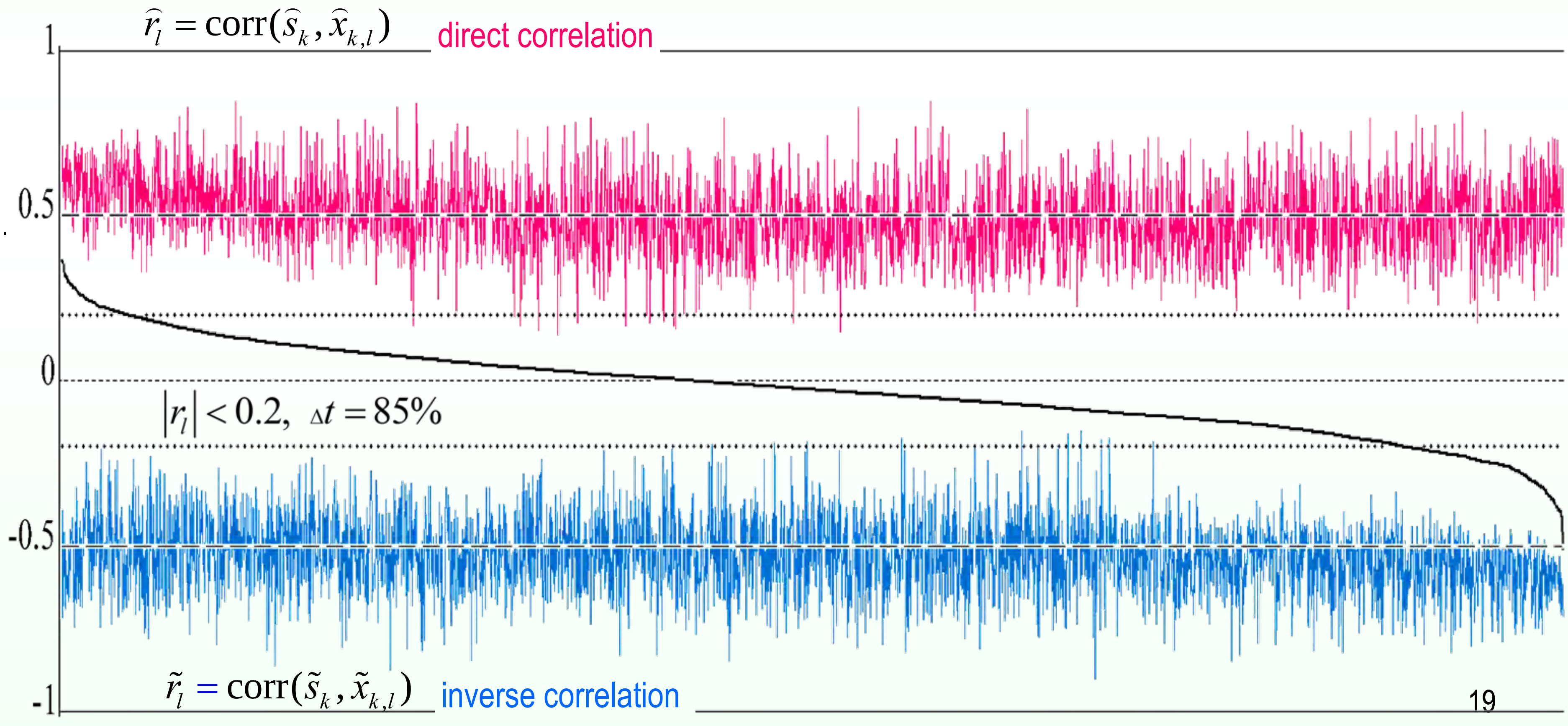
$$\widehat{X}_{\nu,l} = \begin{cases} X_{\nu,l}, & H_{\nu,l} = 1 \\ 0, & H_{\nu,l} = 0 \end{cases}, \quad \widehat{x}_{k,l} = \sum_{\nu=0}^{N-1} \widehat{X}_{\nu,l}\, \mathrm{e}^{i2\pi\nu k/N}$$

$$\tilde{X}_{\nu,l} = \begin{cases} 0, & H_{\nu,l} = 1 \\ X_{\nu,l}, & H_{\nu,l} = 0 \end{cases}, \quad \tilde{x}_{k,l} = \sum_{\nu=0}^{N-1} \tilde{X}_{\nu,l}\, \mathrm{e}^{i2\pi\nu k/N}$$

EXTREME CORRELATIONS of CS-, NS-COMPONENTS of TEMPERATURE and WOLF's NUMBERS

$$r_l = \operatorname{corr}(s_k, x_{k,l}) = \hat{r}_l \cdot \left(\frac{D\hat{s}_{k,l} \cdot D\hat{x}_{k,l}}{Ds_k \cdot Dx_{k,l}} \right)^{1/2} + \tilde{r}_l \cdot \left(\frac{D\tilde{s}_{k,l} \cdot D\tilde{x}_{k,l}}{Ds_k \cdot Dx_{k,l}} \right)^{1/2}$$

$$r_l > 0 \Rightarrow \hat{r}_l > r_l, \quad r_l < 0 \Rightarrow |\tilde{r}_l| > |r_l|$$



CS/NS BOUNDARIES

$$\langle x_{k,l} \rangle = \langle \widehat{x}_{k,l} \rangle + \langle \tilde{x}_{k,l} \rangle, \quad X_{0,l} = \widehat{X}_{0,l} + \tilde{X}_{0,l},$$

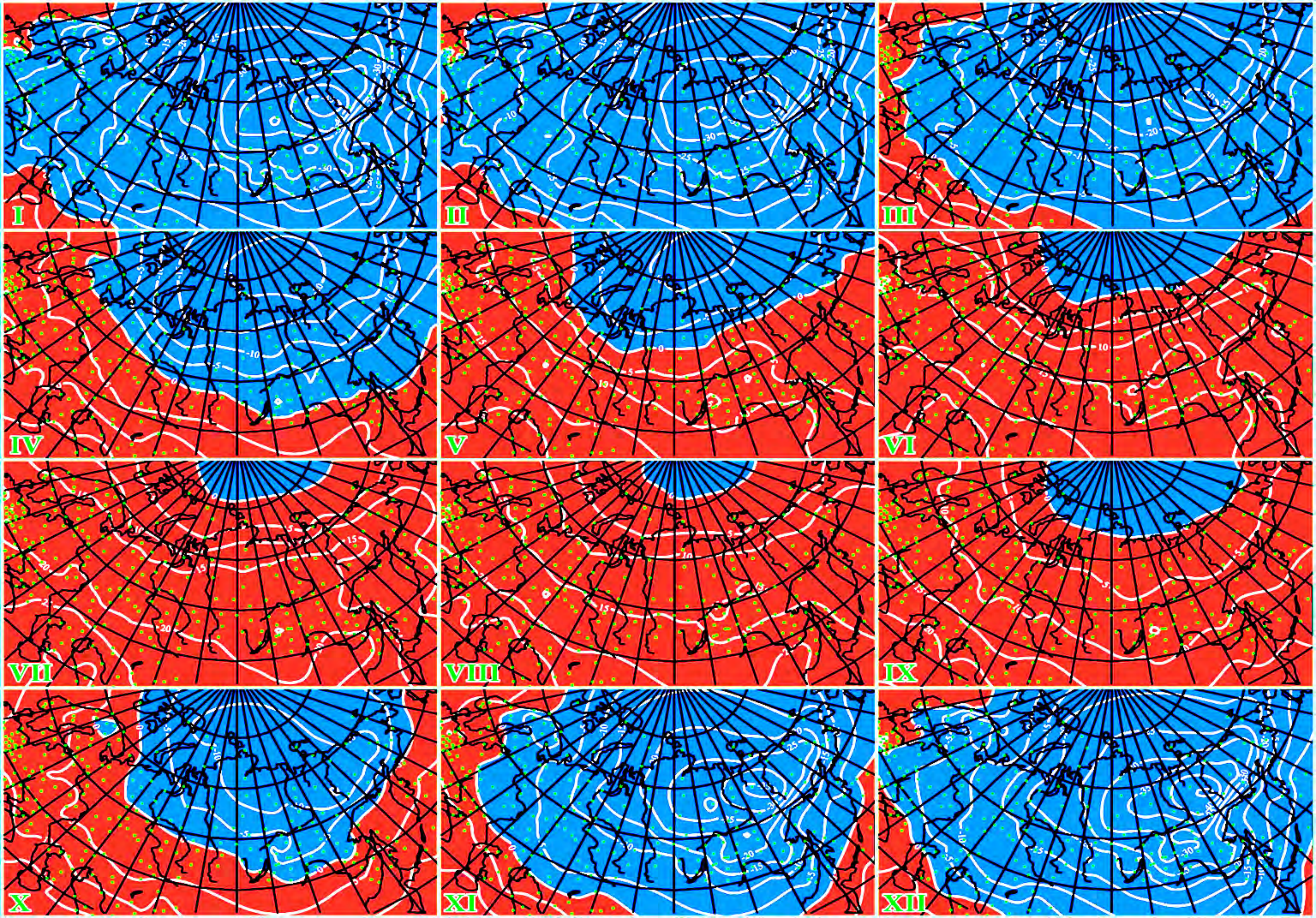
$$\langle s_k \rangle = \langle \widehat{s}_{k,l} \rangle + \langle \tilde{s}_{k,l} \rangle, \quad S_0 = \widehat{S}_{0,l} + \tilde{S}_{0,l} \ .$$

$$s_k > 0 \Rightarrow S_0 > 0$$

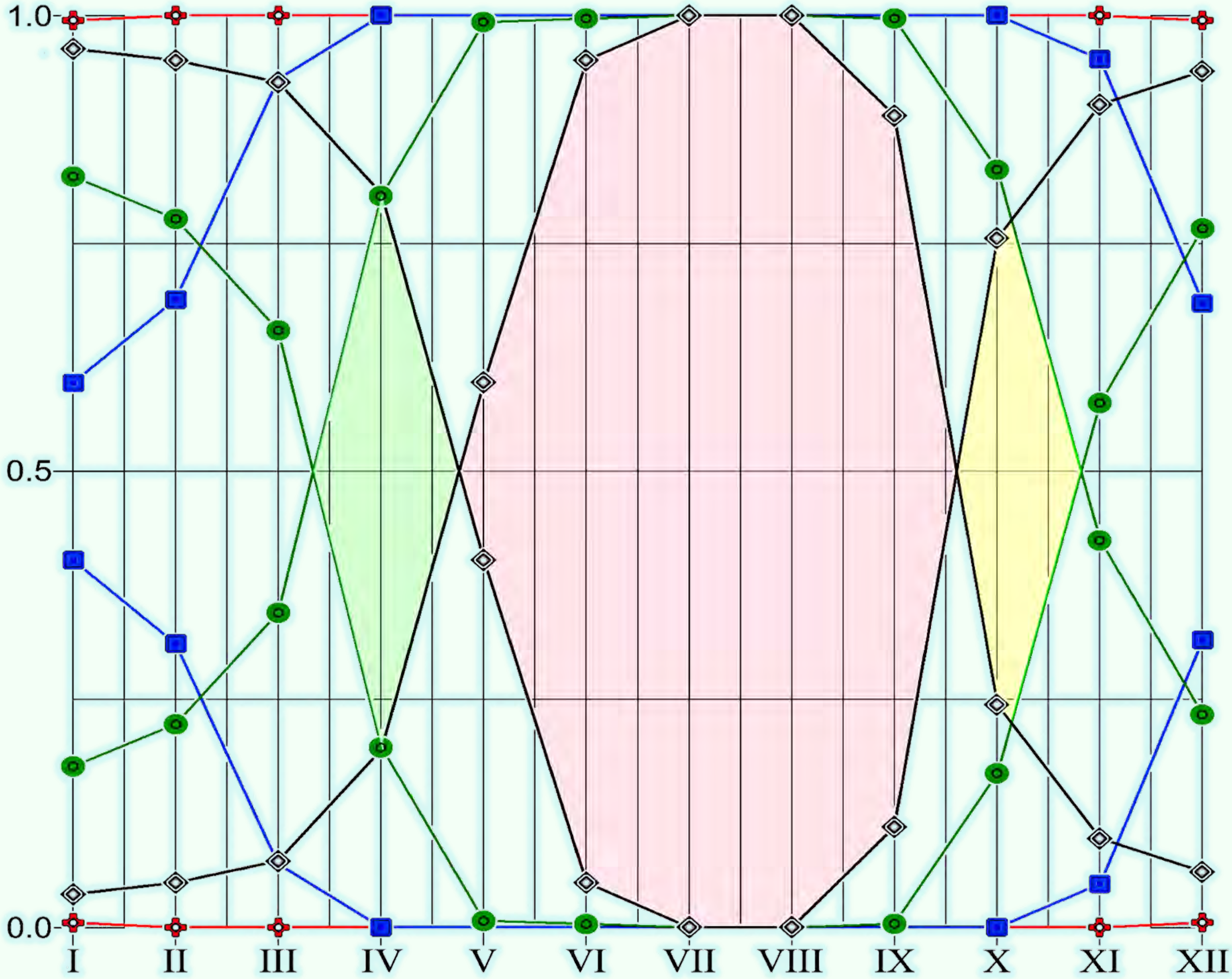
$$X_{0,l} > 0 \Rightarrow \left\{ \widehat{X}_{0,l} = X_{0,l},\ \tilde{X}_{0,l} = 0,\ \widehat{S}_{0,l} = S_0,\ \tilde{S}_{0,l} = 0 \right\}$$

$$X_{0,l} < 0 \Rightarrow \left\{ \widehat{X}_{0,l} = 0,\ \tilde{X}_{0,l} = X_{0,l},\ \widehat{S}_{0,l} = 0,\ \tilde{S}_{0,l} = S_0 \right\}$$

CS/NS-BOUNDARIES, ZERO-ISOTHERMS

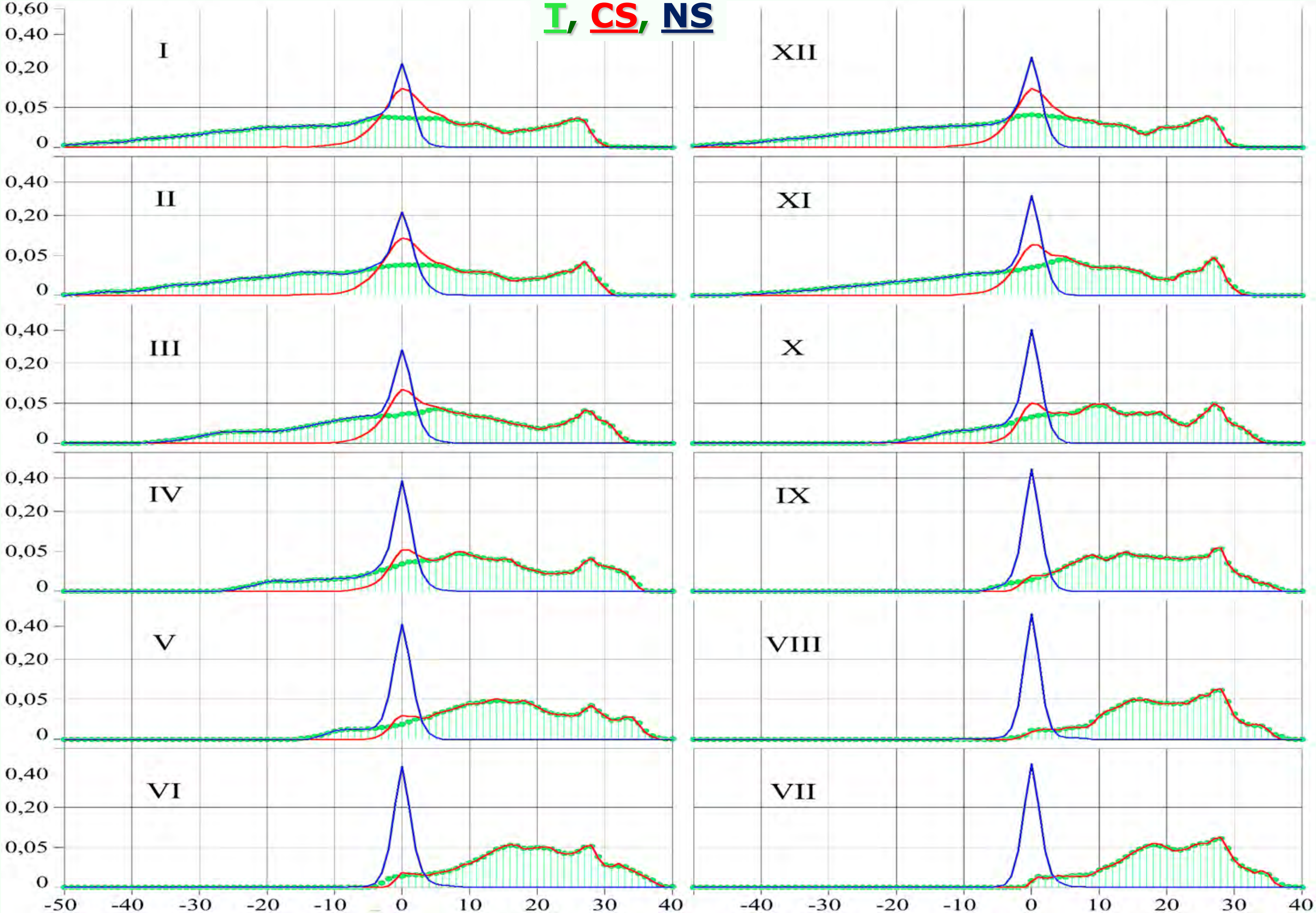


WEATHER STATIONS into CS-, NS-ZONES

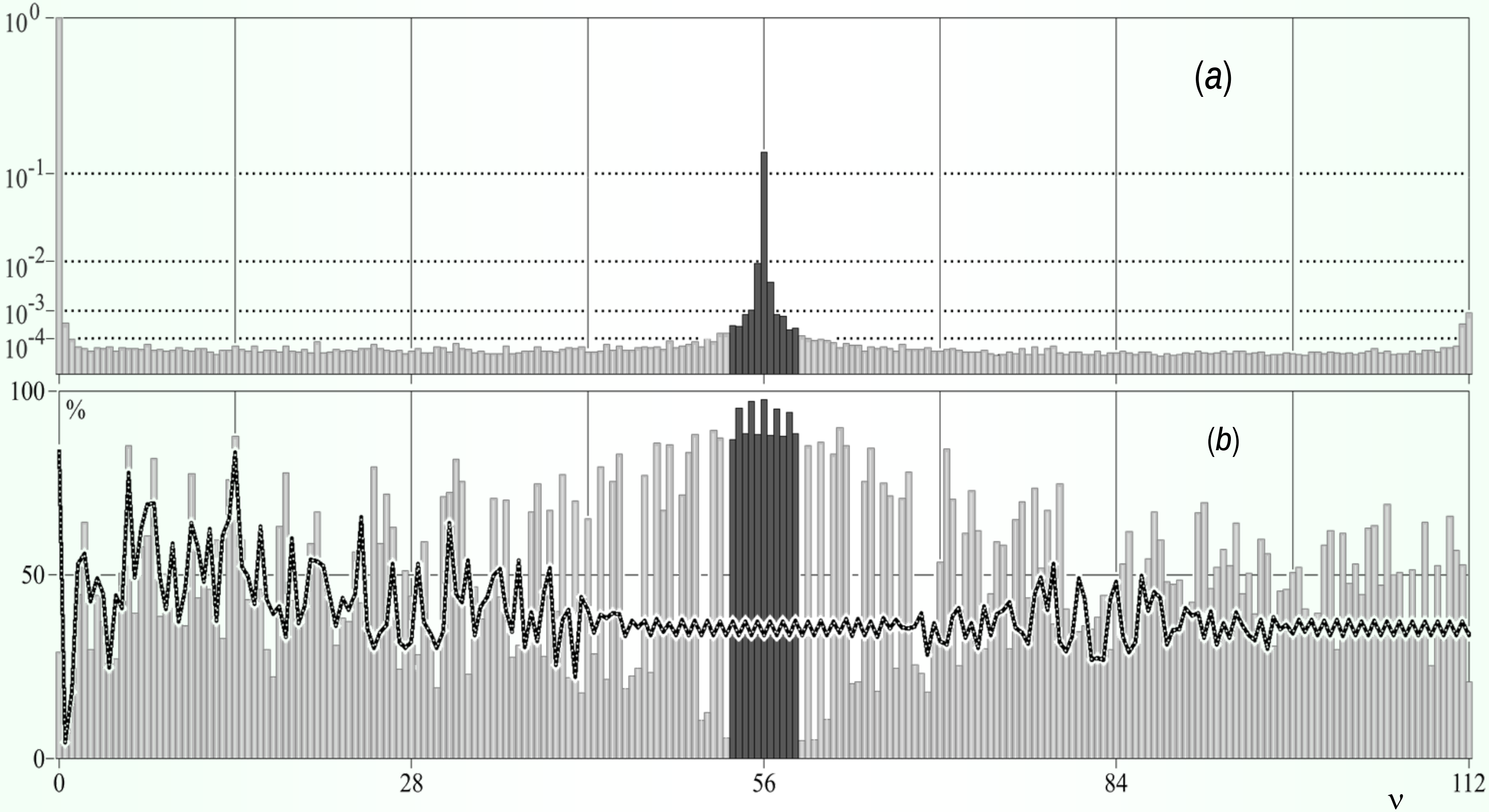


HISTOGRAMS of AVERAGE MONTHLY TEMPERATURES

T, CS, NS

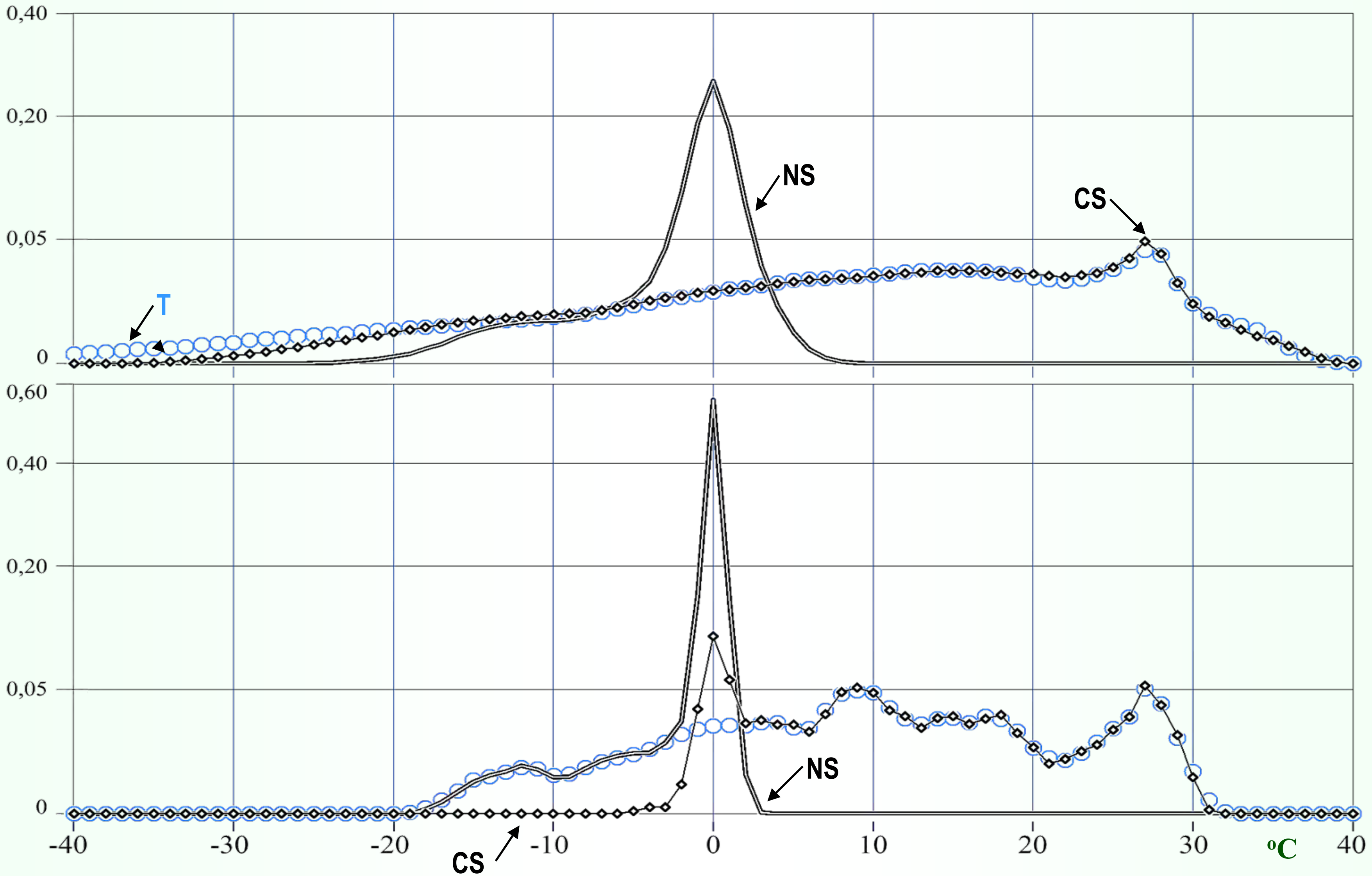


COINCIDENCE of SIGNS of the FOURIER COEFFICIENTS

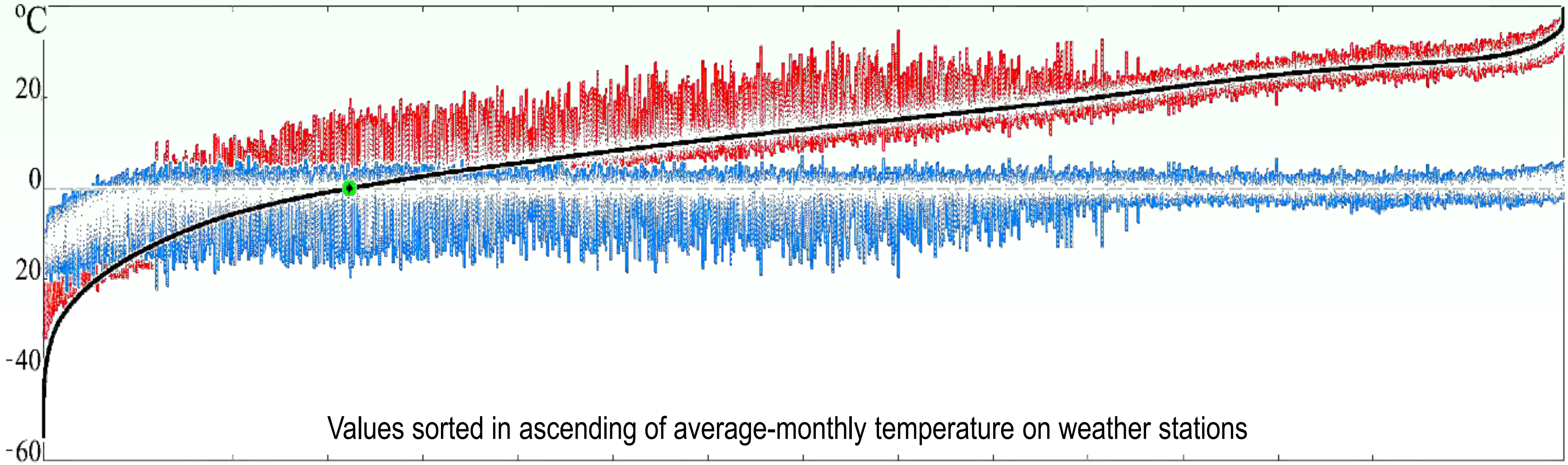


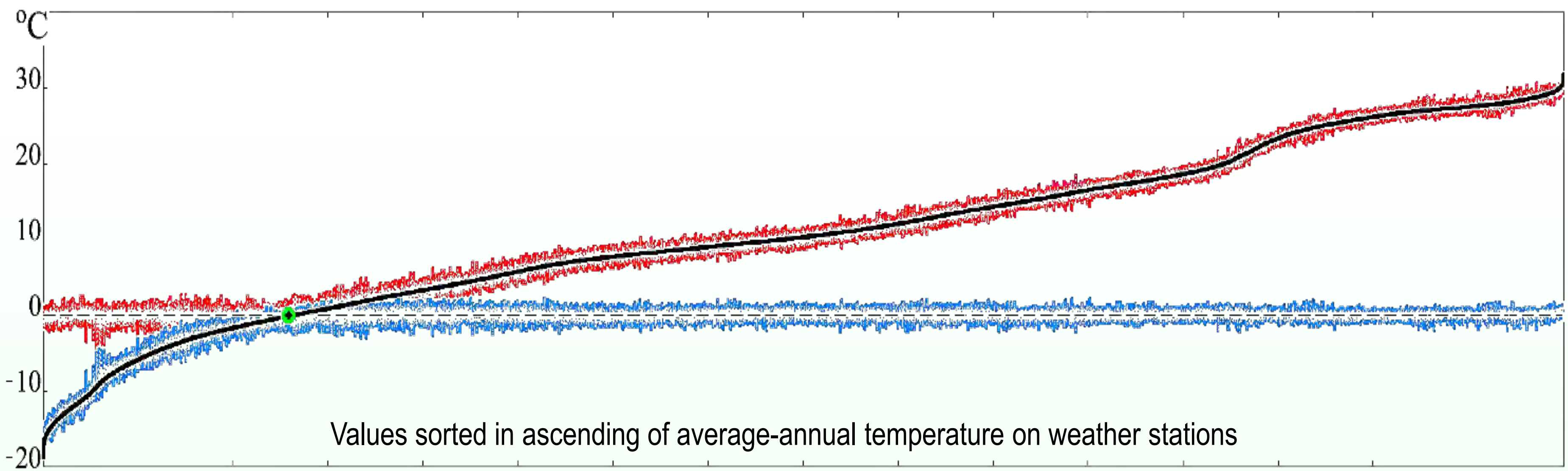
Spectral density of 818 series of temperature; power scale with index ¼ is used along ordinate (*a*). The relative number of coincidences of signs of the Fourier coefficients of Wolf numbers with signs of the Fourier coefficients of temperature series (*b*). Dark color marks interval, in which concentrated 94% of the signal power, the number of coincidences of signs in this interval ranges from 86.9% to 97.7%.

HISTOGRAMS of TEMPERATURES & CS-, NS-COMPONENTS: ANNUAL VARIATION∧, AVERAGE-ANNUAL∨



COLLATIONS of the AVERAGE TEMPERATURES, CS- , NS-COMPONENTS





NORMALIZED SECOND INITIAL MOMENTS of COMPONENTS of TEMPERATURE & WOLF's NUMBERS

$$\widehat{\vartheta}_l = \frac{(\widehat{x}_{k,l}, \widehat{x}_{k,l})}{(x_{k,l}, x_{k,l})} \qquad \tilde{\vartheta}_l = \frac{(\tilde{x}_{k,l}, \tilde{x}_{k,l})}{(x_{k,l}, x_{k,l})} \qquad \widehat{\eta}_l = \frac{(\widehat{s}_{k,l}, \widehat{s}_{k,l})}{(s_k, s_k)} \qquad \tilde{\eta}_l = \frac{(\tilde{s}_{k,l}, \tilde{s}_{k,l})}{(s_k, s_k)}$$

$$\widehat{\vartheta}_l + \tilde{\vartheta}_l = 1 \qquad \widehat{\eta}_l + \tilde{\eta}_l = 1$$

$$r_2 = \mathrm{corr}\left(\widehat{\eta}_l, \widehat{\vartheta}_l\right) = \mathrm{corr}\left(\tilde{\eta}_l, \tilde{\vartheta}_l\right) = -\mathrm{corr}\left(\widehat{\eta}_l, \tilde{\vartheta}_l\right) = -\mathrm{corr}\left(\tilde{\eta}_l, \widehat{\vartheta}_l\right)$$

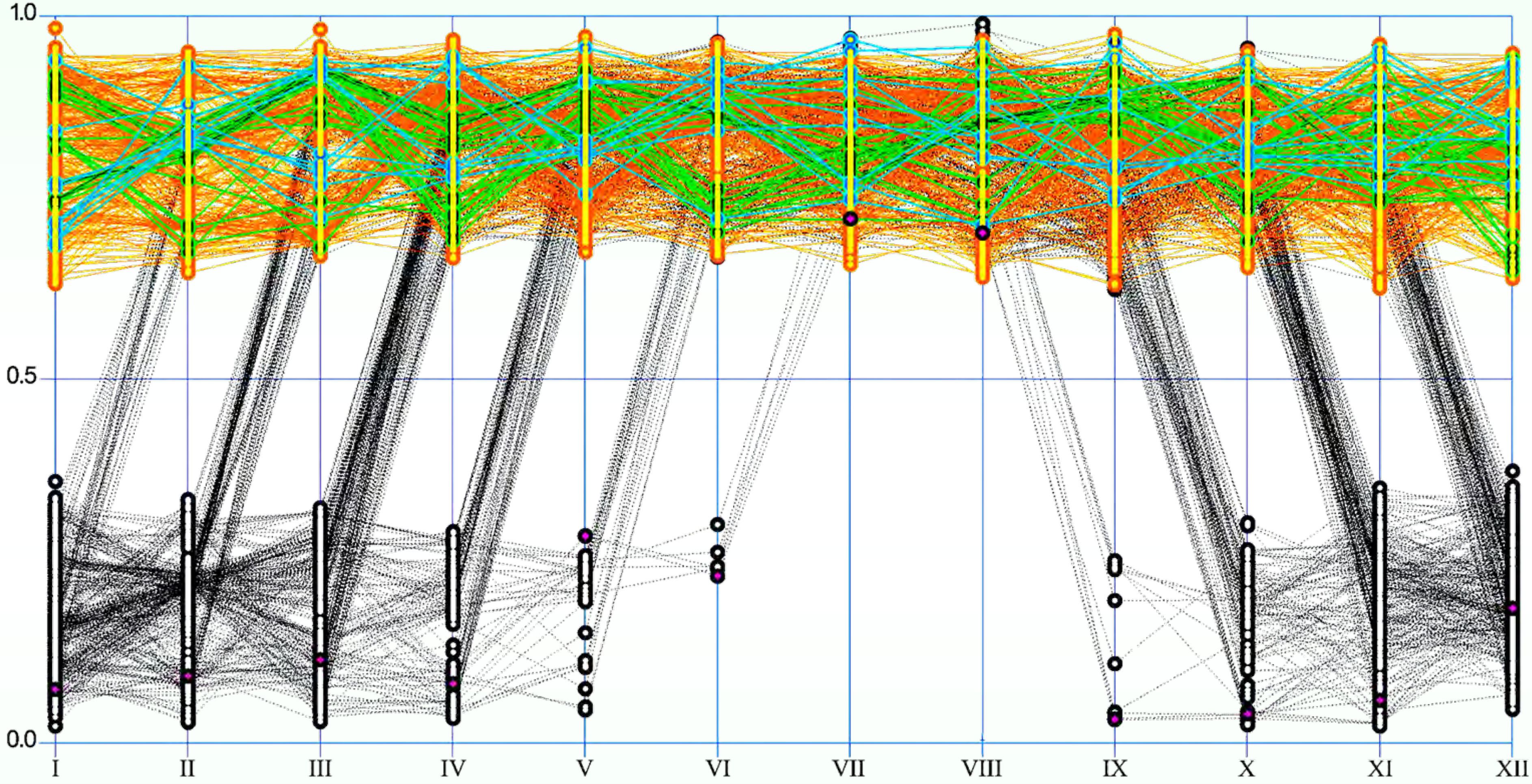
Weather stations of the North-West Coast of America

#	SI	Latitude °N	Longitude °	Country
1	72594	40.8	-124.2	USA
2	72597	42.4	-122.9	USA
3	72698	45.6	-122.6	USA
4	72688	45.7	-118.8	USA
5	72791	46.2	-123.9	USA
6	72792	47.1	-122.9	USA
7	72793	47.5	-122.3	USA
8	71894	49.4	-126.6	Canada
9	71109	50.7	-127.4	Canada
10	71101	53.3	-131.8	Canada
11	70398	55.0	-131.6	Alaska

Weather stations from the zone of influence of the warm North Atlantic Flow

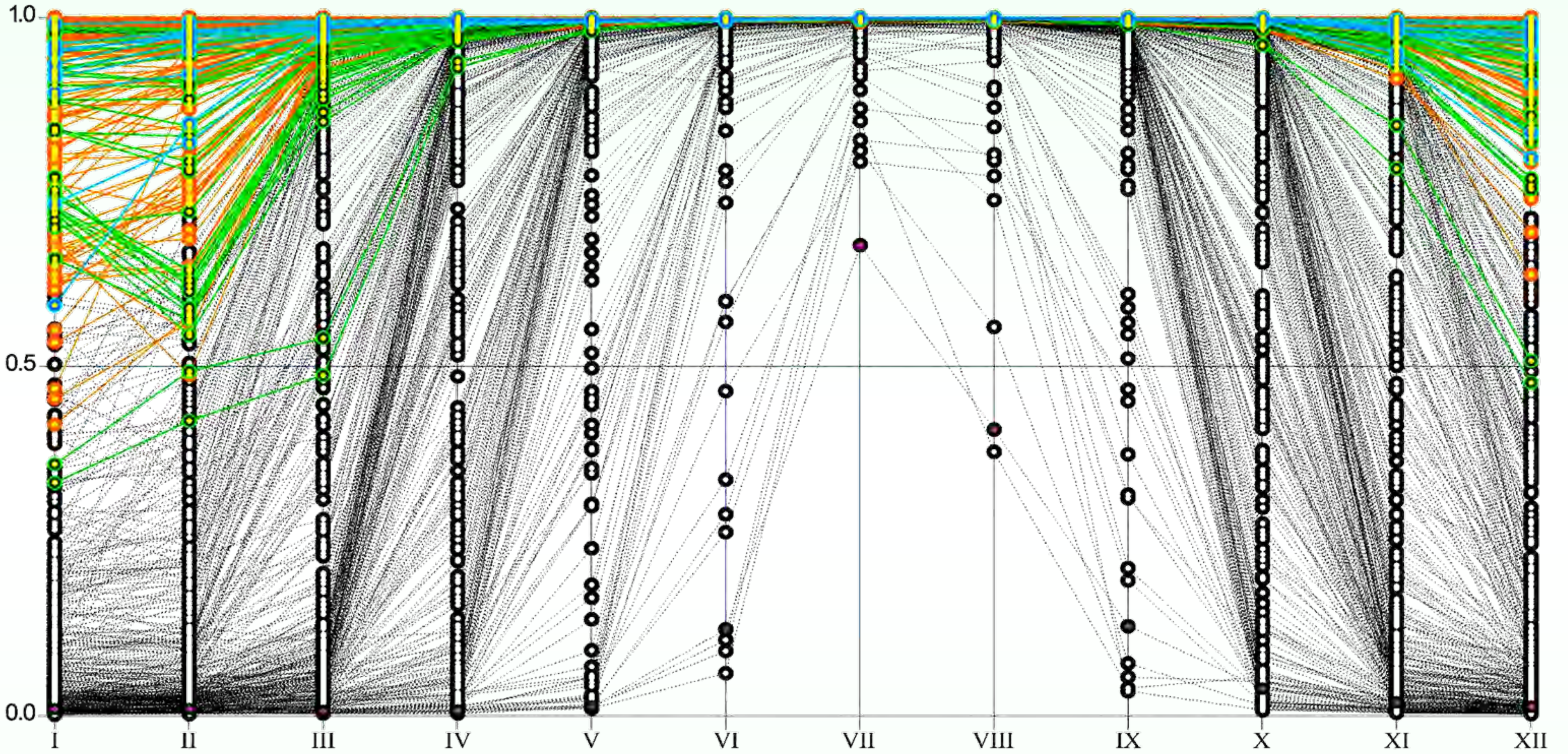
#	SI	Latitude °N	Longitude °	Country
1	7015	50.6	3.1	France
2	6447	50.8	4.4	Belgium
3	10469	51.3	12.4	Germany
4	10410	51.4	7.0	Germany
5	3955	51.9	-8.5	Ireland
6	10361	52.1	11.6	Germany
7	6260	52.1	5.2	Netherlands
8	10338	52.5	9.7	Germany
9	10384	52.5	13.4	Germany
10	3962	52.7	-8.9	Ireland
11	3377	53.2	-0.5	England
12	3302	53.3	-4.5	England
13	3969	53.4	-6.3	Ireland
14	10147	53.6	10.0	Germany
15	10184	54.1	13.5	Germany
16	10170	54.2	12.1	Germany
17	10035	54.5	9.6	Germany
18	3917	54.7	-6.2	Ireland
19	3162	55.3	-3.2	England
20	3980	55.4	-7.3	Ireland
21	6186	55.7	12.5	Denmark
22	3100	56.5	-6.9	England
23	3091	57.2	-2.2	England
24	3026	58.2	-6.3	England
25	1415	58.9	5.6	Norway
26	3005	60.1	-1.2	England
27	1317	60.4	5.3	Norway
28	6011	62.0	-6.8	Denmark
29	1212	62.9	6.5	Norway
30	4018	63.1	-22.6	Iceland
31	4082	64.3	-15.2	Iceland

NORMALIZED SECOND INITIAL MOMENTS $\widehat{\eta}_l$



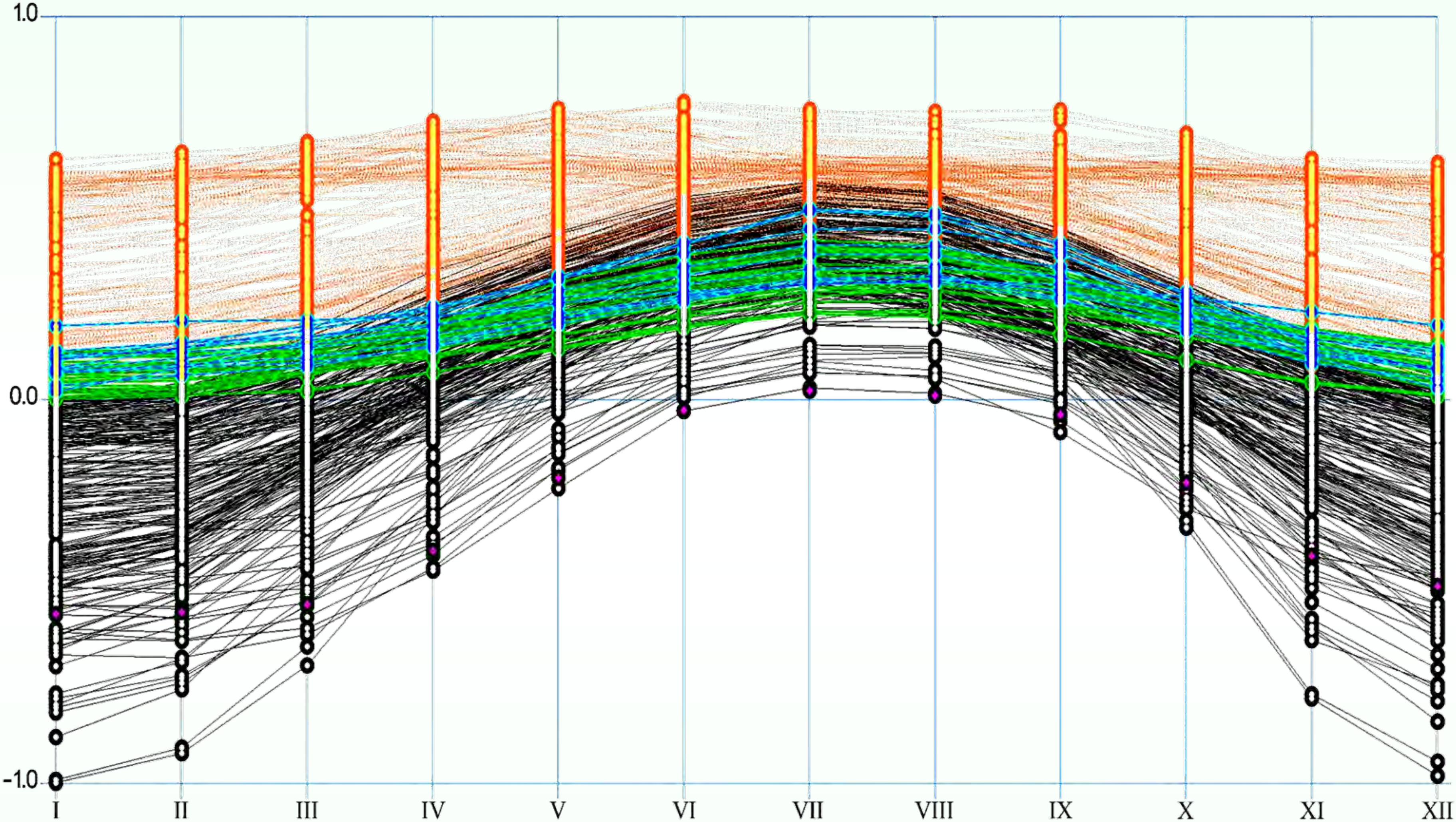
(yellow, orange) - 358 stations from 0,5° to 50° N
(green) - 31 stations in the North Atlantic from 50° to 64,3° N
(blue, cyan) - 11 stations of NW Coast of America, from 40,8° to 55° N
(black) - 418 stations that do not coincide with previous ones, from 80° to 50° N

NORMALIZED SECOND INITIAL MOMENTS $\widehat{\vartheta}_l$



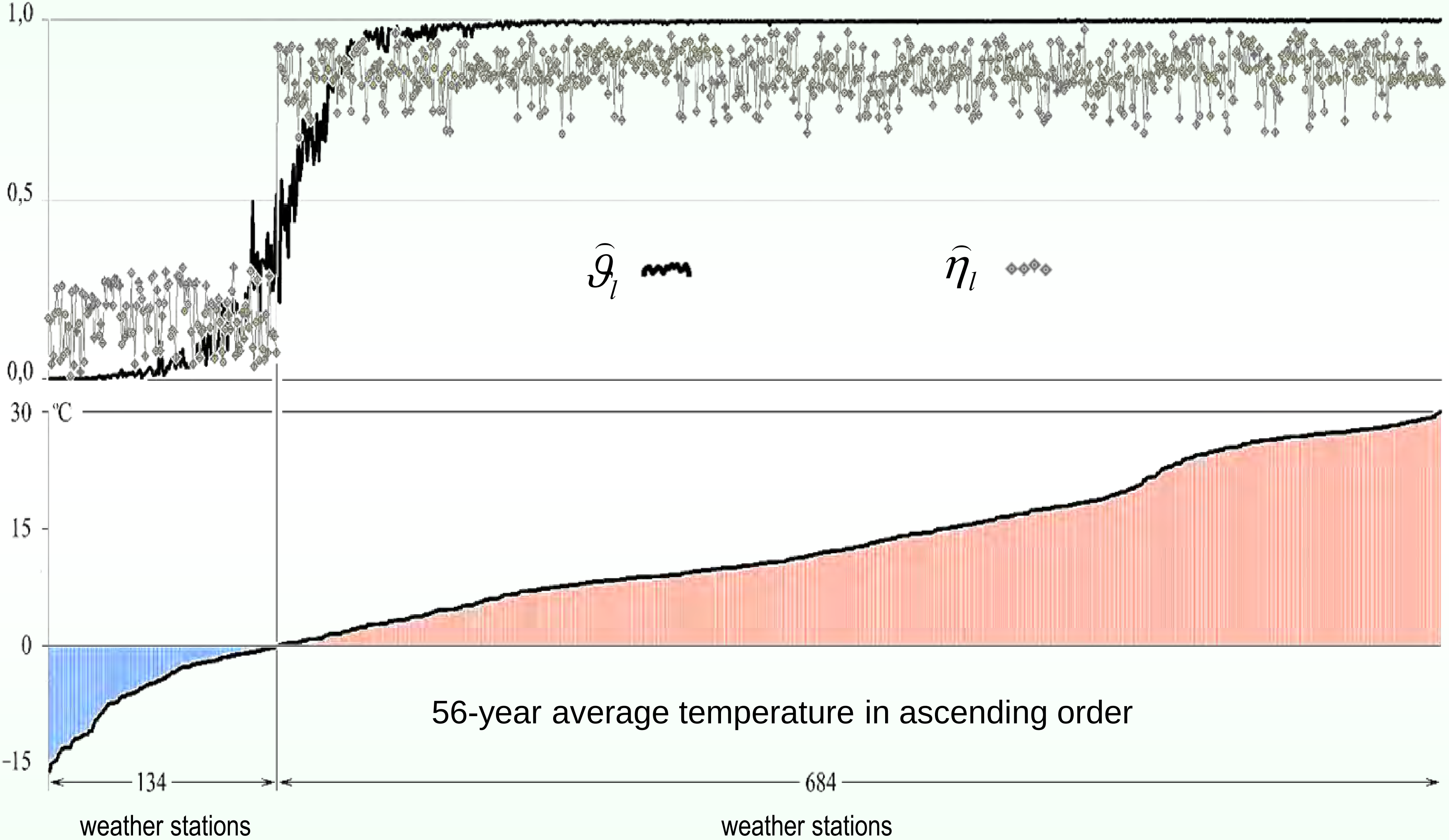
(yellow, orange) - 358 stations from 0,5° to 50° N
(green) - 31 stations in the North Atlantic from 50° to 64,3° N
(blue, cyan) - 11 stations of NW Coast of America, from 40,8° to 55° N
(black) - 418 stations that do not coincide with previous ones, from 80° to 50° N

NORMALIZED AVERAGE MONTHLY TEMPERATURES

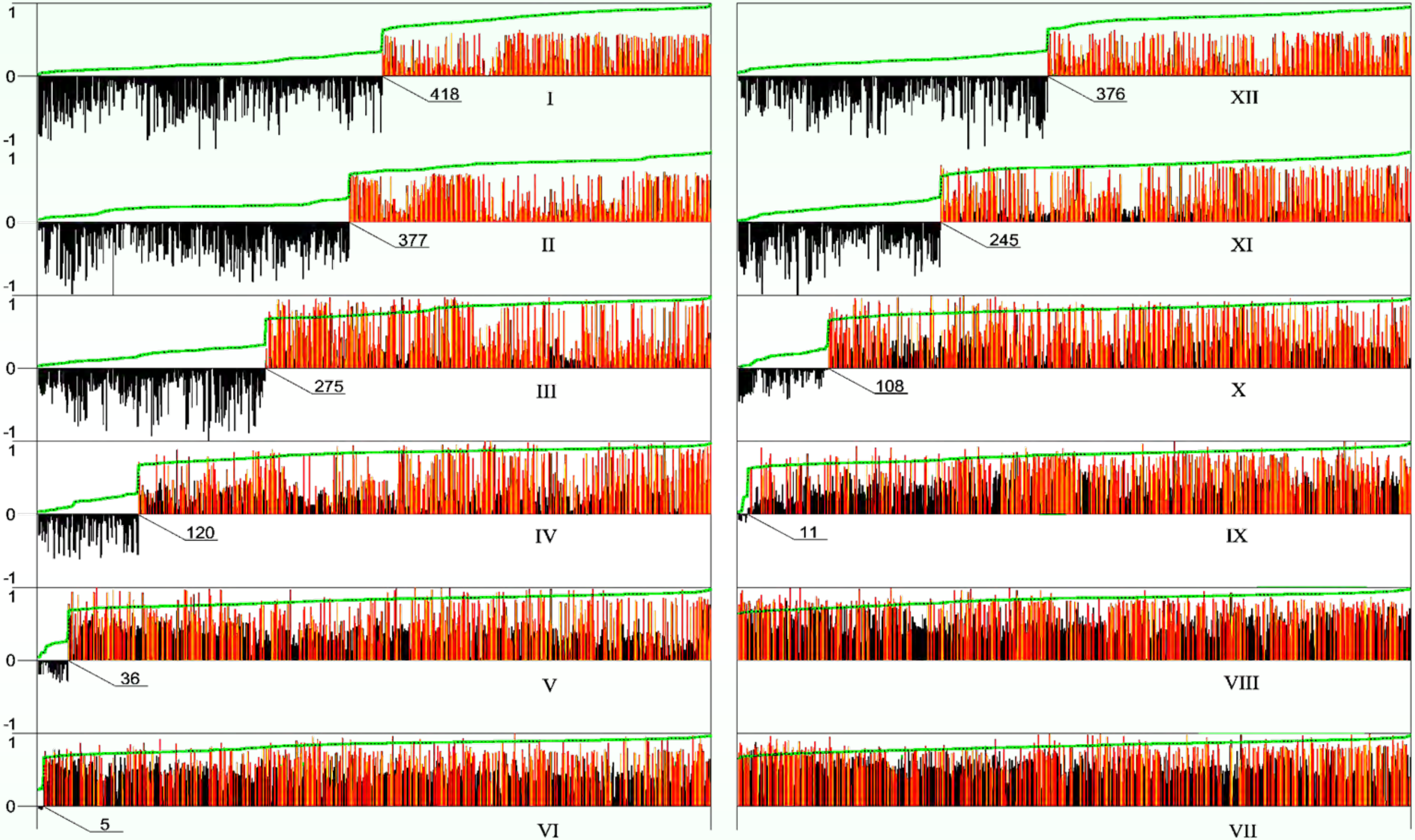


(yellow, orange) - 358 stations from 0,5° to 50° N
(green) - 31 stations in the North Atlantic from 50° to 64,3° N
(blue, cyan) - 11 stations of NW Coast of America, from 40,8° to 55° N
(black) - 418 stations that do not coincide with previous ones, from 80° to 50° N

56-YEAR NORMALIZED SECOND INITIAL MOMENTS, [1955, 2010]



COLLATION of MEAN TEMPERATURES & INITIAL MOMENTS $\widehat{\eta}_l$

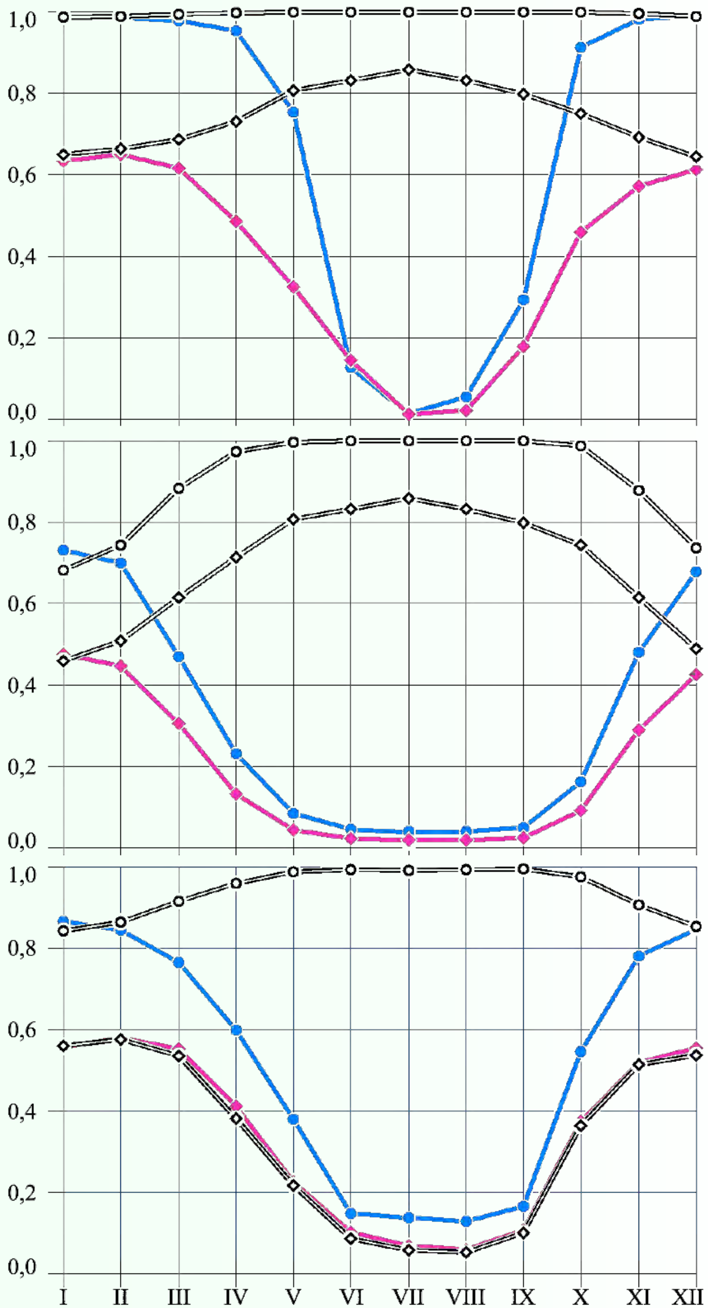


Black bars denote the polar and temperate zone; orange bars denote tropical and subtropical zone; green lines are moments $\widehat{\eta}_l$ ranged in ascending order. Each point of the abscissa corresponds to one of the weather stations.

$\mathrm{corr}\left(\widehat{\eta}_l, x_l\right)$

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
0.812	**0.779**	**0.719**	**0.657**	**0.387**	**0.148**	-0.050	-0.002	**0.386**	**0.615**	**0.778**	**0.778**

NORMALIZED JOINT INITIAL MOMENTS



$$ {}_{\uparrow}\widehat{\kappa}_{\vartheta} = \frac{({}_{\uparrow}x_{k,l}, \widehat{x}_{k,l})}{\sqrt{({}_{\uparrow}x_{k,l}, {}_{\uparrow}x_{k,l})(\widehat{x}_{k,l}, \widehat{x}_{k,l})}} $$

$$ {}_{\downarrow}\tilde{\kappa}_{\vartheta} = \frac{({}_{\downarrow}x_{k,l}, \tilde{x}_{k,l})}{\sqrt{({}_{\downarrow}x_{k,l}, {}_{\downarrow}x_{k,l})(\tilde{x}_{k,l}, \tilde{x}_{k,l})}} $$

$$ {}_{\uparrow}\widehat{\kappa}_{\eta} = \frac{({}_{\uparrow}x_{k,l}, \widehat{s}_{k,l})}{\sqrt{({}_{\uparrow}x_{k,l}, {}_{\uparrow}x_{k,l})(\widehat{s}_{k,l}, \widehat{s}_{k,l})}} $$

$$ {}_{\downarrow}\tilde{\kappa}_{\eta} = \frac{({}_{\downarrow}x_{k,l}, \tilde{s}_{k,l})}{\sqrt{({}_{\downarrow}x_{k,l}, {}_{\downarrow}x_{k,l})(\tilde{s}_{k,l}, \tilde{s}_{k,l})}} $$

$$ \widehat{\kappa}_{\vartheta} = \frac{(x_{k,l}, \widehat{x}_{k,l})}{\sqrt{(x_{k,l}, x_{k,l})(\widehat{x}_{k,l}, \widehat{x}_{k,l})}} $$

$$ \tilde{\kappa}_{\vartheta} = \frac{(x_{k,l}, \tilde{x}_{k,l})}{\sqrt{(x_{k,l}, x_{k,l})(\tilde{x}_{k,l}, \tilde{x}_{k,l})}} $$

$$ \widehat{\kappa}_{\eta} = \frac{(x_{k,l}, \widehat{s}_{k,l})}{\sqrt{(x_{k,l}, x_{k,l})(\widehat{s}_{k,l}, \widehat{s}_{k,l})}} $$

$$ \tilde{\kappa}_{\eta} = \frac{(x_{k,l}, \tilde{s}_{k,l})}{\sqrt{(x_{k,l}, x_{k,l})(\tilde{s}_{k,l}, \tilde{s}_{k,l})}} $$

$$ \widehat{r}_{\vartheta} = \mathrm{corr}(x_{k,l}, \widehat{x}_{k,l}) $$

$$ \tilde{r}_{\vartheta} = \mathrm{corr}(x_{k,l}, \tilde{x}_{k,l}) $$

$$ \widehat{r}_{\eta} = \mathrm{corr}(x_{k,l}, \widehat{s}_{k,l}) $$

$$ \tilde{r}_{\eta} = \mathrm{corr}(x_{k,l}, \tilde{s}_{k,l}) $$

CONCLUSION

The links between solar activity and temperature have been confirmed. The manifestations of these relations due to: the constant influx of solar energy, the presence of redistribution of the energy in surface layer, and the cyclical movements, in addition, it's very important to choice reasonable the averaging interval.
Having analyzed the temperature series at 818 weather stations of the Northern Hemisphere and the Wolf numbers from 1955 to 2010, the following results were obtained.

* The CS- or NS-components of the Wolf numbers and temperature series have significant correlation coefficients in the range from weak to strong values for small samples.
* The number of coincidences of signs of the Fourier coefficients of the average monthly temperature and Wolf number series varies from 86.9% to 97.7% in the fundamental mode, which contains 97% of energy of the temperature series.
* Positive values of the initial average annual temperatures different from CS-components and negative values – different from NS-components on 4% in the mean square sense along years and weather stations.
* Analyze of the initial and central, joint, and the second moments of CS- and NS-components and the initial dependencies is resulted in new details of the global redistribution of energy in the climate system.
* The second initial moments of the CS-, NS-components of the Wolf numbers display the climate geography, and fall into two ranges, the width and the distance between which is about 30% of the possible changes.
* The relationship between CS-components of the Wolf numbers and temperature series can be interpreted as an gain of energy from the Sun, and between NS-component - as an energy sink. Distribution of the gain and the sink over the weather stations undergoes jumps from about 27% in January to 39% in May, excluding July and August.

The new approach is informative; it describes the manifestation of the forcing and corresponds to the known concepts of natural and climatic processes. It deserves wide application and the search for other matches or mismatches. The results are convincing that the things, «which are seen», sometimes do not reflect the essence of the phenomenon; it may be helpful to look at latent things, «which are not seen» and are novel at least.

https://www.researchgate.net/profile/Valery_Tartakovsky

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ИМКЭС СО РАН