

Climate Monitoring for the Territory of CIS

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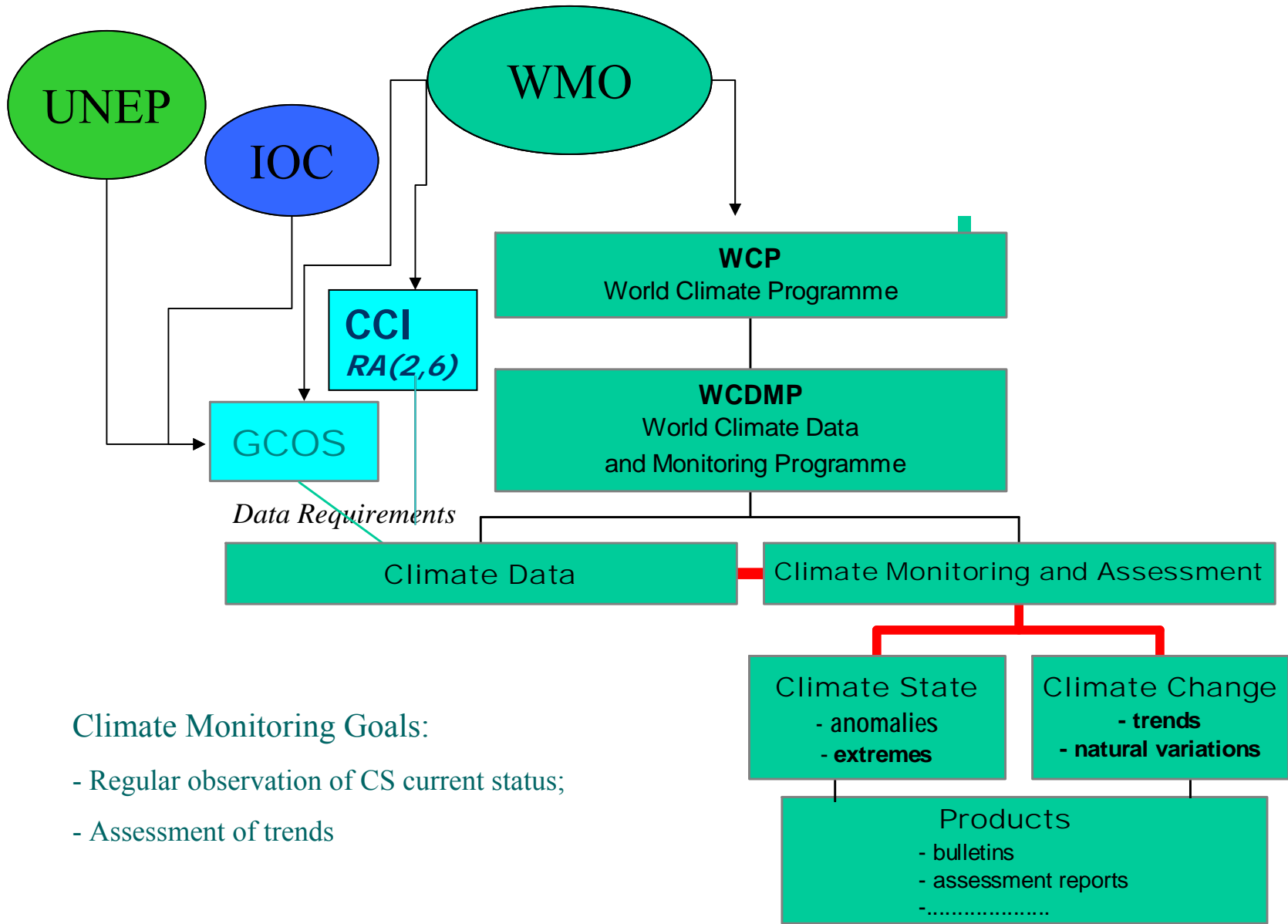
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ИЗМЕНЕНИЕ КЛИМАТА РОССИИ





Products (*NEACC website*)



NEACC Bulletin



4 seasons

Year

IGCE
CM Database
&
Technology

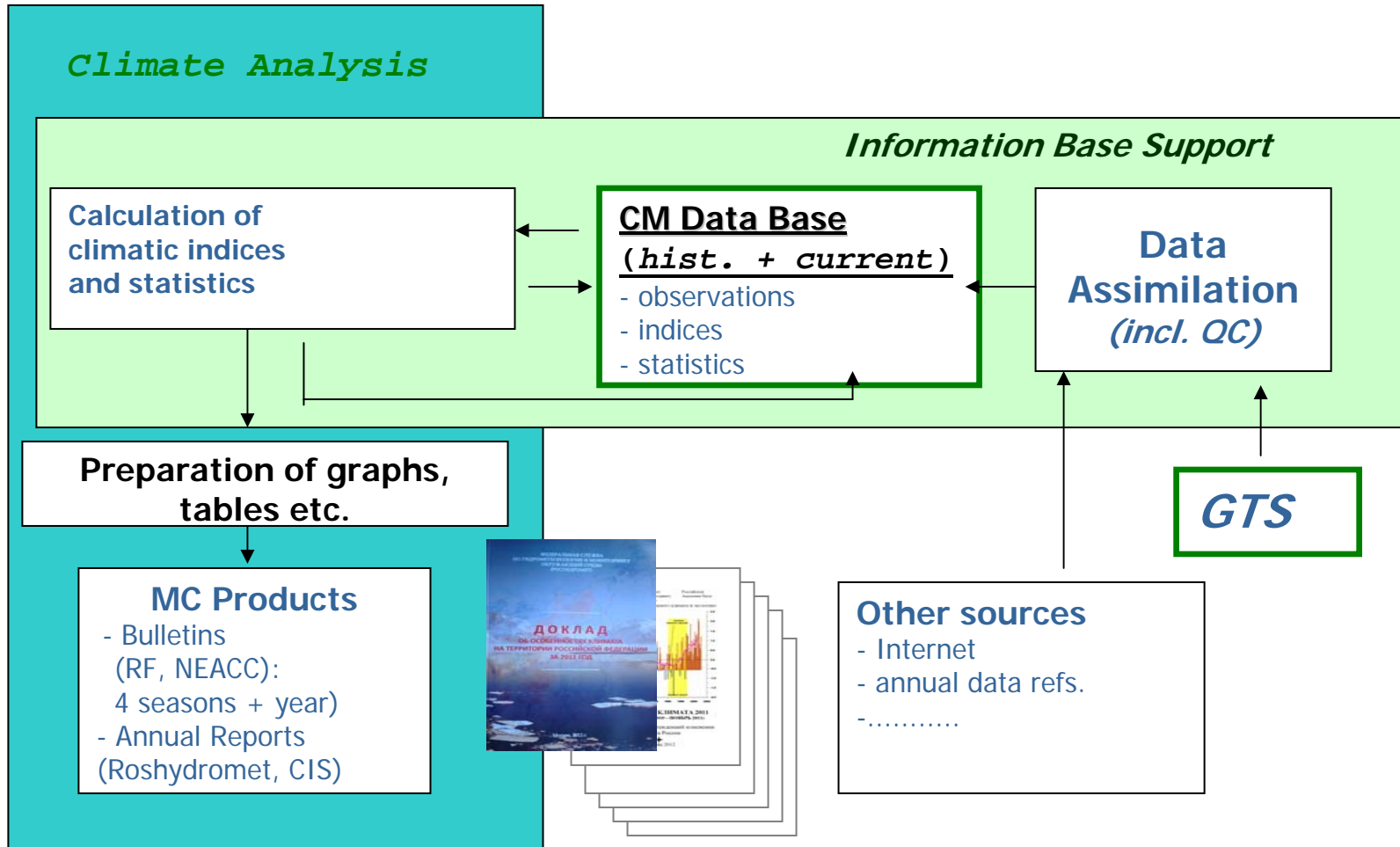


*Annual
Summary Report
on Climate Features and
Change on the Territories
of CIS States
(AR CIS)*



Compiled
data from
CIS NHMS
+
IGCE
CM Database

General Scheme of Climate Monitoring Technology (IGCE)



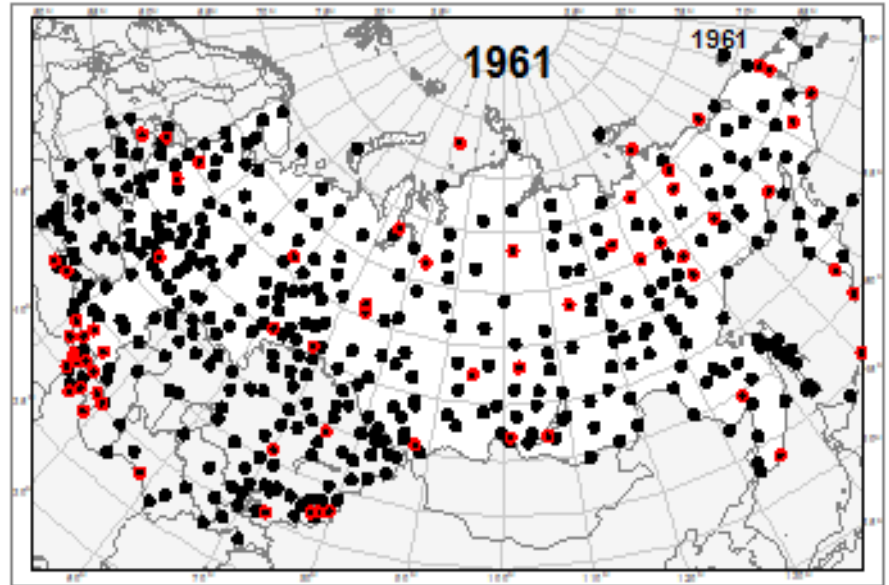
MC DATABASE

- *Historical Data*

- 1383 stations global monthly
(*SAT, Prcp*)
- MC CIS: 455 stations
- time series from:
 - 1951* – all;
 - 1886* – earliest (*longer ser. truncated*)
 - 1936* – most;

- *Current Data*

- CLIMAT reports from
 - Hydrometcenter RF (all avail.)
 - ARIHMI-WDC (CIS)
- SYNOP (Hydrometcenter RF)
 - presently for CLIMAT QC;*
 - daily extremes (in prosp.)*



Anomalies, indices, statistics

- **Station anomalies**
 - monthly
 - seasonal (*at least 2 mon. avail.*)
 - yearly (*at least 11 mon. avail.*)
- **Percentile indices**
- **Regional averages** (*algorithm accounts for uneven network density*)

• **Normals:** ref. per. 1961-90

Statistics/anomalies/indices/ calculated considering missing data:

$$Ex_{im} = \sum_y \delta_{iym} x_{iym} / \sum_y \delta_{iym}$$

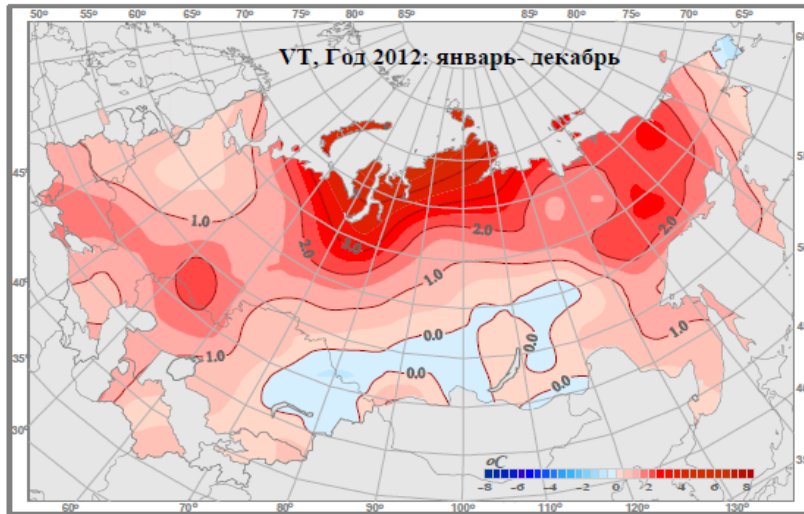
$$\delta_{iym} = \quad 1 \text{ data avail.}$$

$$0 \text{ --" -- missing}$$

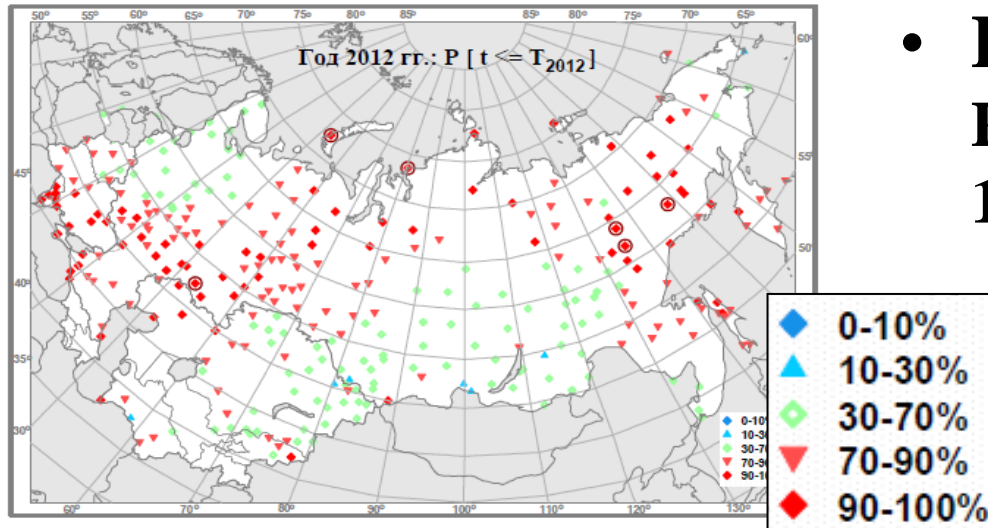
- **Sample statistics** (*rms, med, ...*) – **ref.per.**
- **Ranks** (1936 – cur. Year)
- **Trends** (1976 – cur. Year)

SAT Anomaly (2012, year)

- NECC Bulletin



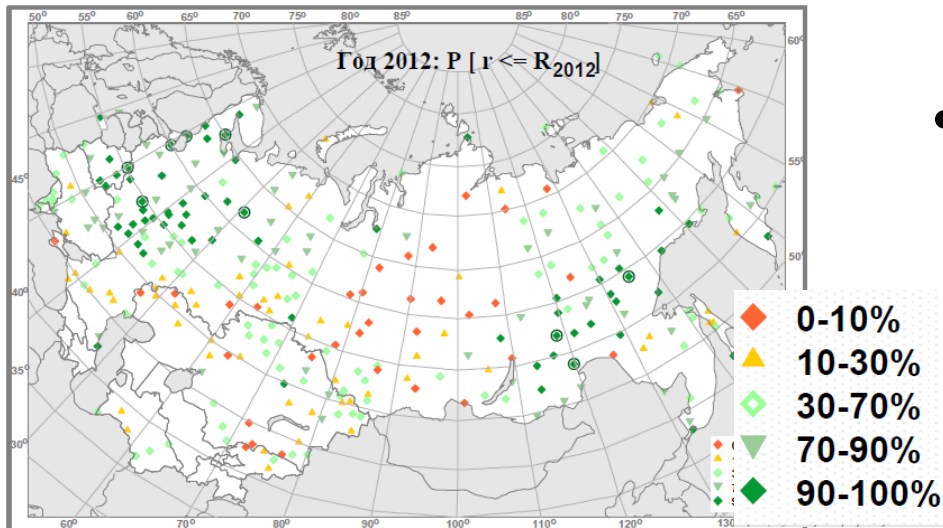
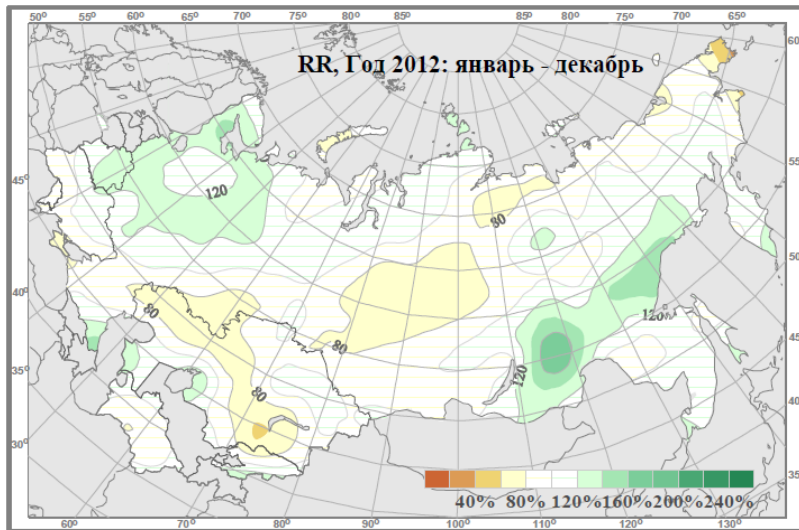
- **SAT anomaly (°C):**
deviation from
1961-90 ref. per. mean



- **Percentile index**
 $P\{T_y < T_{2012}\}$
1936 < y < 2011

Precipitation Anomaly (2012, year)

- NECC Bulletin

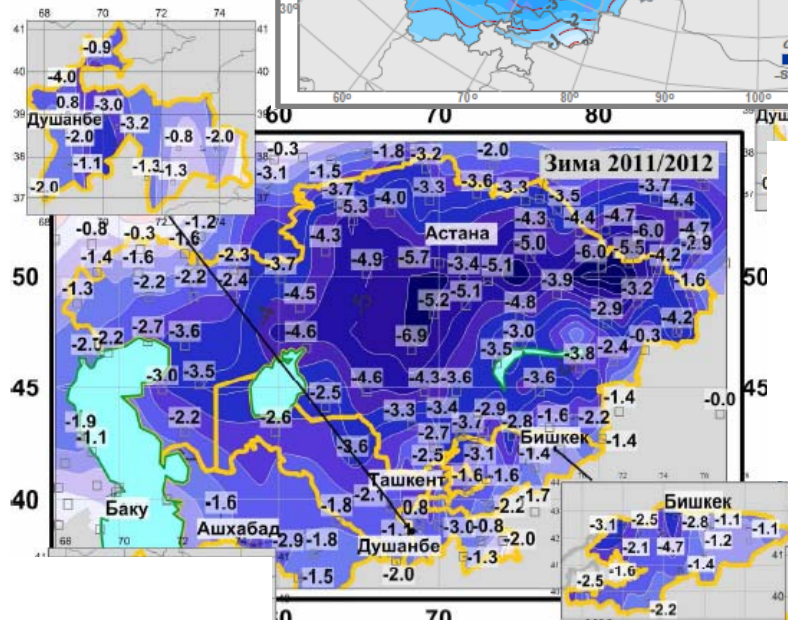
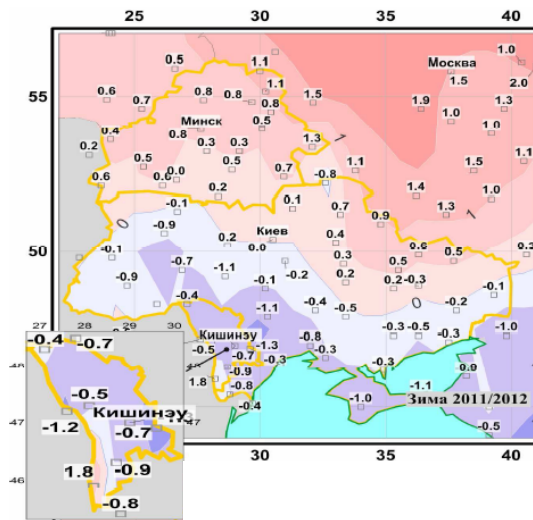
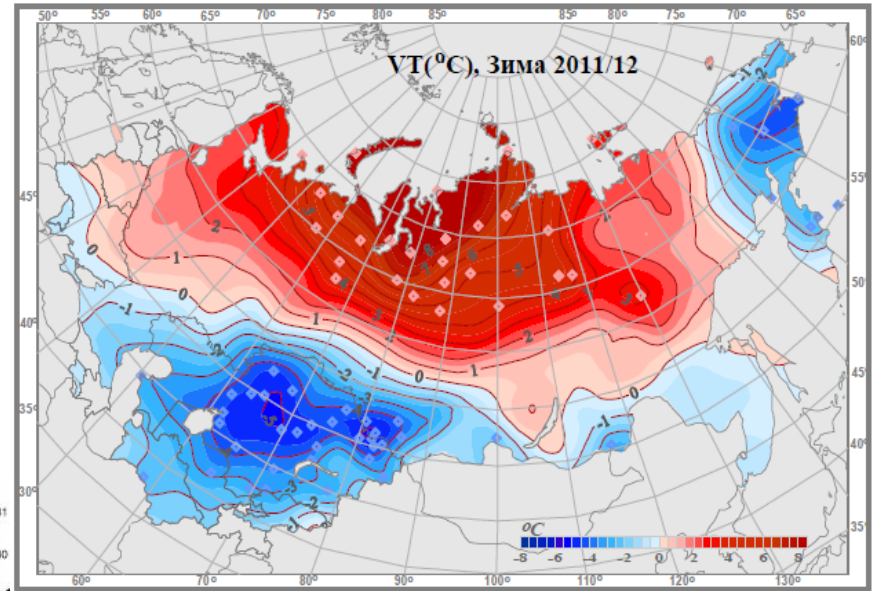


- SAT anomaly (°C):
deviation from
1961-90 ref.per. mean

- Percentile index
 $P\{T_y < T_{2012}\}$
1936 < y < 2011

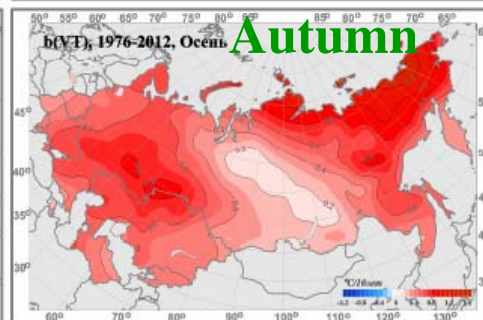
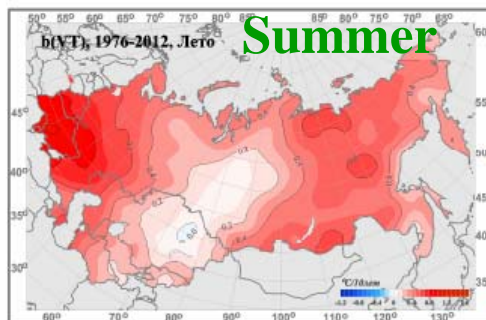
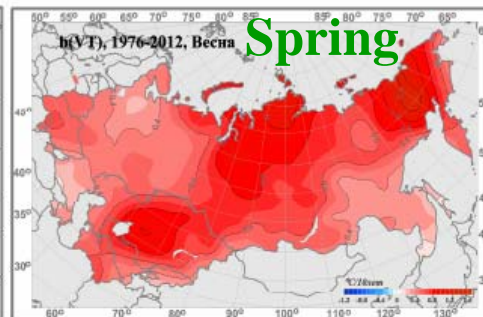
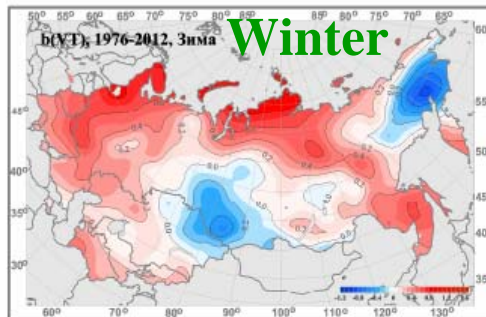
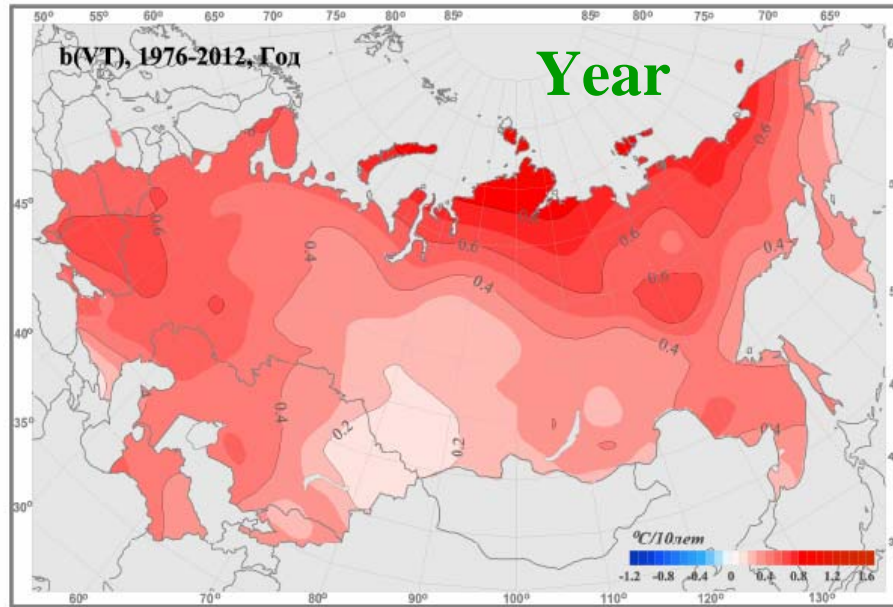
SAT Anomaly (2012, winter)

- **NECC Bulletin**
(*IGCE data only*)



- **Ann. Rep. CIS: Western & Eastern parts**
(*CIS NHMS data used*)

SAT trend 1976-2012 ($^{\circ}\text{C}/10 \text{ yrs}$)



Regional SAT trend 1976-2012

b- lin.trend ($^{\circ}\text{C}/10\text{ yrs}$) D – explained variance

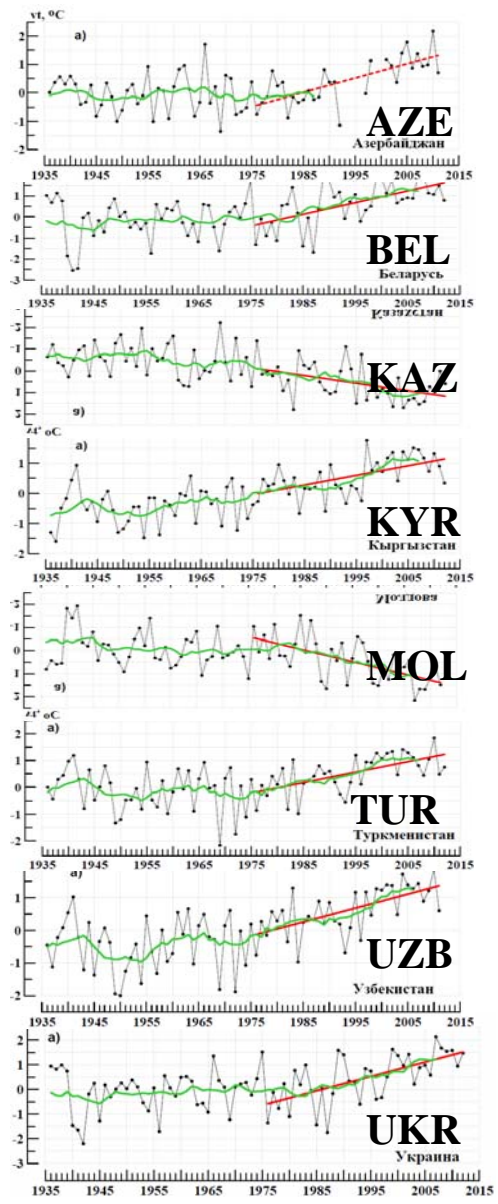
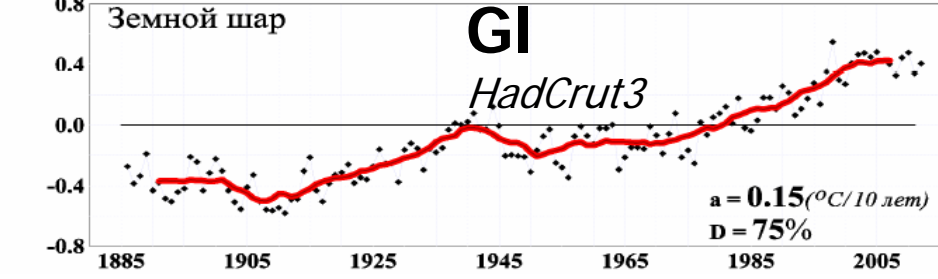
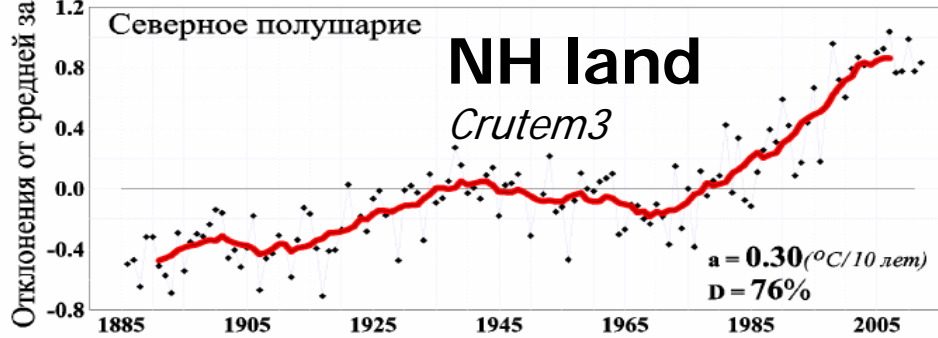
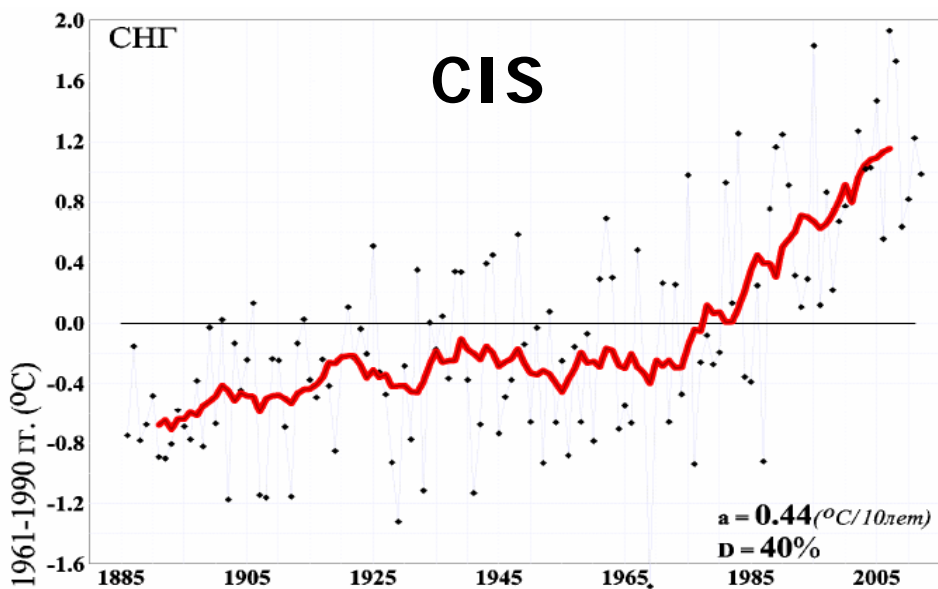
Регион		Year		Win		Spr		Sum		Aut	
		Год		Зима		Весна		Лето		Осень	
		<i>b</i>	<i>D</i>	<i>b</i>	<i>D</i>	<i>b</i>	<i>D</i>	<i>b</i>	<i>D</i>	<i>b</i>	<i>D</i>
Az	Азербайджан	-	-	-	-	0.31	-	0.71	-	-	-
Arm	Армения	-	-	0.19	0	-0.07	0	-	-	0.48	-
Bel	Беларусь	0.56		0.52	5	0.52		0.77		0.43	
Kaz	Казахстан	0.36		0.01*	0	0.70		0.22	10	0.57	
Kyr	Кыргызстан	0.32		0.29	5	0.45		0.19	10	0.41	
Mol	Молдова	0.54		0.24	2	0.56		0.95		0.45	
Rus	Россия	0.43		0.19	2	0.57		0.44		0.54	
Tad	Таджикистан	-	-	-	-	-	-	-	-	-	-
Tur	Туркменистан	0.39		0.32	4	0.52		0.33		0.44	
Uzb	Узбекистан	-	-	0.22	1	0.62		0.28		-	-
Ukr	Украина	0.58		0.38	4	0.53		0.92		0.53	

unreliable due to missing data

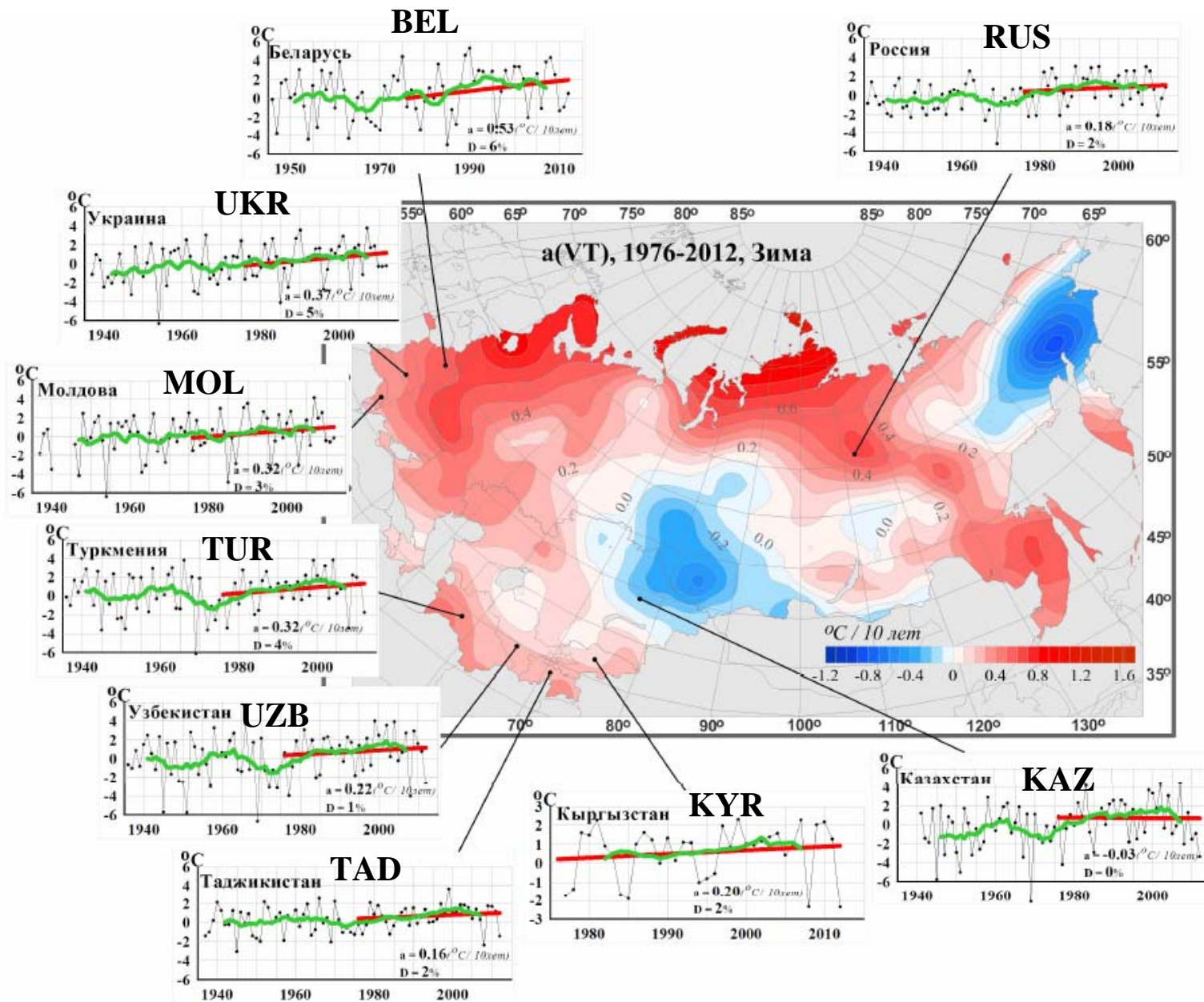
* -0.03 accord. to KazHMS

Signif. at 1%

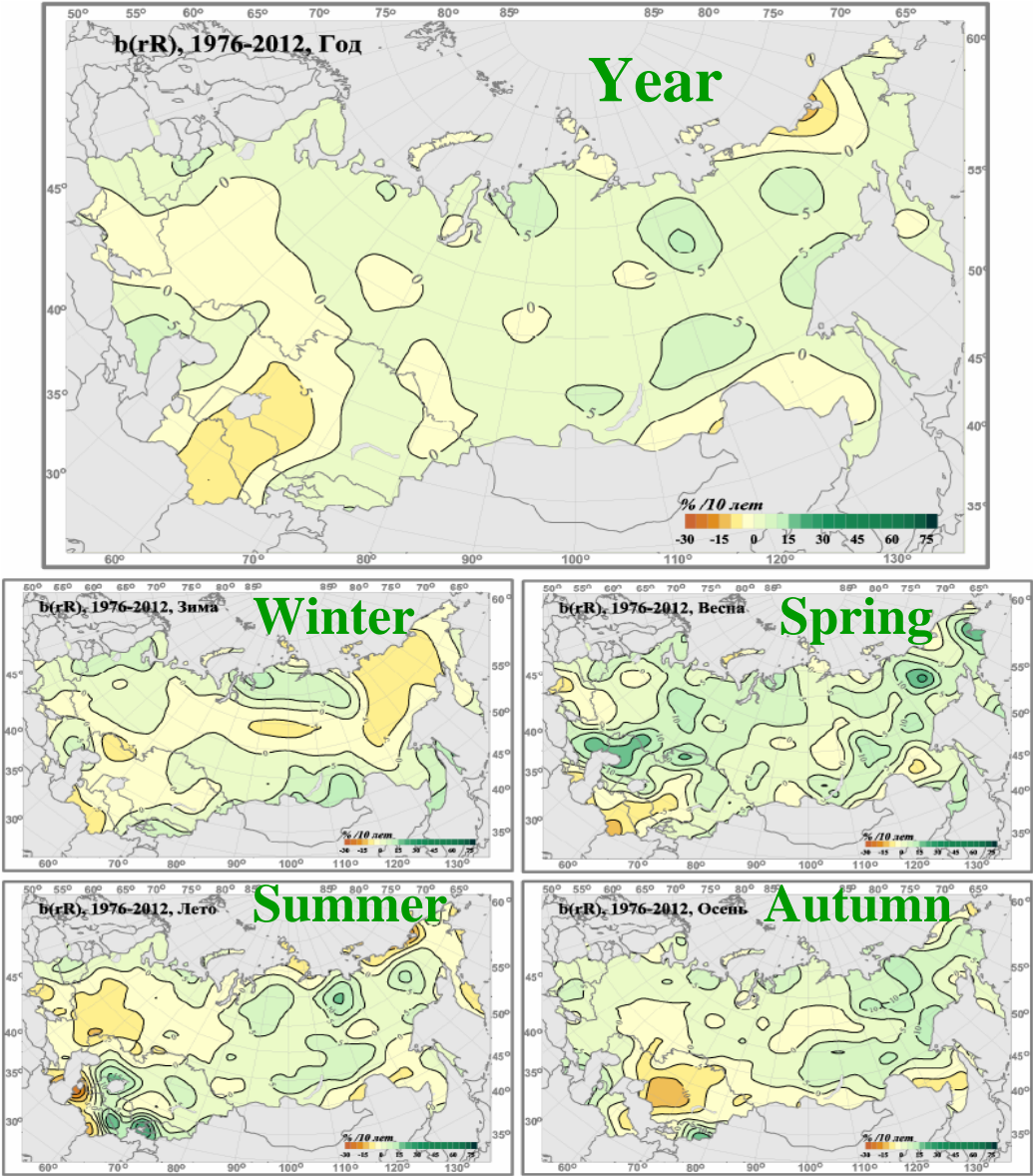
SAT Anomaly (year)



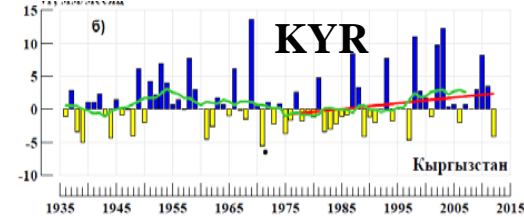
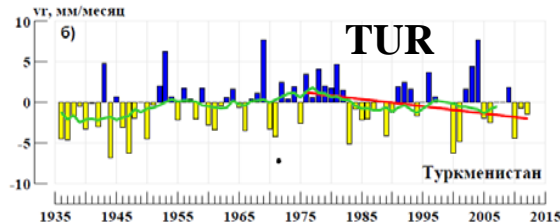
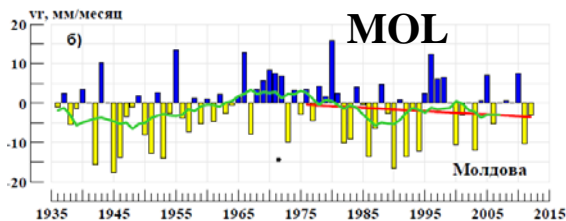
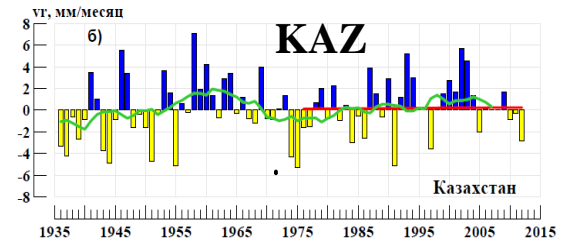
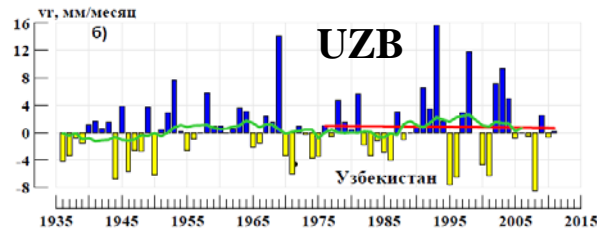
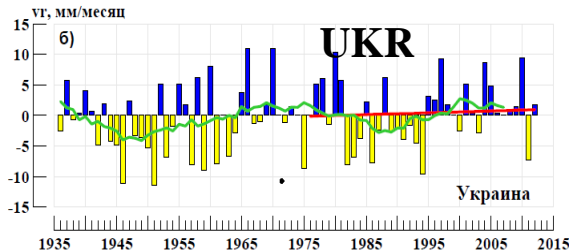
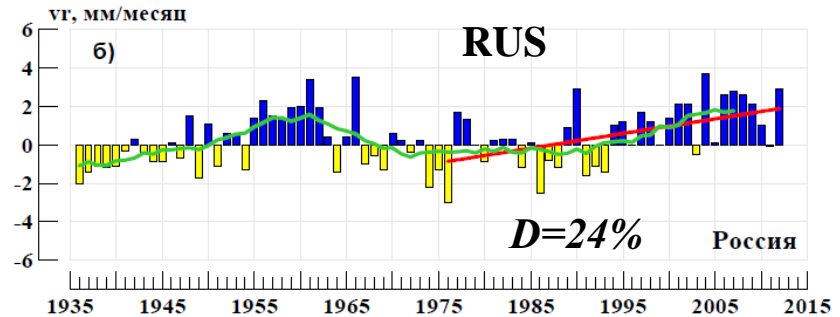
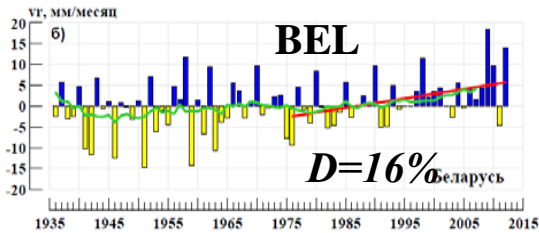
Winter SAT: time series & trend



Precipitation trend 1976-2012 (%/10 yrs)

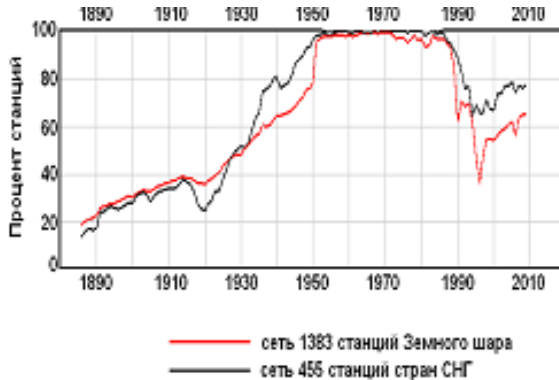


Annual Precipitation 1936-2012 over CIS states

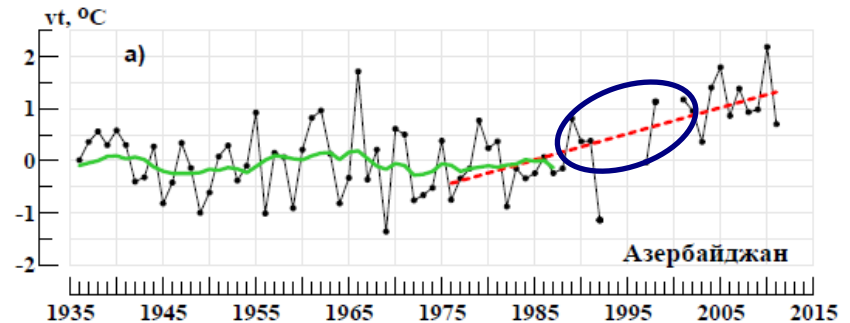


Problems

- Historical data gap of 1990s



...results in discontinuous series for some countries



- In some regions
 - list of stations reporting CLIMAT changes
 - Irregular CLIMAT reports currently

ARMENIA	
37682	AMASIA
37717	SEVAN OZERO
37789	YEREVAN

AZERBAIJAN	
37661	SHEKI
37735	GANDJA
37747	YEVLA KH
37860	MASHTAGA
37936	NAKHCHIVAN
37989	ASTARA
37850	BAKU