PROVIDING THE UPPER-AIR DATA RELEVANT TO STUDIES OF THE NORTHERN POLAR CLIMATE CHANGES

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- “Data policy is servant of research objectives”, so the goal is to serve the research to answer the two IPCC questions:
  - Is climate becoming warmer
  - Is climate becoming more variable and more extremal

- The International Polar Year (IPY) research activity presumes wide study of all components of the climate system. Among the topics of this study, the Upper-Air (U/A) climate status and changes are a significant part

- In more details, the study of the Northern Polar Zone (NPZ) U/A Climate is to concentrate on monitoring and data collection issues. There are several difficulties in successful decision of these data and information problems, which are discussed in this paper.

Main sources of our knowledge uncertainty

- High variability of the U/A parameters in the NPZ
- lack of observational data, especially for the Northern polar zone lying in Russian sector of Arctic
- This lack of data is the reason to apply special methods of analysis of those data that are available.
- In this situation, the value of observations **(even the value of each single observation!)** is growing essentially!!!!
- There must not be illusion that absolutely perfect data for U/A climate study in the NPZ could be ever existing – let us be realistic!!!!!

Problems and difficulties

- The following problems and difficulties related to data for the U/A climate studies in the NPZ, are:
- -obtaining long period U/A observations from various possible sources,
- - inhomogeneity detection (approaches and methods specific for the Northern Polar Zone),
- - assessment of data availability from the known radiosonde datasets
- - radiosonde data vs satellite data for the NPZ
- - the main tendencies in U/A climate change for the NPZ

Updating database

- 116 radiosonde stations in the NPZ, are selected
- Sources of data:
  - Daily data from AEROSTAB (from RIHMI-WDC, Obninsk)
  - Monthly **CLIMAT TEMP,** coming from GTS
- Potential sources of data:
  - IGRA dataset (NCDC/NOAA)
  - Digitized data from fUSSR stations
  - Data in tabular form for 1950s and early 1960s (need to be digitized)

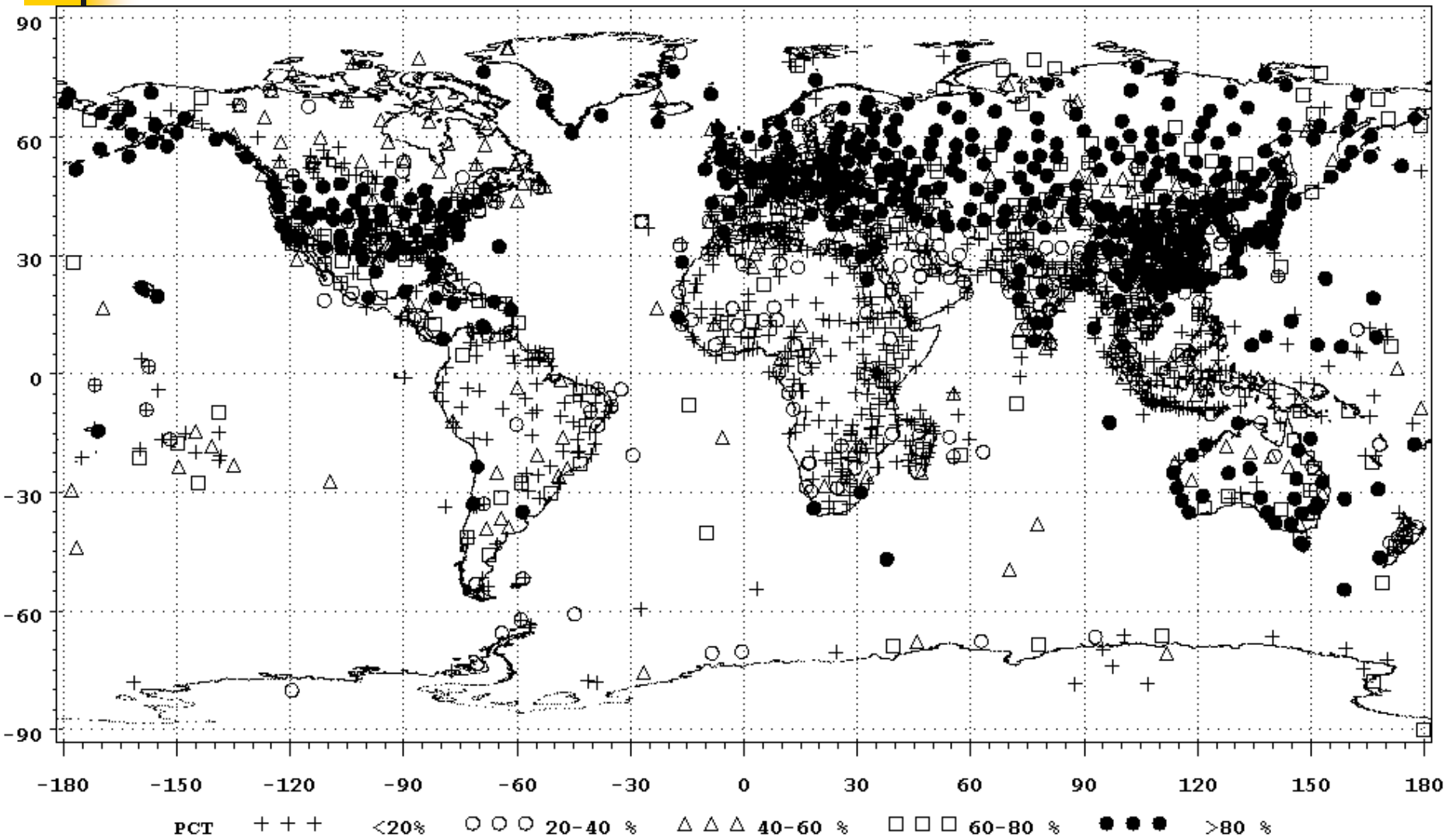
As a result:

- the series are updated including December 2005
- Anomalies adjusted to corresponding standard deviations, are calculated
- The results are averaged with weighting, for the region north to 60N

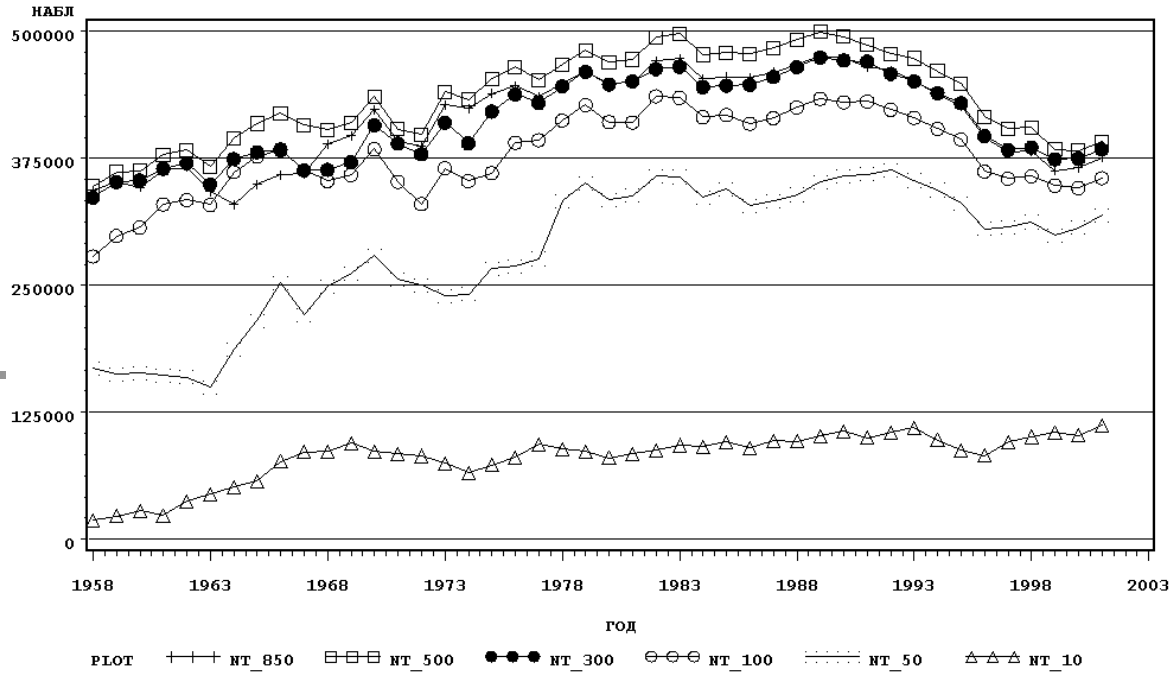
Datasets available now for the upper-air climate studies

- SATELLITE:
- MSU based temperature series:
- UAH (University Alabama at Huntsville) available at VORTEX.NSSTC.UAH.EDU/DATA/MSU/, WWW.NSSTC.UAH.EDU/DATA/MSU/
- RSS (Remote Sensing Systems, Inc.) available at HTTP://WWW.SSMI.COM/MSU/DATA/,
- FTP://FTP.SSMI.COM/MSU/DATA/
- Reanalysis Outputs (Are they Data??? Are they appropriate???)
- Derivaties (monthly statistics) (IGRA-monthly, MONADS)

Global Radiosonde Network (% of max possible obs)(CARDS, 1958-2001)



GLOBE, 1958-2001



RUSSIAN FEDERATION,

1958-2001

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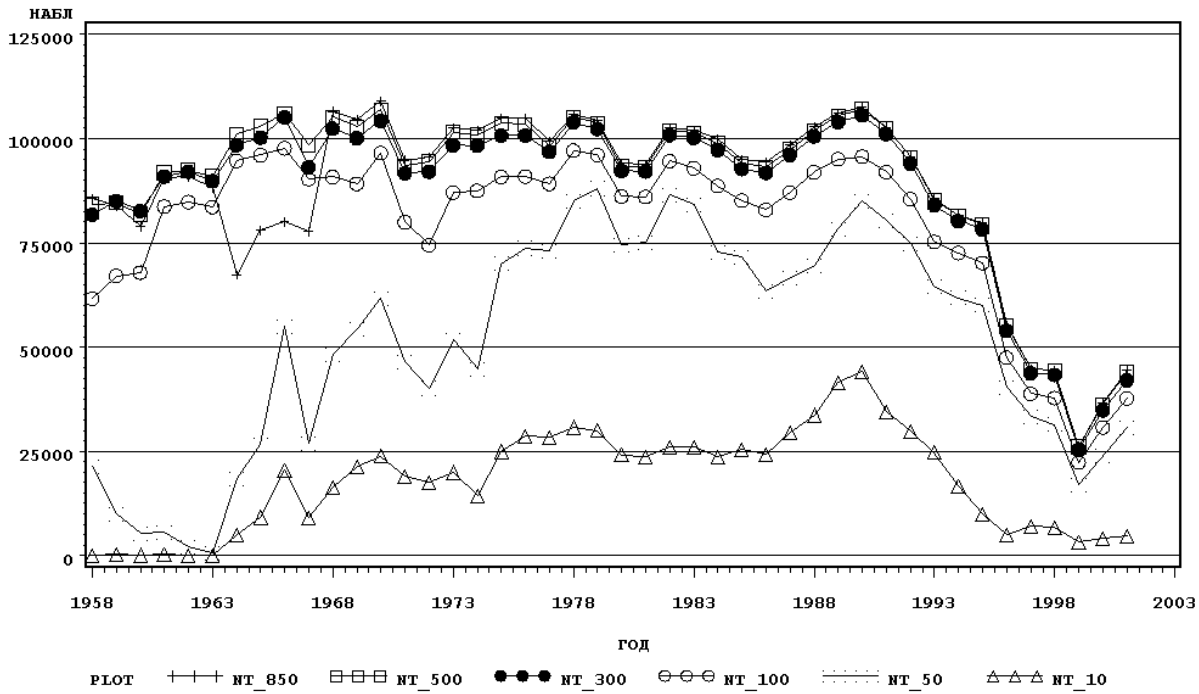
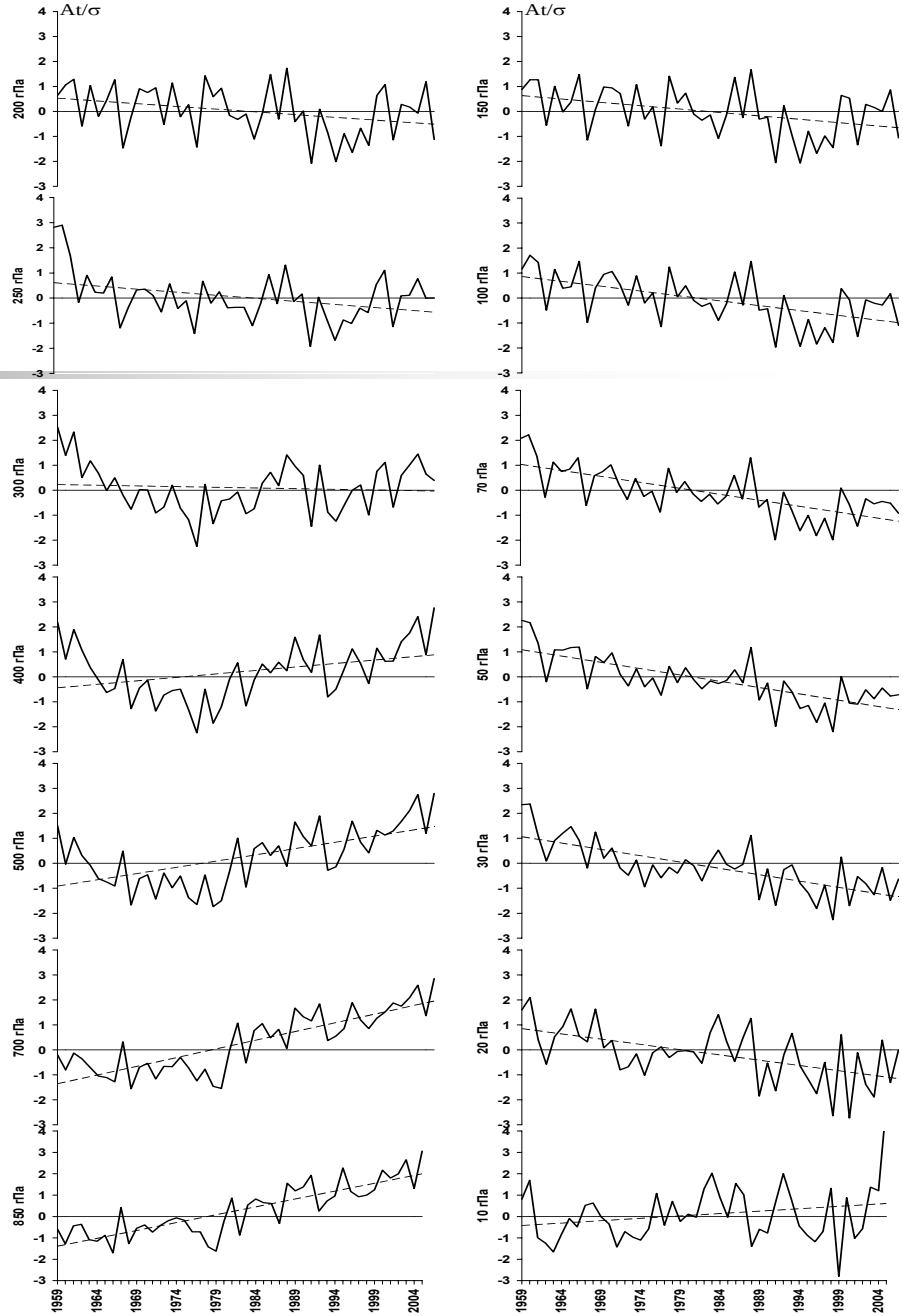


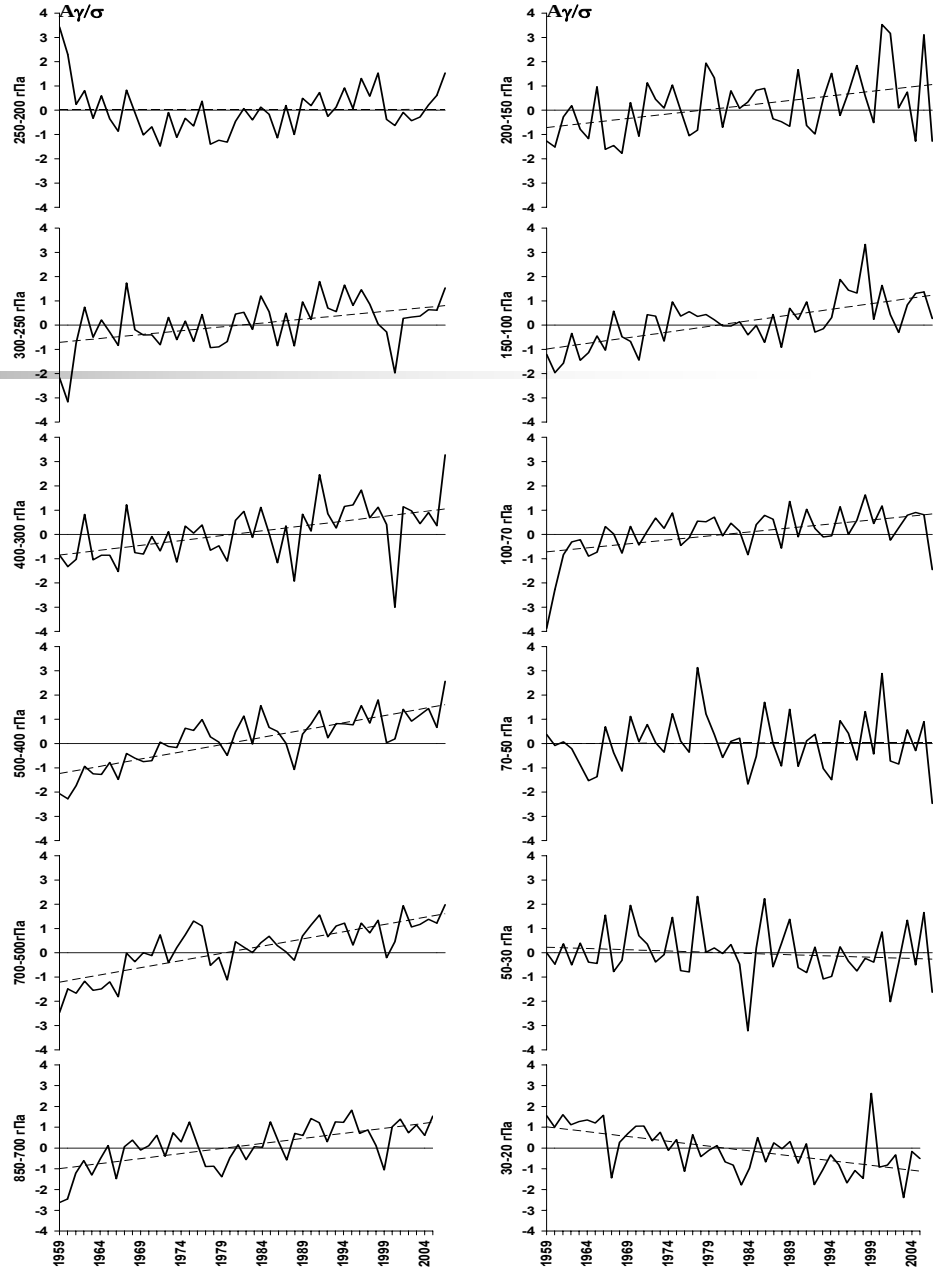
Some features of U/A T, H, RH for the Northern Polar Zone

TEMPERATURE, AT/std T



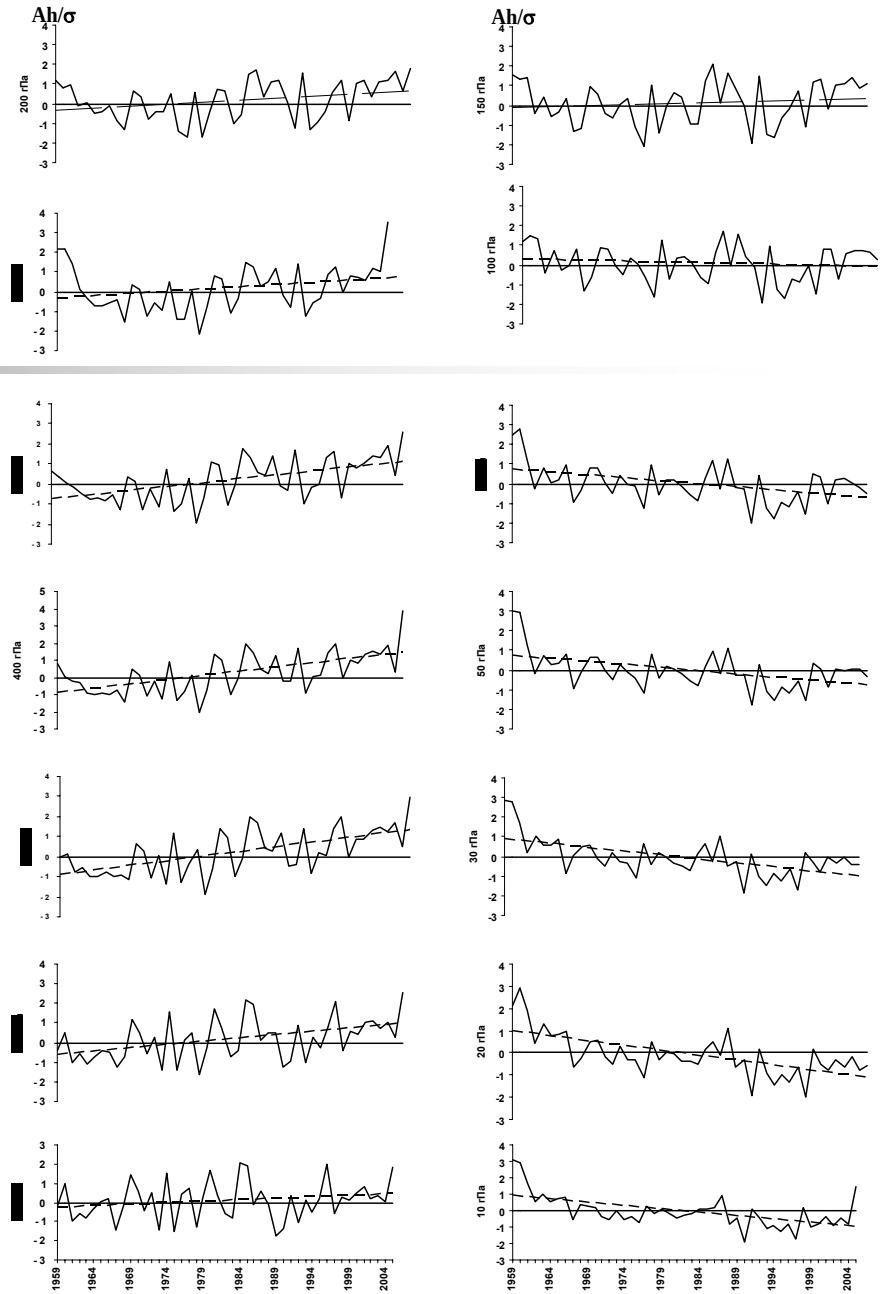
Some features of U/A T, H, RH for the Northern Polar Zone

VERTICAL GRADIENT OF TEMPERATURE, ADT/std DT



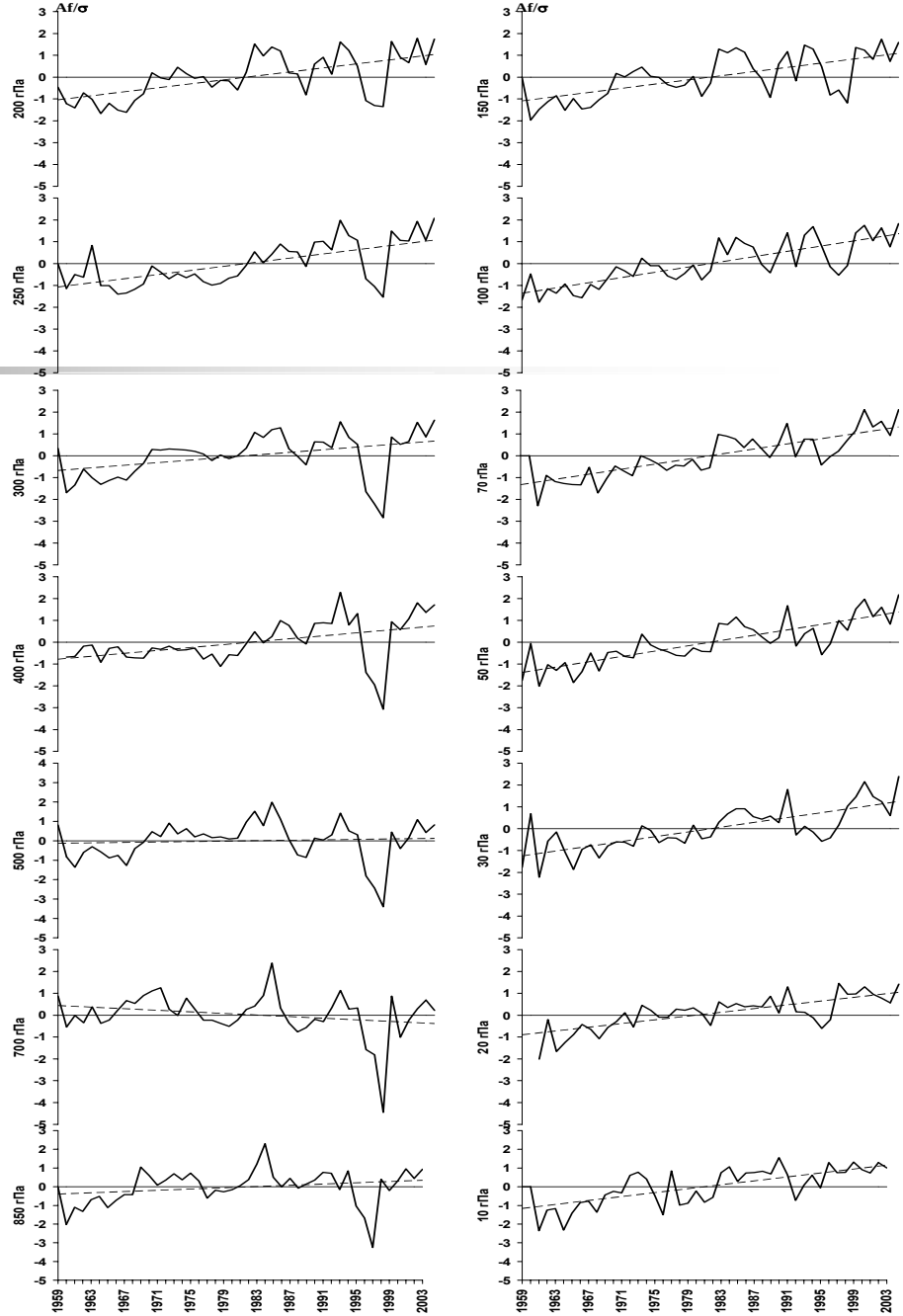
Some features of U/A T, H, RH for the Northern Polar Zone

Height, AH/std H



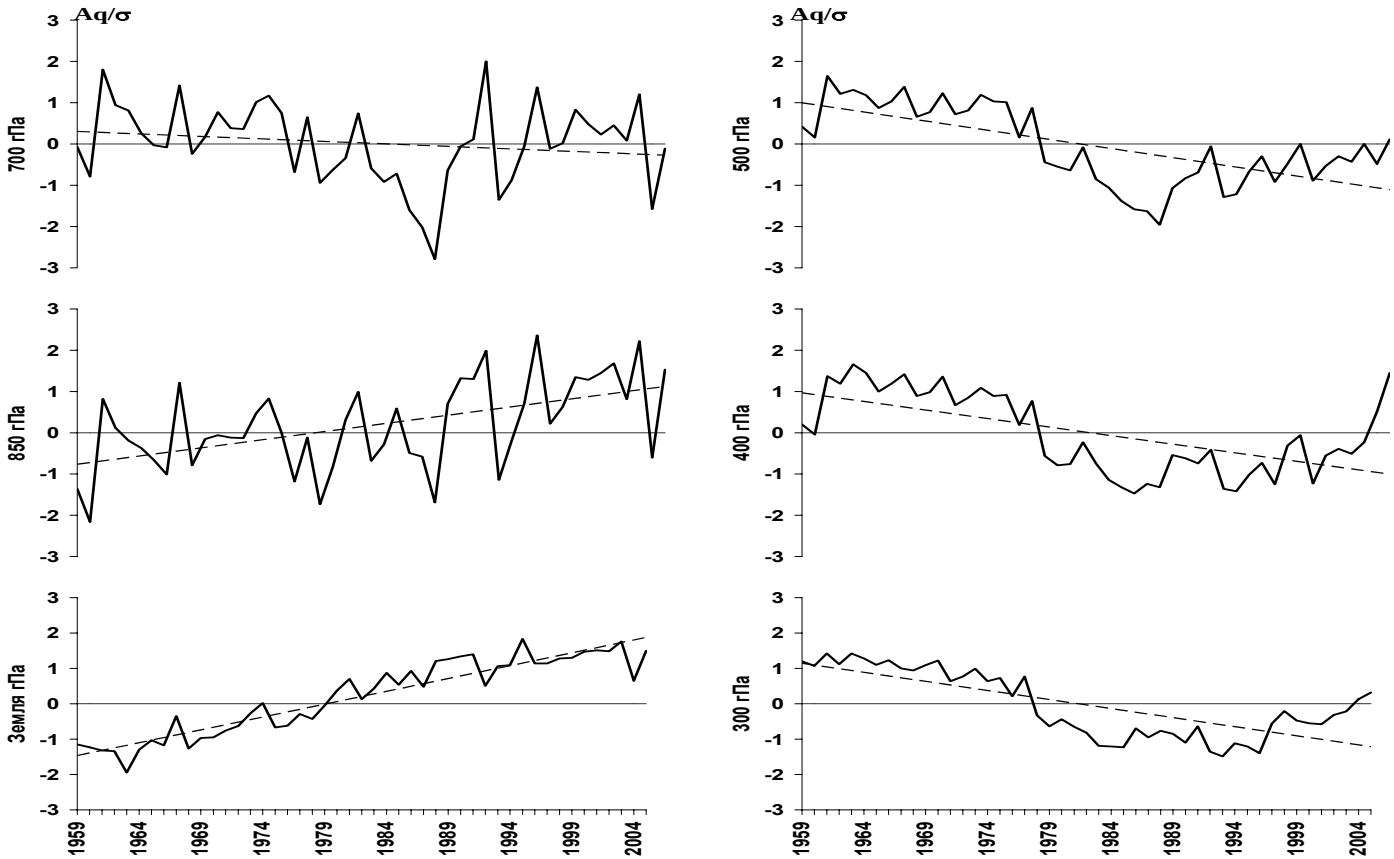
Some features of U/A T, H, RH for the Northern Polar Zone

Wind speed, AW/std W

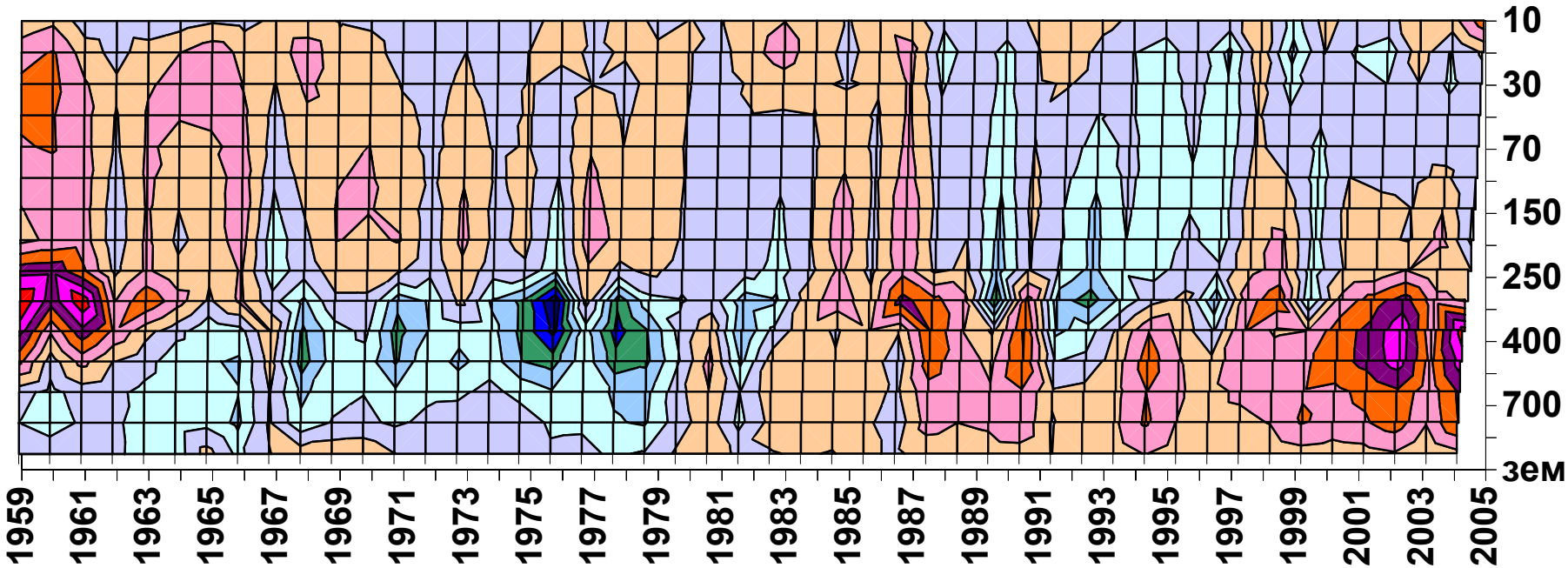


Some features of U/A T, H, RH for the Northern Polar Zone

Relative humidity, ARH/std RH

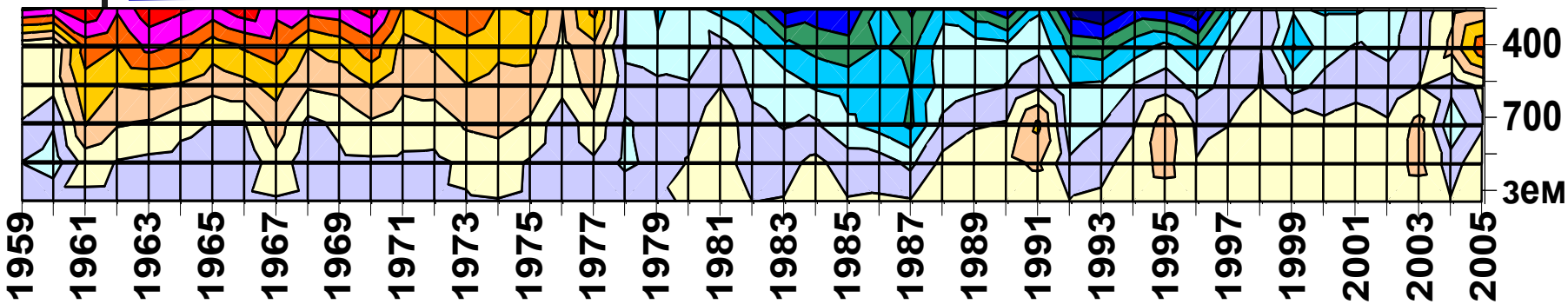


Annual T adjusted anomalies



-6,0--5,0 -5,0--4,0 -4,0--3,0 -3,0--2,0 -2,0--1,0 -1,0-0,0 0,0-1,0 1,0-2,0
2,0-3,0 3,0-4,0 4,0-5,0 5,0-6,0

Annual RH adjusted anomalies

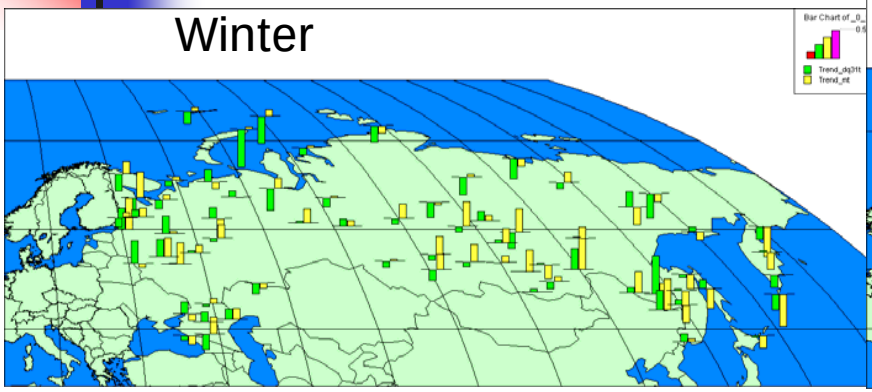


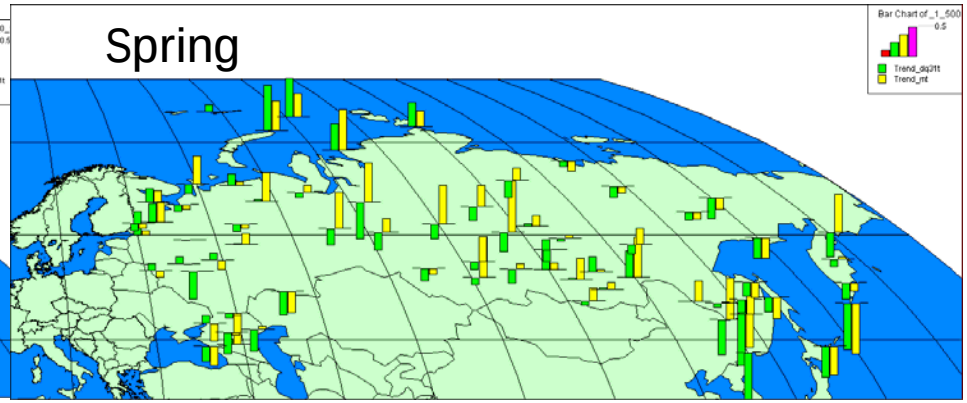
-120,0--100,0 | -100,0--80,0 | -80,0--60,0 | -60,0--40,0 | -40,0--20,0 | -20,0-0,0
0,0-20,0 | 20,0-40,0 | 40,0-60,0 | 60,0-80,0 | 80,0-100,0 | 100,0-120,0

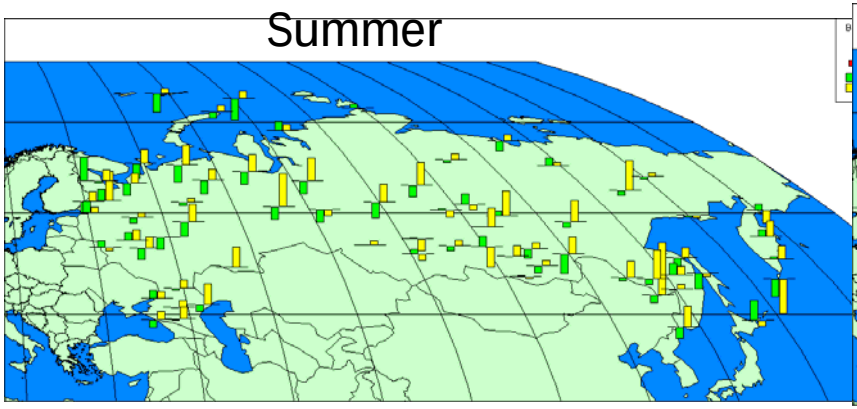
Low Frequency Signal in the Intraseasonal Variability Parameters

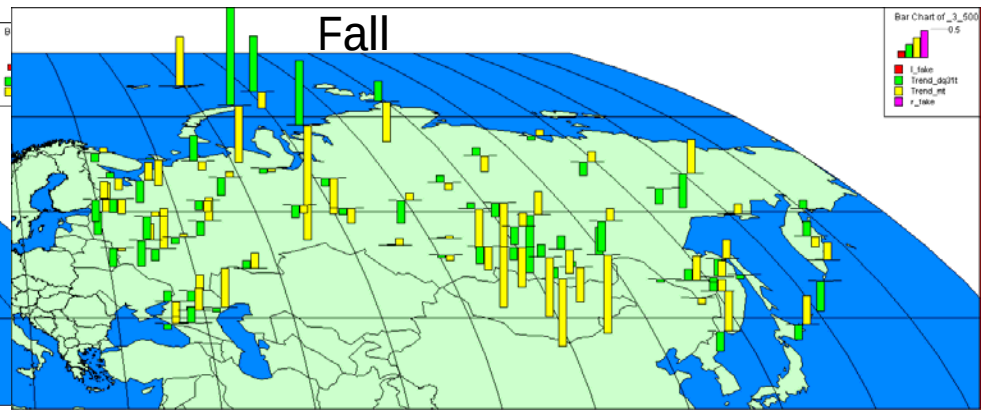
- IPCC 1995 SAR, 2001 TAR: Is Climate becoming more variable and more extremal?
- Is connected to the problem of extremal events, natural disasters, etc.
- Iskenderian & Rosen (Journ. Climate, 2000) used Oort's statistics and NCAR/NCEP reanalyses
- For the station data: series of monthly and seasonal STD and monthly & seasonal Adjusted Interquartile range (special selection of stations needed); gaps in data make this problem difficult
- But plus is that inhomogeneities of level shift type do not affect the trends

Trends in seasonal 500 hPa temperature mean (yellow) and seasonal Adjusted Interquartile Ranges (AdjIQR)(green),1964-2003



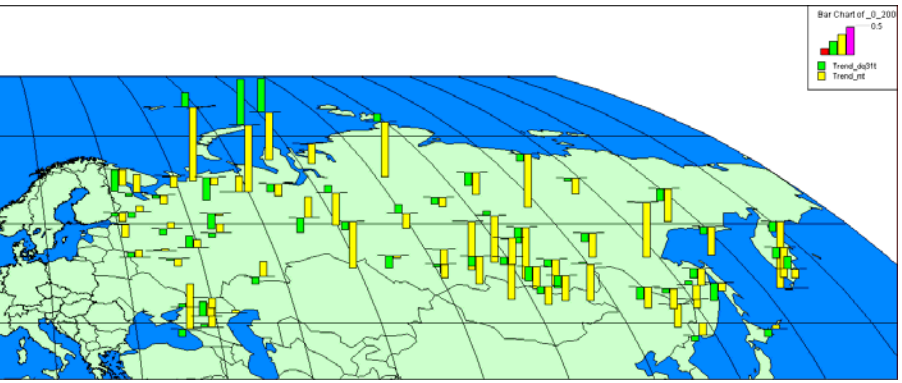




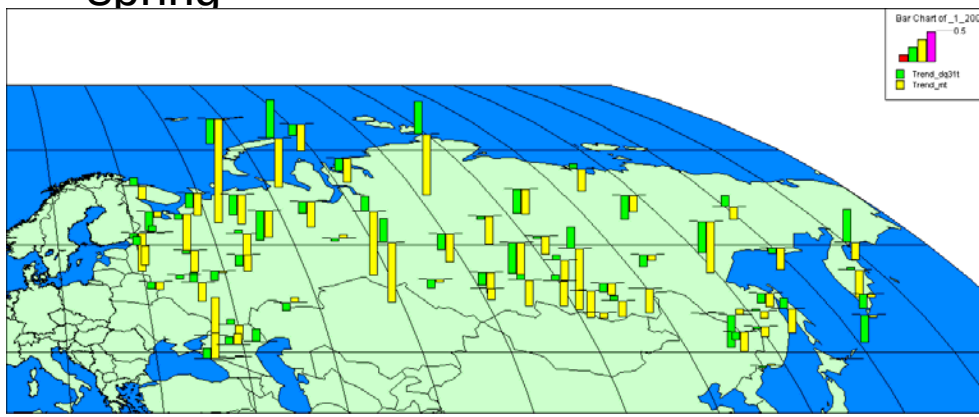


Trends in seasonal 200 hPa temperature mean (yellow) and seasonal Adjusted Interquartile Ranges (AdjIQR)(green),1964-2003

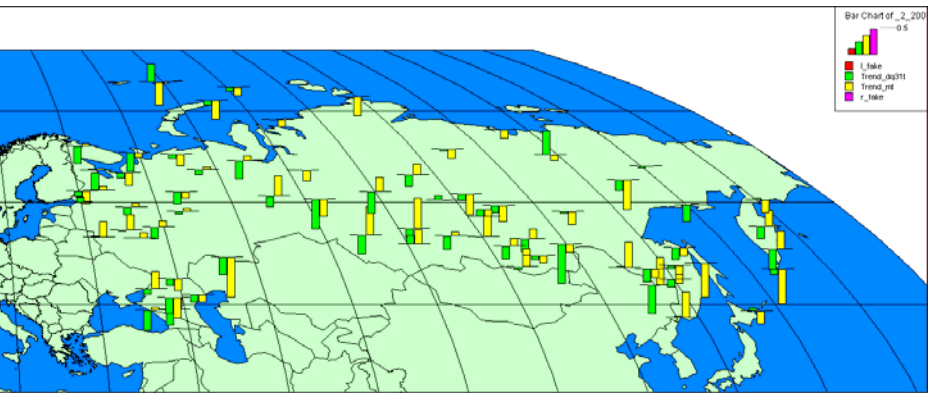
Winter



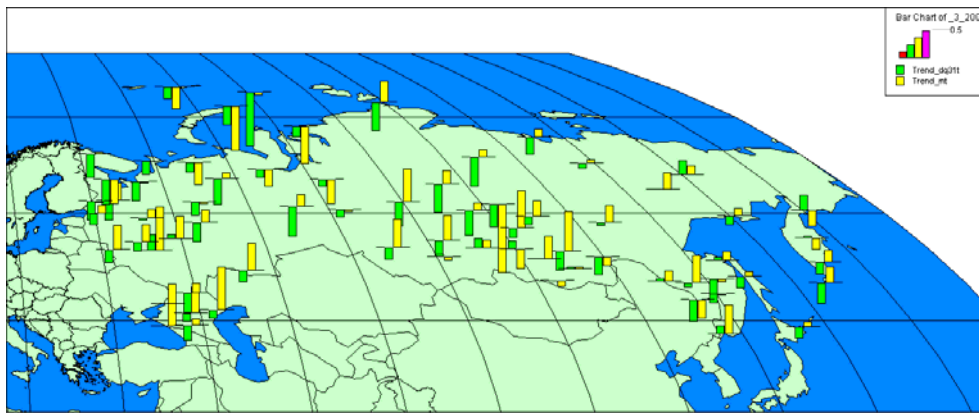
Spring



Summer



Fall



Some concluding remarks:

- In U/A data for NPZ climate, we need to be realistic, to understand the gaps in data and to evaluate how they influence our knowledge on these climate issues
- WMO, it's national services, carry the most loadings on the U/A climate (and other climate-related) observation & monitoring, so the WMO approaches to data distribution must be respected in IPY data policy
- However, though undertanding the gaps in the U/A data for NPZ, the data what we have now are a "box of gold" – we need to be able to obtain and to understand this GOLD INFORMATION!!!!!!
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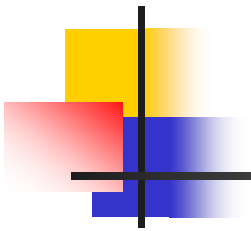

- THANK YOU!
- Questions, comments?