



# Meteorological observations in the Arctic





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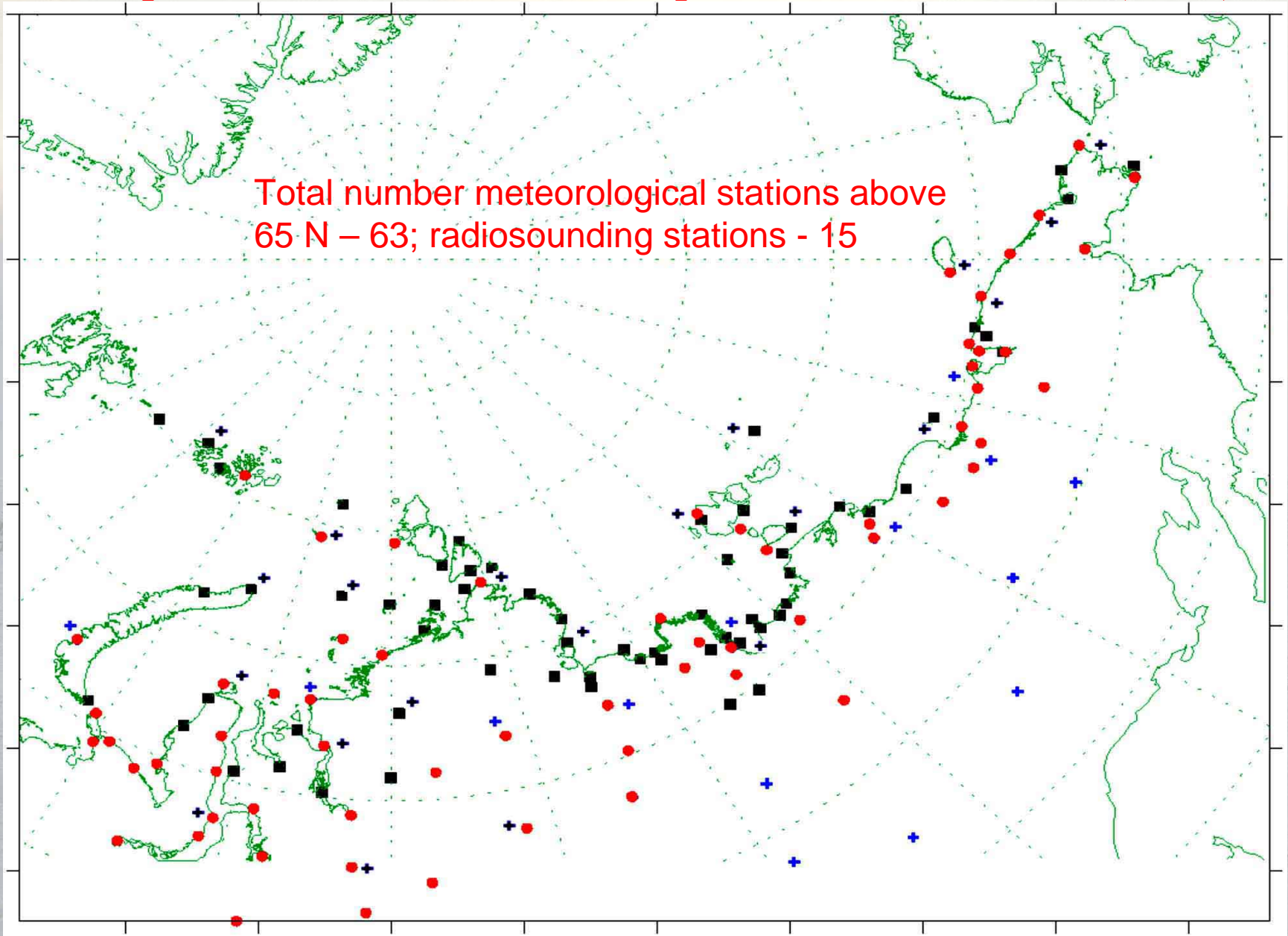
# Meteorological network in the Russian Arctic (past, recent and future)



# Past and present state of the Russian polar stations network (2008)

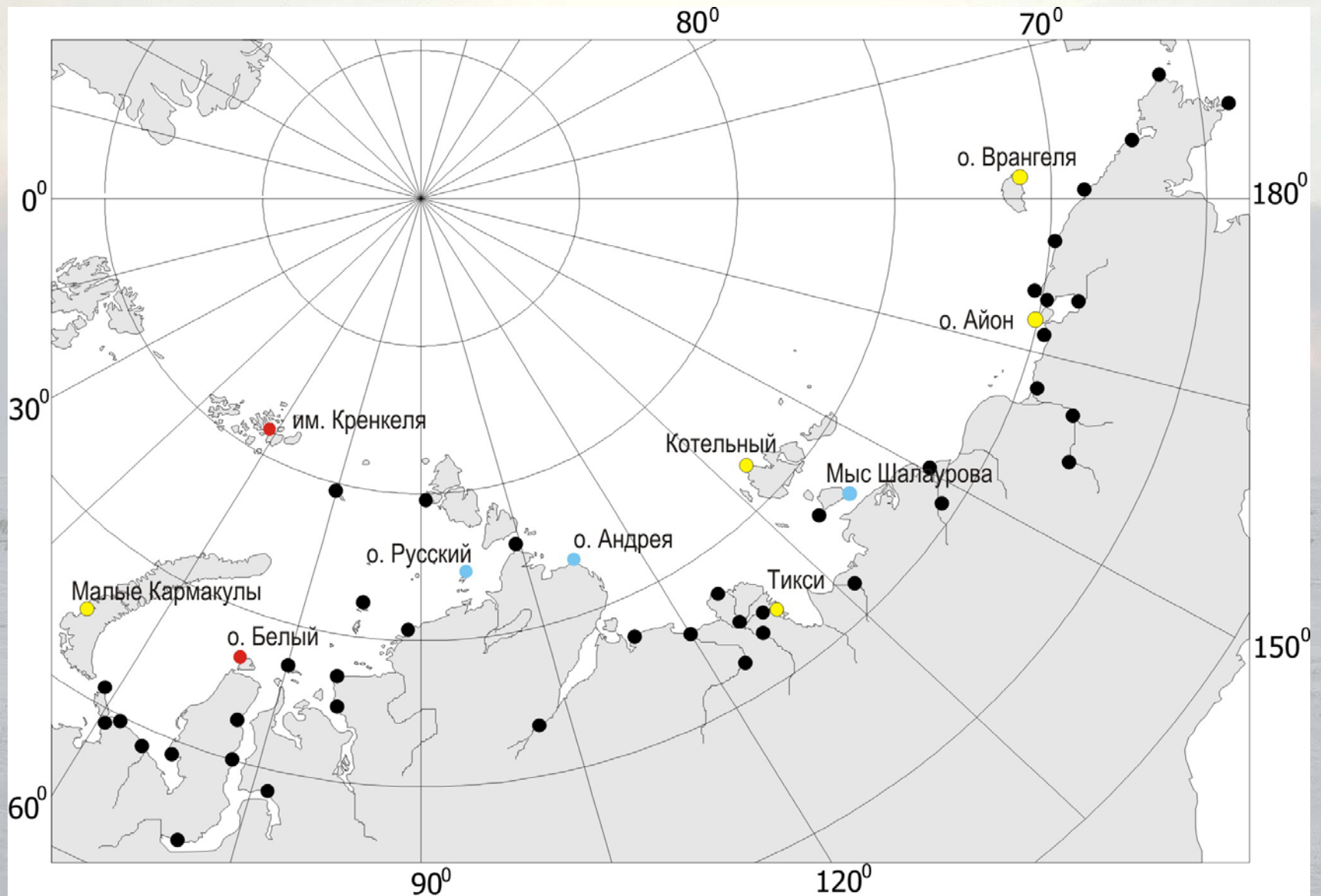
Total number meteorological stations above  
65 N – 63; radiosounding stations - 15

Closed  and working  meteorological stations. Closed  and working  radiosounding stations





# First step in the restoration of meteorological network



● -stations, restored in 2002-2005    ● planned to restoration    ● planned to modernization



**Polar station Belyi Island, Kara Sea,  
73°20'N 70°03'E**

**Station had been opened November  
1 1933, burned in March 2001,  
restored in November 1 2002**





# **Polar station Kheisa Island**

**80°037'N 58°003W**

**Station had been  
opened November 1  
1929, burned in March  
2001, restored in  
October 2004**



# Establishing a Modern Weather Station and Research Observatory in Tiksi, Russia

## Main goals of the project:

- to establish a upgraded hydro-meteorological research station in Tiksi Russia with modern communications, power, laboratory and office space that will support collection long-term weather and climate grade records of the atmosphere and associated land/ocean parameters;
- to integrate the Tiksi Station measurements into international observing networks for example, the Global Atmosphere Watch, the Baseline Surface Radiation Network, the Climate Reference Network, the Global Terrestrial Network for Permafrost and the Micropulse Lidar Network;
- to develop a joint international science program between Russia, the U.S., Finland, Norway and other interested international partners that will contribute to the International Polar Year and beyond.



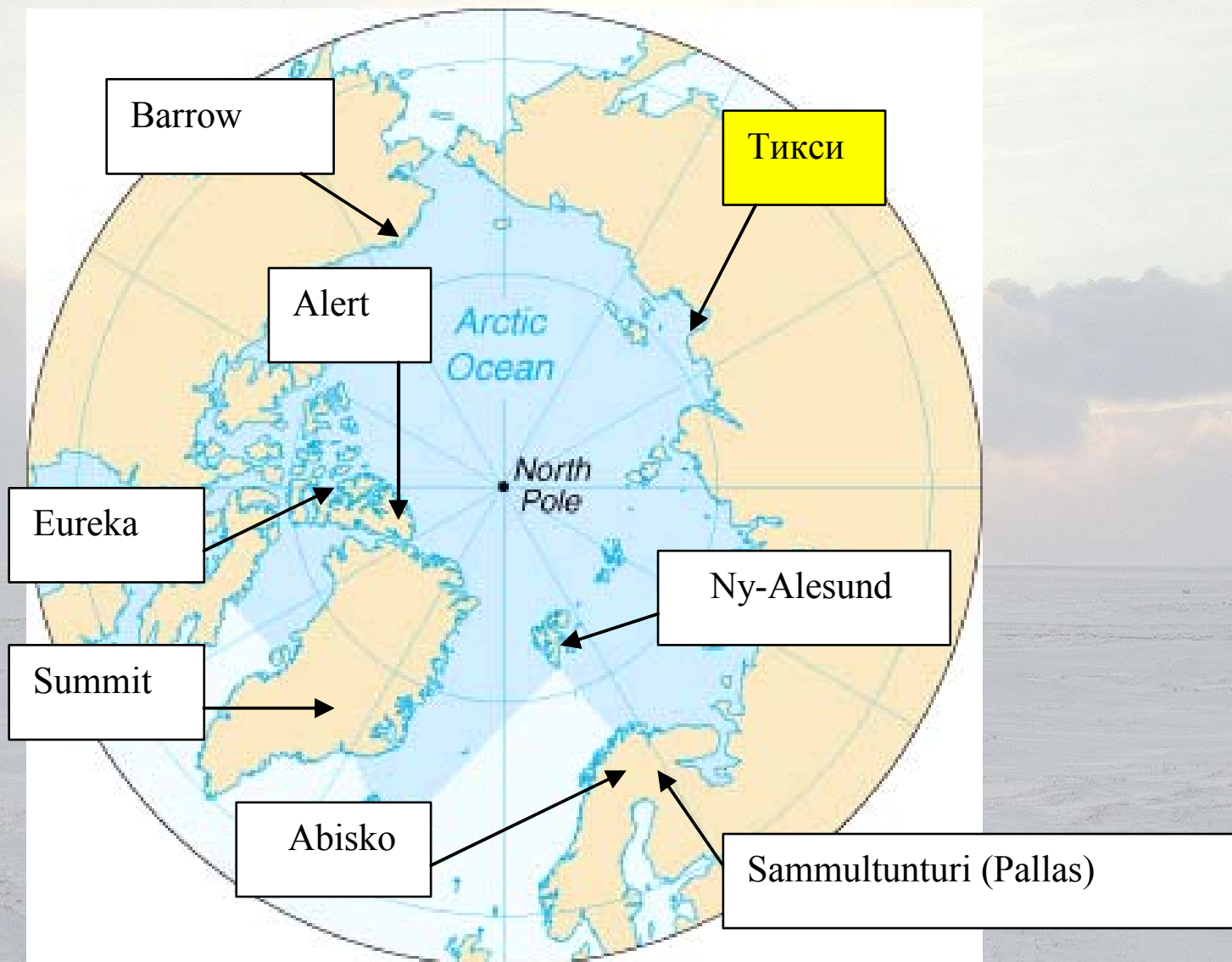
# Expected Outcomes

- upgrading the existing infrastructure including the main Tiksi Weather Station building as well as specialty satellite buildings such as clean air sampling facilities.
- modernization of the Tiksi Weather Station including establishing an automatic weather station, implementation of non-paper methods of collection, processing, distribution and storage of the data, communications, and developing facilities for hosting guest science programs.
- development of a joint science program of observations with contributions to the International Polar Year.  
Installing instrumentation at the observatory to support cloud, radiation, aerosol and chemistry studies that are complementary with existing Arctic measurement programs in the U.S., Canada, Finland, Norway and Sweden.
- provide an additional measurement site in Siberia to support network observation programs such as the Global Atmosphere Watch, the Baseline Surface Radiation Network, the Climate Reference Network, the Global Terrestrial Network for Permafrost and the Micropulse Lidar Network.



# Rationally for creation of Atmospheric Observatory in Tiksi





Hydrometeorological Observatory in Tiksi – the key component of creating in framework of IPY Baseline Surface Radiation Network (BSRN)



# Existing positions of meteorological and radiosounding observations , measurements of fast ice thickness, sea level, water temperature and salinity



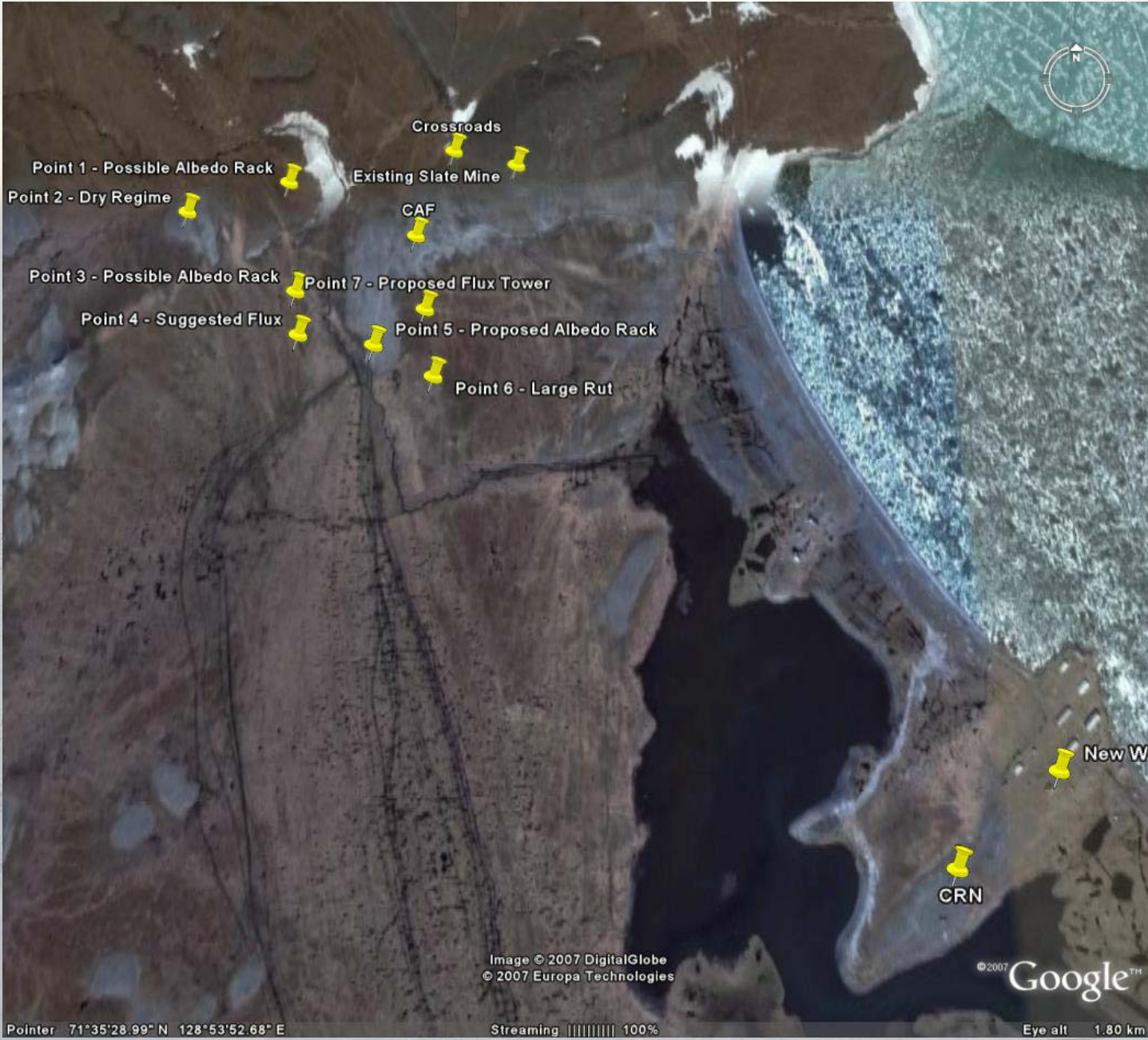


# The main building of future Hydrometeorological Observatory (November 2006)





# Position of future installations in Hydrometeorological Observatory

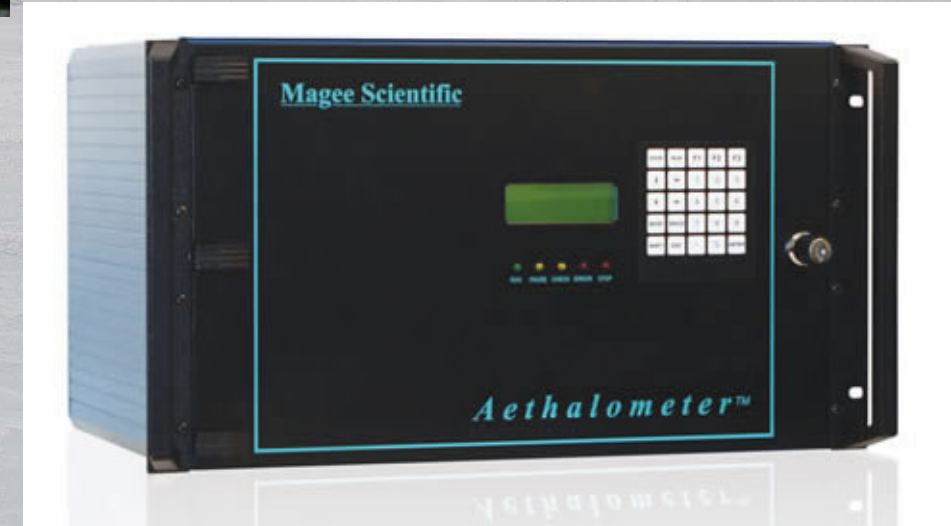
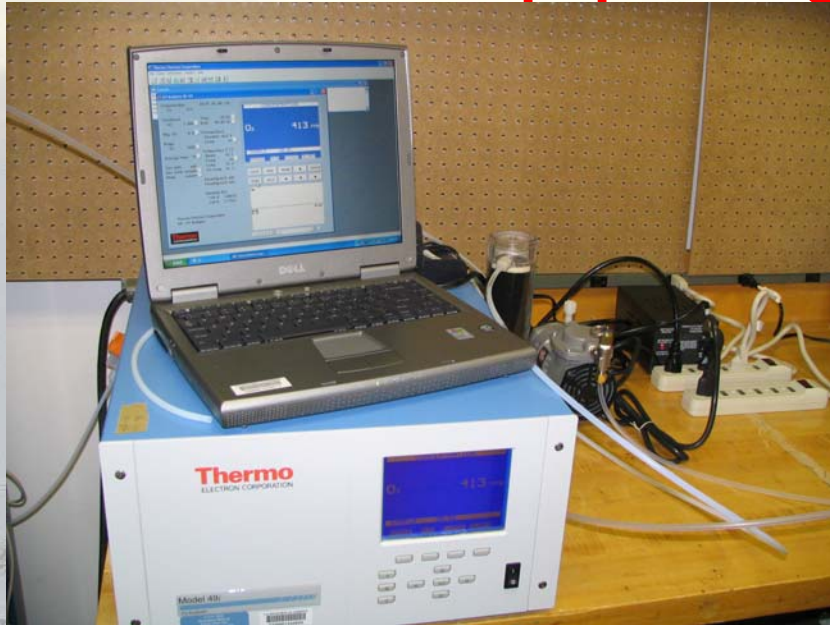


# Planning activities in 2008

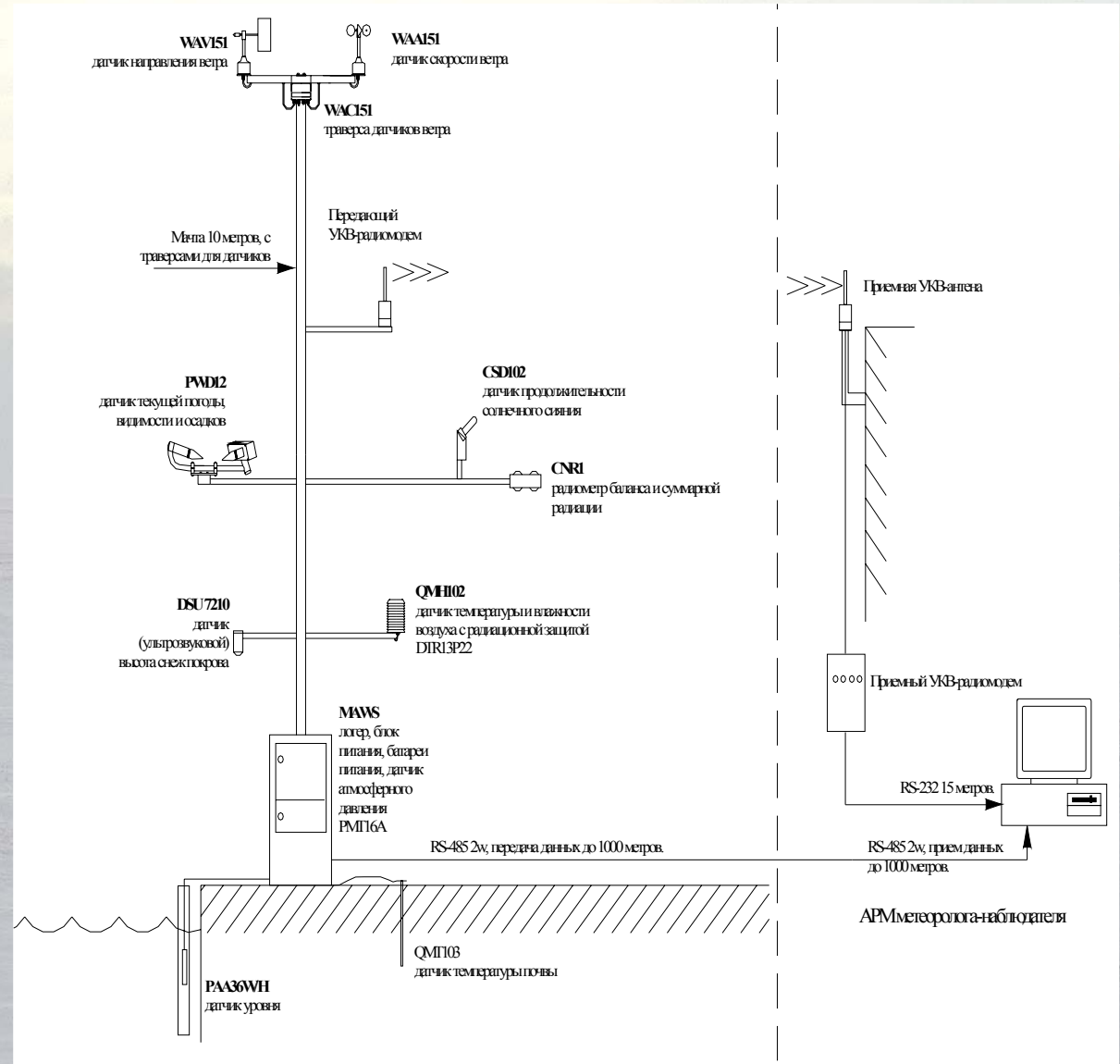




# Surface ozone analyzer and black carbon sampler with associated equipment going to Tiksi from USA



# Planning by Roshydromet in 2008 modernization of meteorological station in Tiksi

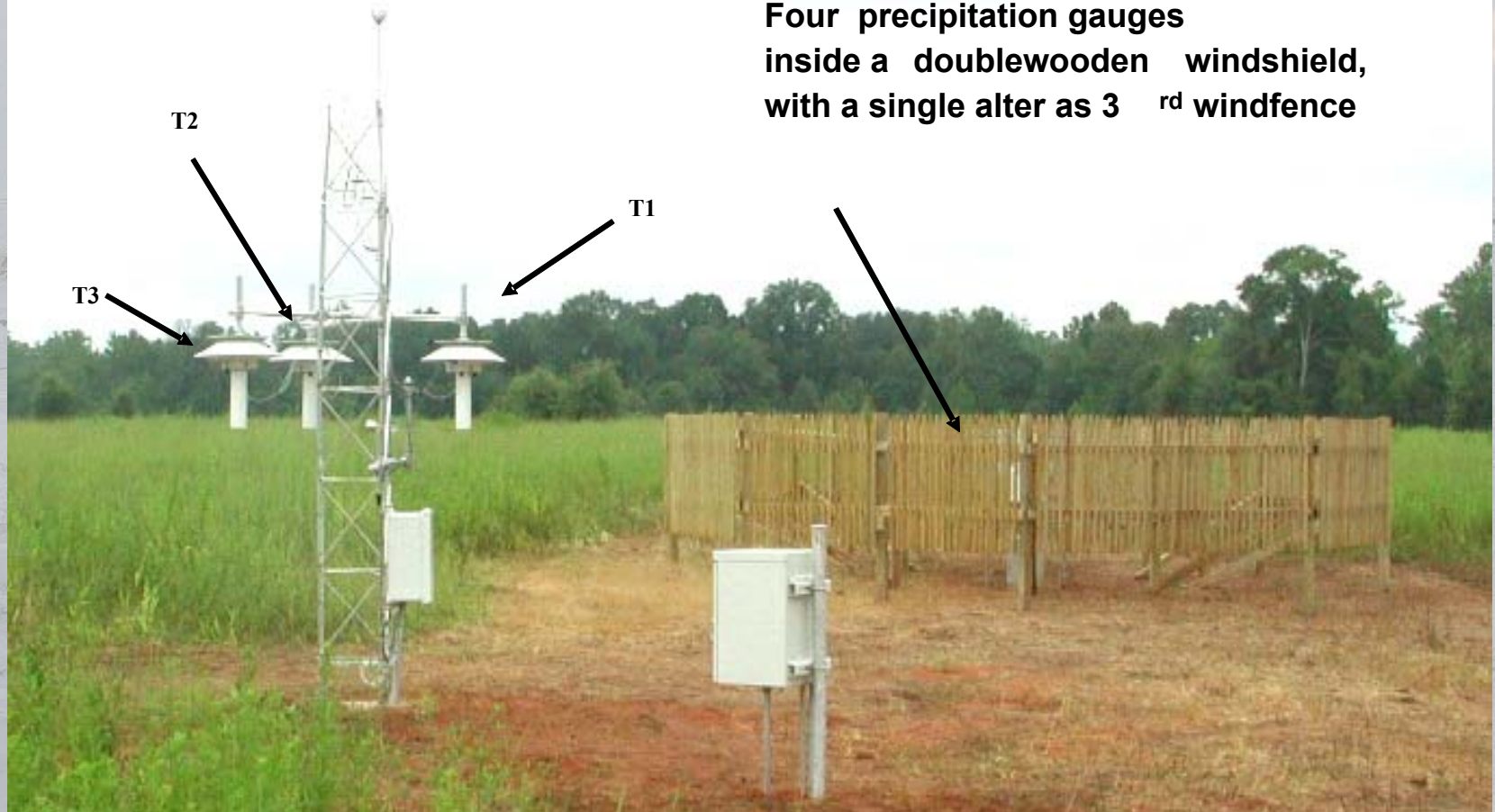




# Planning by NOAA Climate Reference Network installation of automated long-term Climate Monitoring Station for extreme climates in Tiksi and Yakutsk

Three separately housed,  
power-aspirated platinum -  
resistance thermometers

Four precipitation gauges  
inside a doublewooden windshield,  
with a single alter as 3<sup>rd</sup> windfence

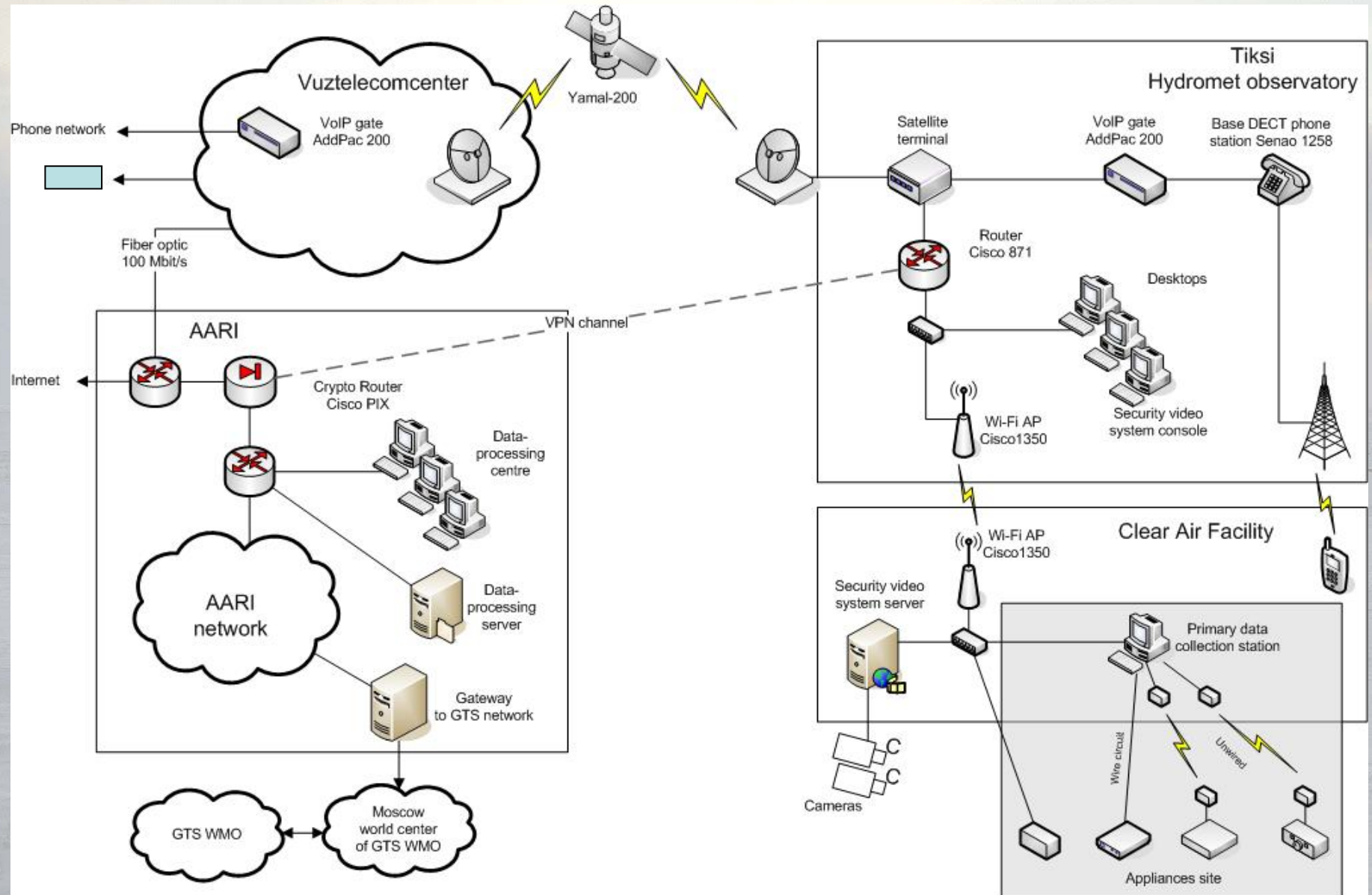


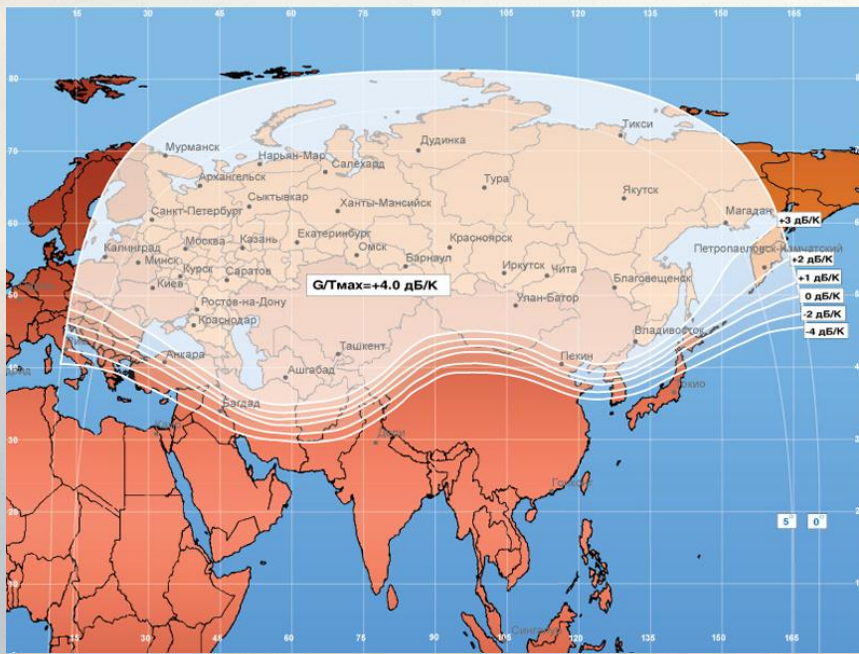
# Planning by Roshydromet in 2008 modernization of radiosounding complex in Tiksi





# Scheme of data transmission from Hydrometeorological observatory to participants of Project





The zone, covered by Russian satellite "Yamal -200"

Satellite antenna with diameter 2.5 meters, which will be installed on the main building of Observatory in Tiksi in May 2008





# Proposal to list of joint future research projects in Hydrometeorological Observatory

- « Unification of the standard meteorological observations »
- « Monitoring of ultra-violet radiation and total ozone content »
- « Monitoring of atmospheric pollution in the  
Hydrometeorological Observatory area »
- « Trace gases in polar atmosphere »
- « Research of total aerosol content in polar atmosphere »
- « Study of surface aerosol in Tiksi »
- « Investigations of surface radiation balance in Tiksi »
- « Surface heat balance and turbulent fluxes in the coastal areas  
of the  
Arctic regions »
- « Investigations of permafrost in the Tiksi area »

# Historical datasets of meteorological observations





## List of observations, fulfilling in the meteorological station “Polarka”

- Standard meteorological observations (from 1934)
- Radiosoundings (from 1935)
- Total ozone content (from 1993)
- Geophysical measurements of polar ionosphere properties (1956)
- Sea level measurements (from 1949)
- Temperature and salinity of sea surface layer (from 1932)
- Fast ice thickness measurements (from 1934)

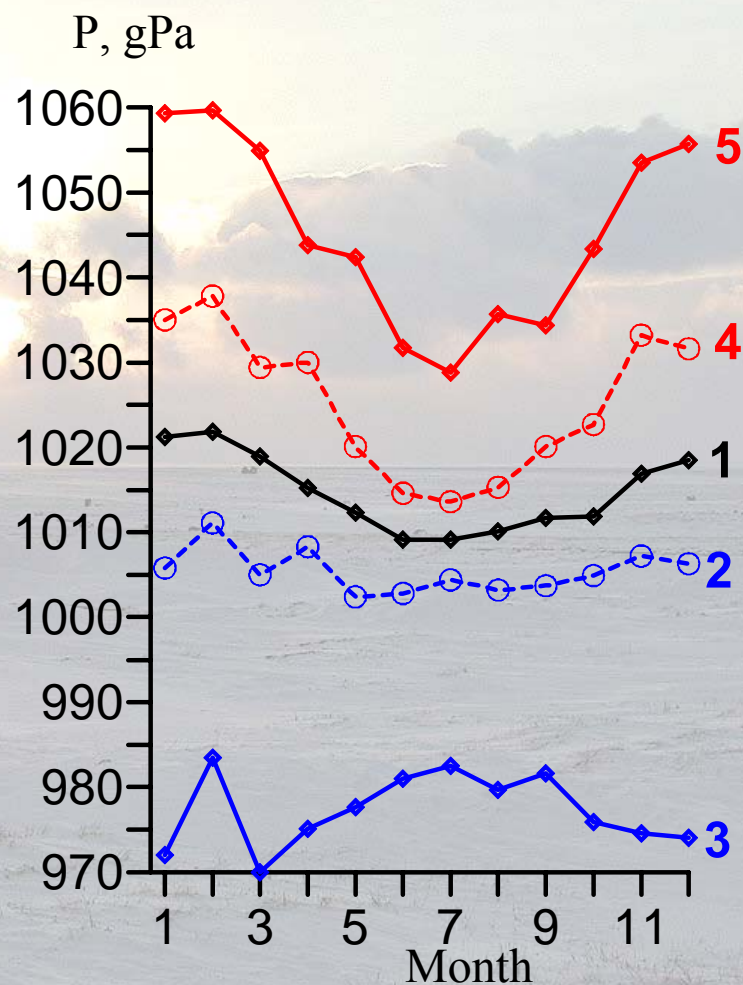
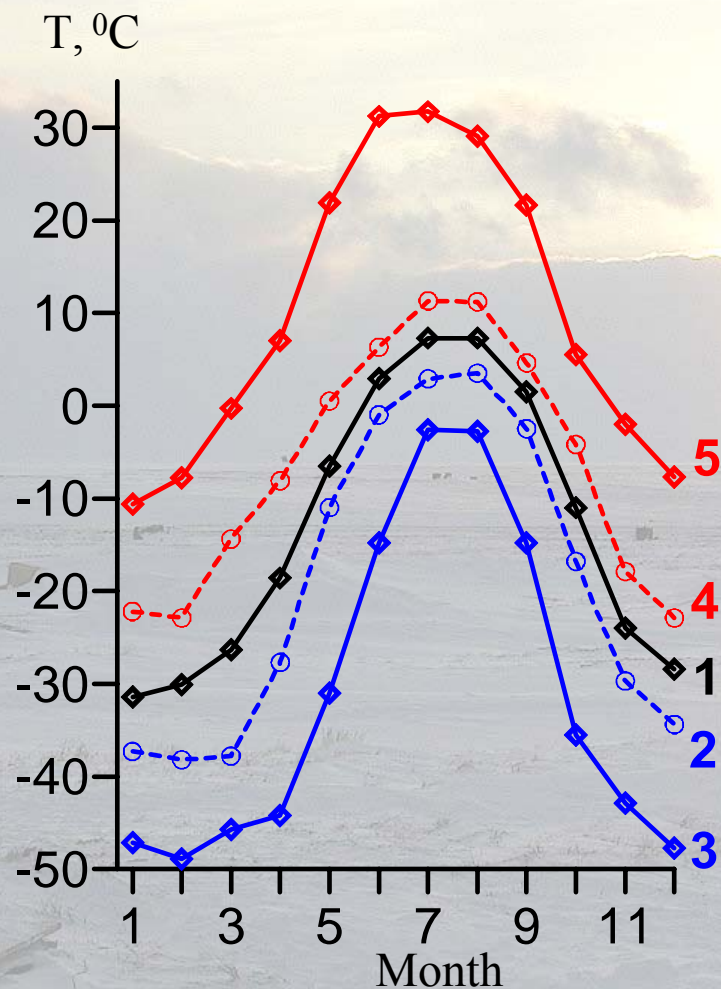
The historical Tiksi data sets have recently been digitized

Example of original table of meteorological data (January 1966)

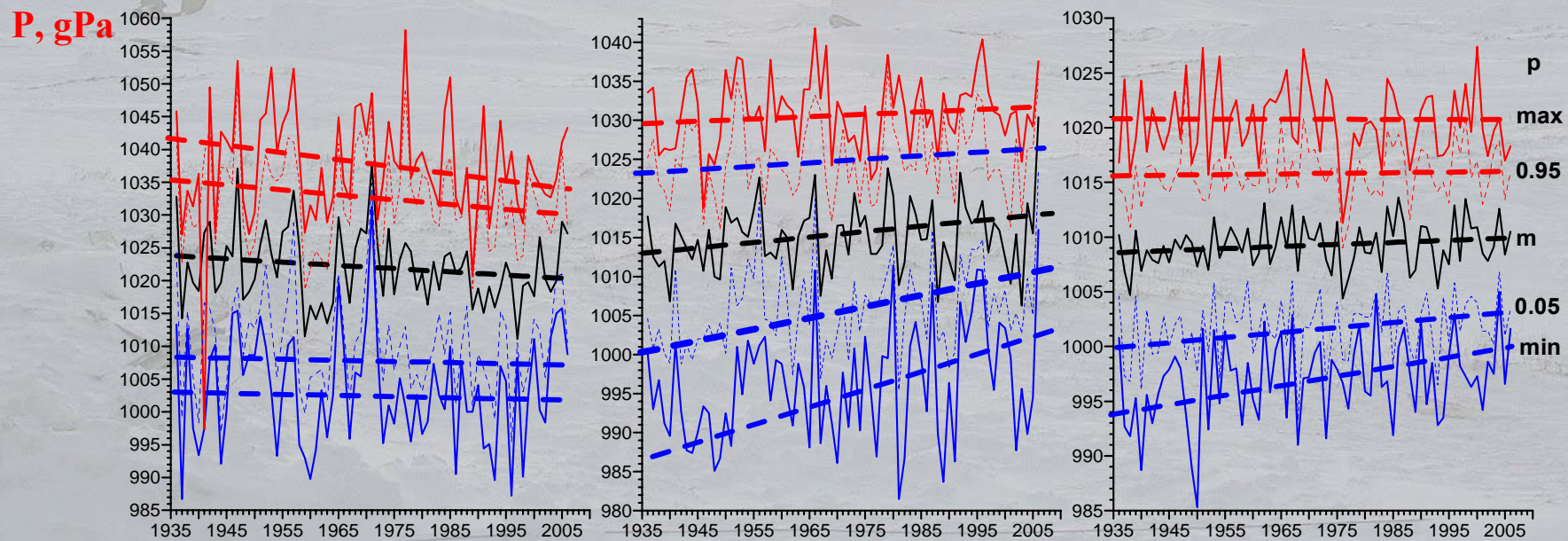
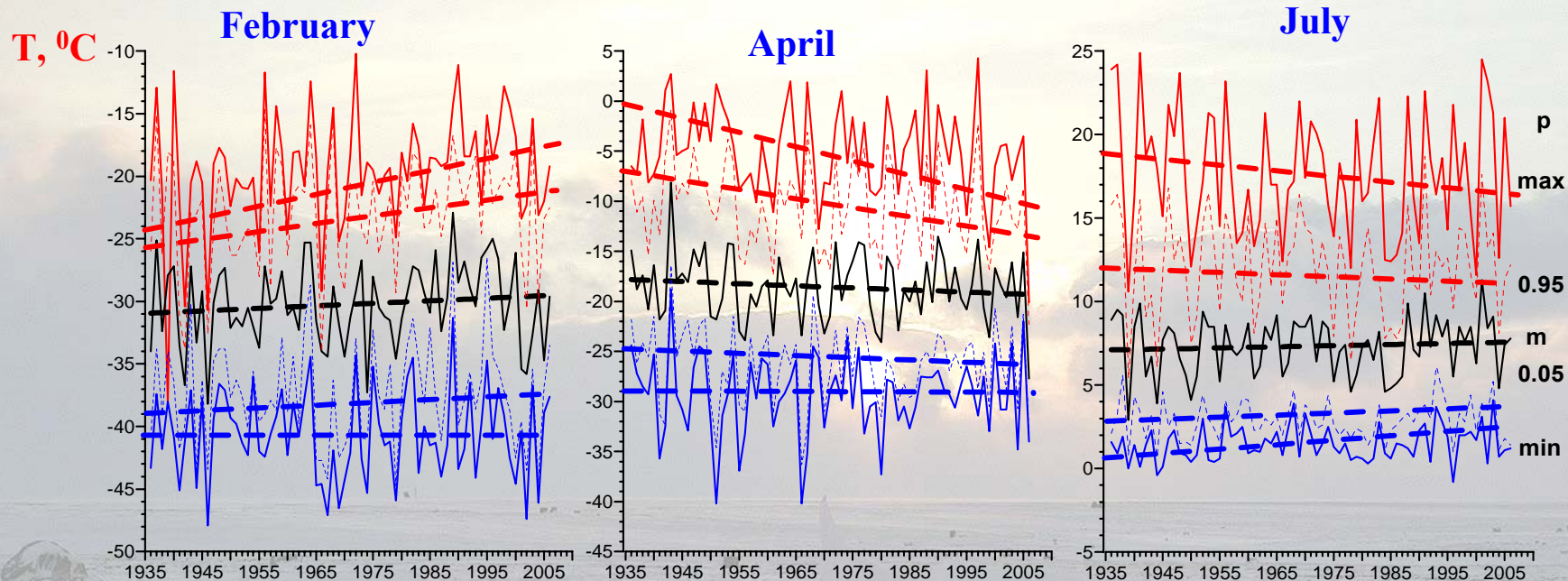
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# Seasonal variability of monthly means (1) and extremes from daily (3, 5) and monthly (2, 4) averaged data

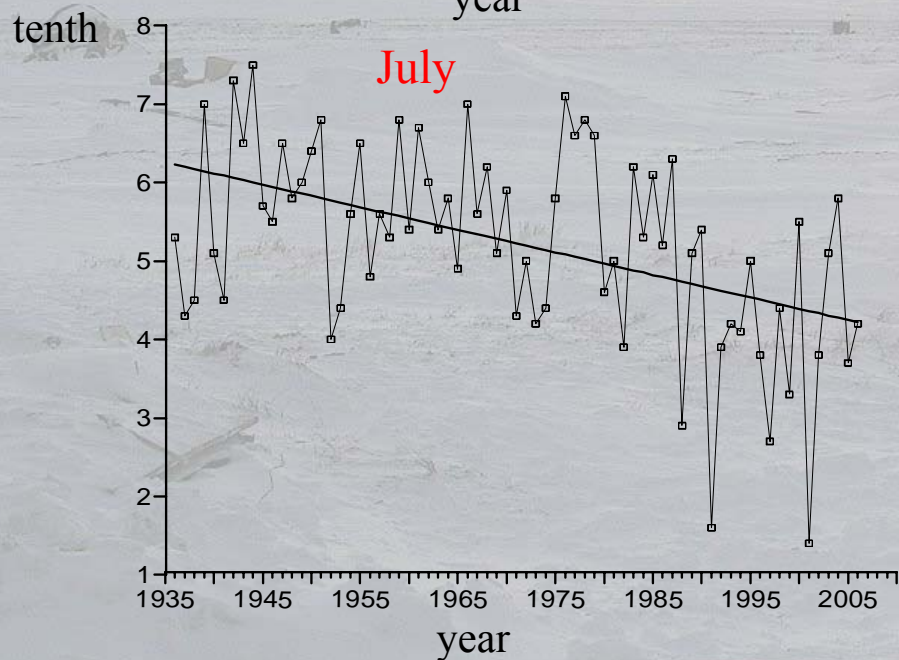
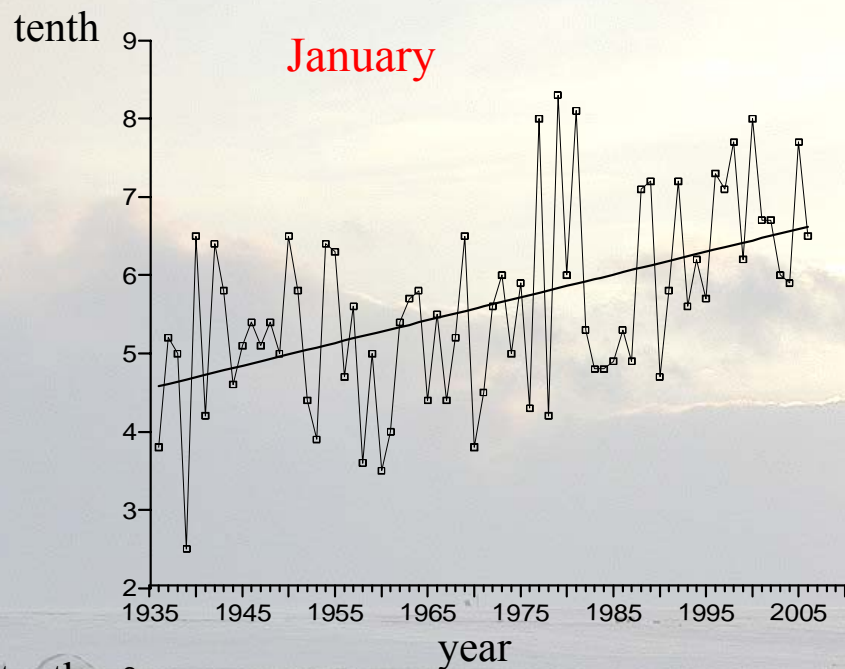


# Trends of monthly mean quantile values of air surface temperature and surface pressure

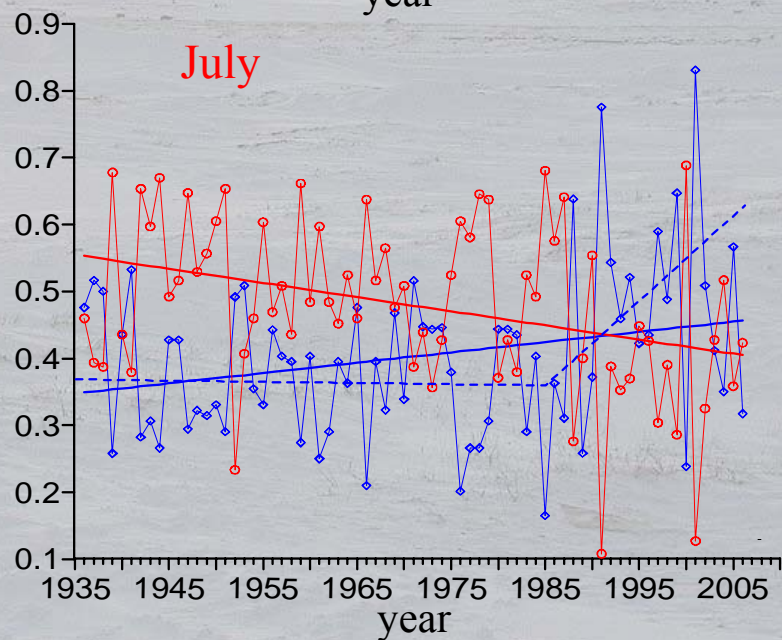
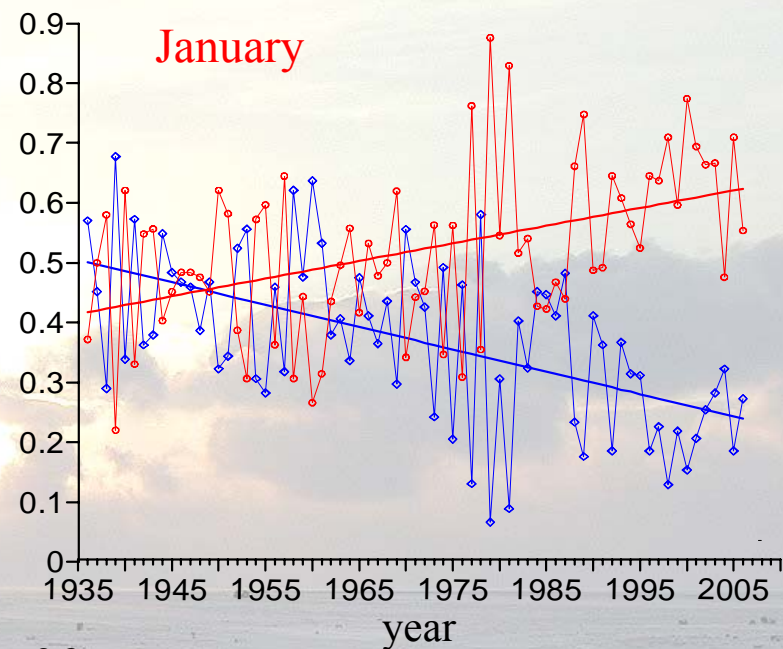




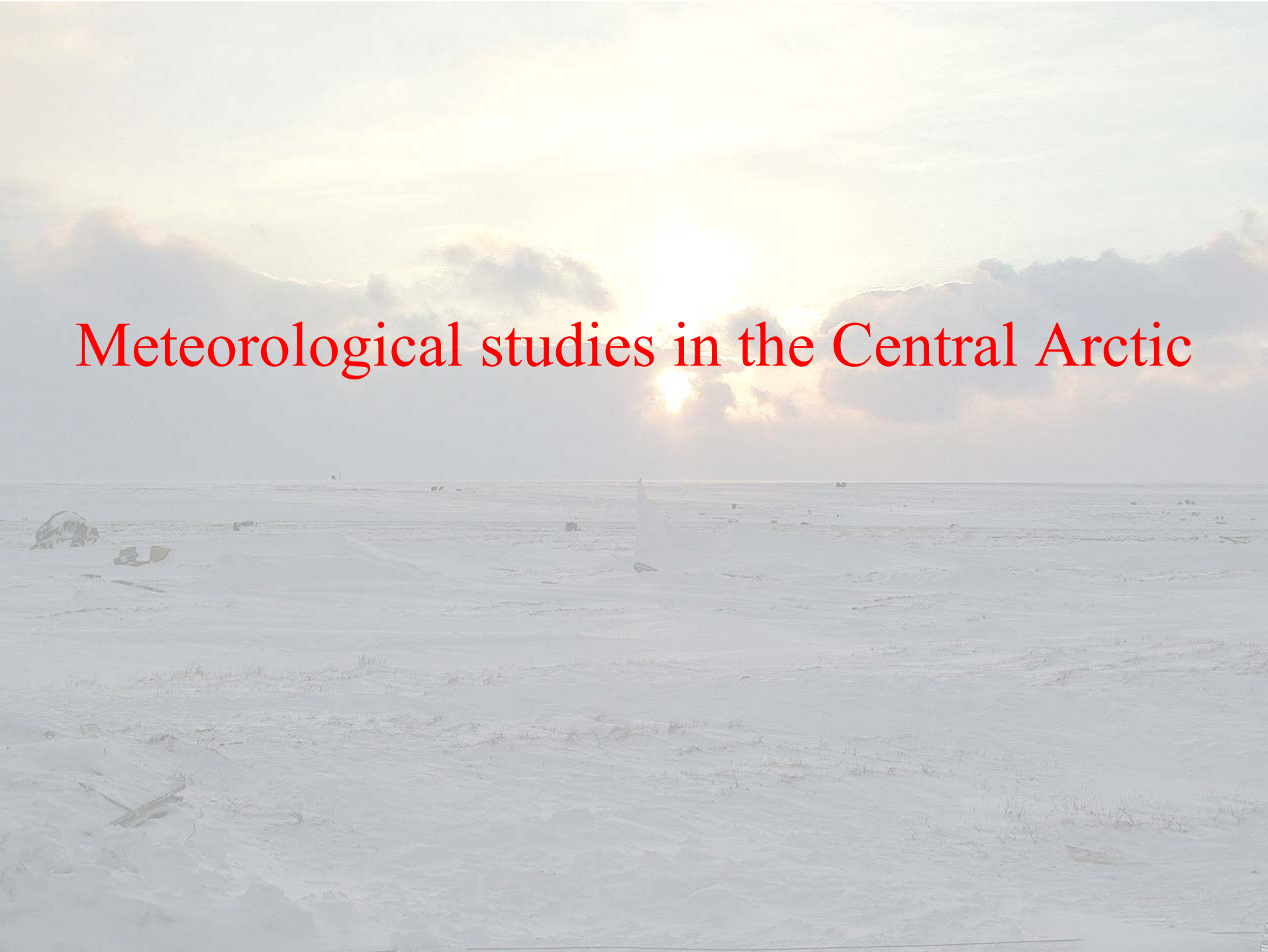
## Interannual variability of total cloudiness



## Relative occurrence of clear sky (blue) and overcast (red)



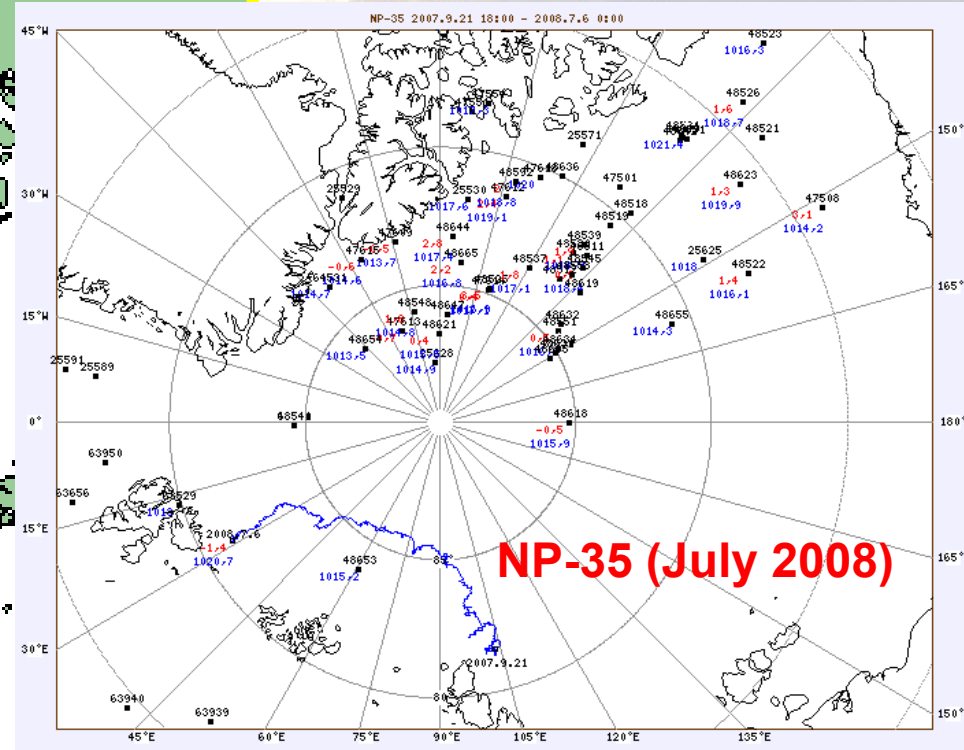
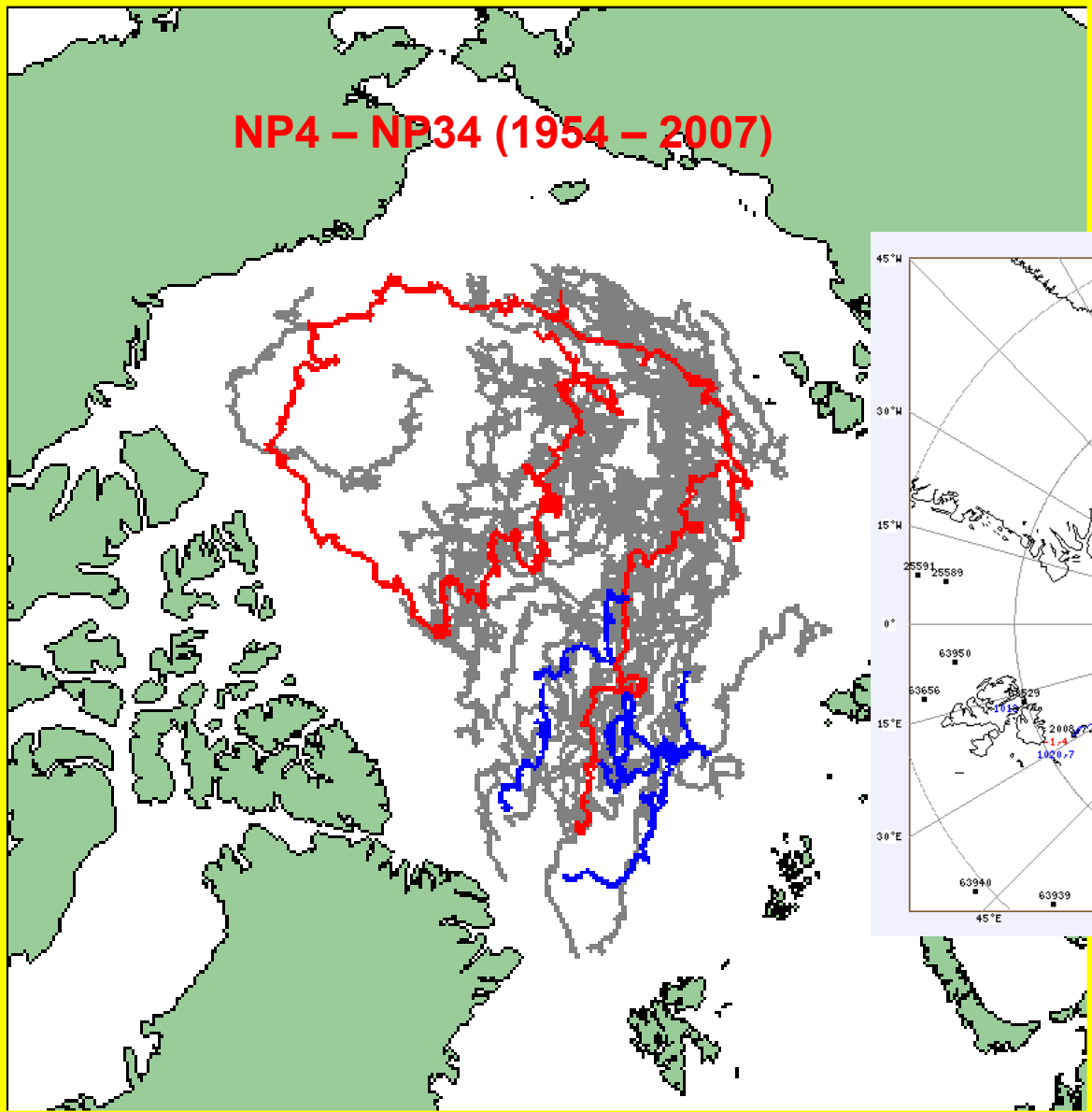
# Meteorological studies in the Central Arctic





# Drifting stations «North Pole»

NP4 – NP34 (1954 – 2007)



# Research vessel «Academician Fedorov»





# Ice reconnaissance using the helicopter MI-8



# Landing operation from the research vessel “Academician Fedorov”





# Program of scientific investigations at the drifting stations “North Pole”

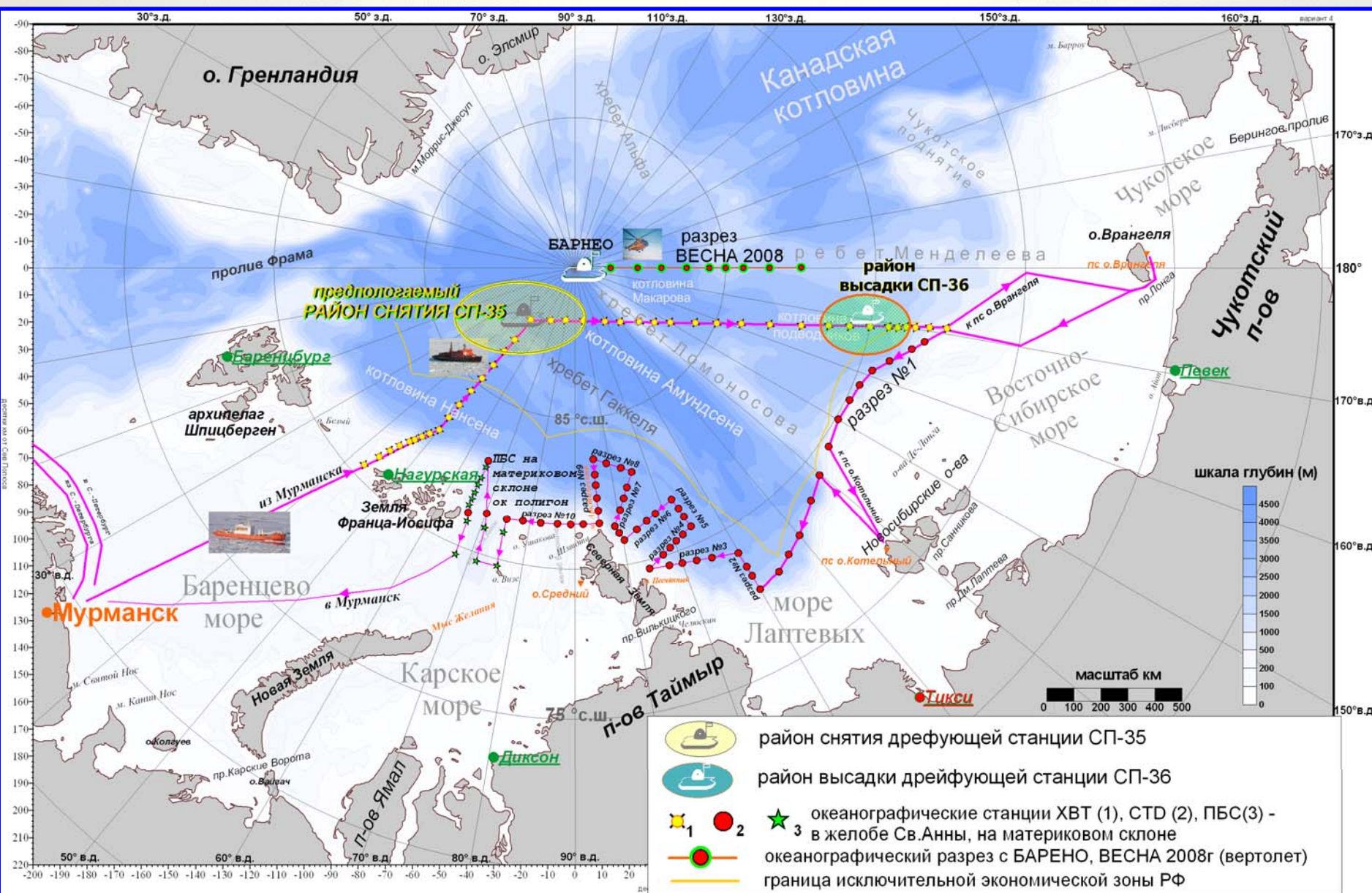
- Study of the atmospheric boundary layer.
- Oceanographic observations
- Investigations of evolution of morphometric characteristics of sea ice cover
- Study of biological characteristics of sea ice
- Study of plankton and benthos communities
- Investigations of solid particles in the snow cover and sedimentary material transported by the ice cover
- Ecosystem investigations
- Sub-satellite experiments orientated on the study sea ice characteristics

# Monitoring of environmental system in the Central Arctic

- Atmospheric monitoring (about 35 parameters)
- Monitoring of the ozonosphere
- Monitoring of the atmospheric surface layer and of the components of radiation balance
- Monitoring of environmental pollution
- Monitoring of hydrological parameters







# Central Arctic, 2008

## WELCOME

