National Research
Tomsk
State
University

THE SNOW COVER MONITORING OF THE WESTERN SIBERIA

Yulia Mishenina
Junior Researcher
Department of Meteorology and Climatology

Tomsk was founded in 1604. Within the first century Tomsk had been a fortress, helping the Russians to go further to Siberia.

The **population** of Tomsk is 576 624 people (by far 2020). Tomsk is often called **a students' town**. In fact, there are **6 universities** here and many institutes.

TSU is the oldest university in the Russian Asia, that was founded in 1878 as the First Siberian Imperial University.

TSU today

20
Faculties
and
Institutes

150
Specialties and
subject areas

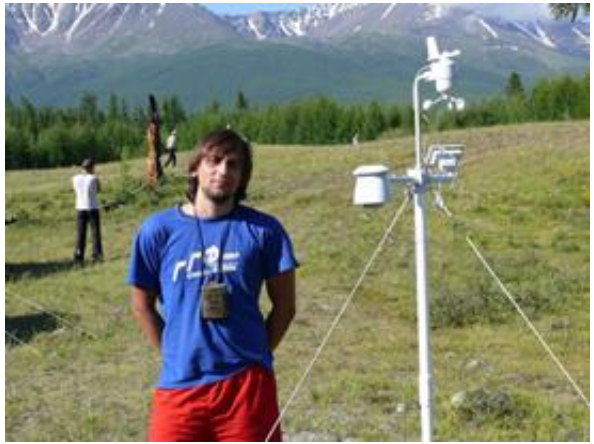
15 000
Students

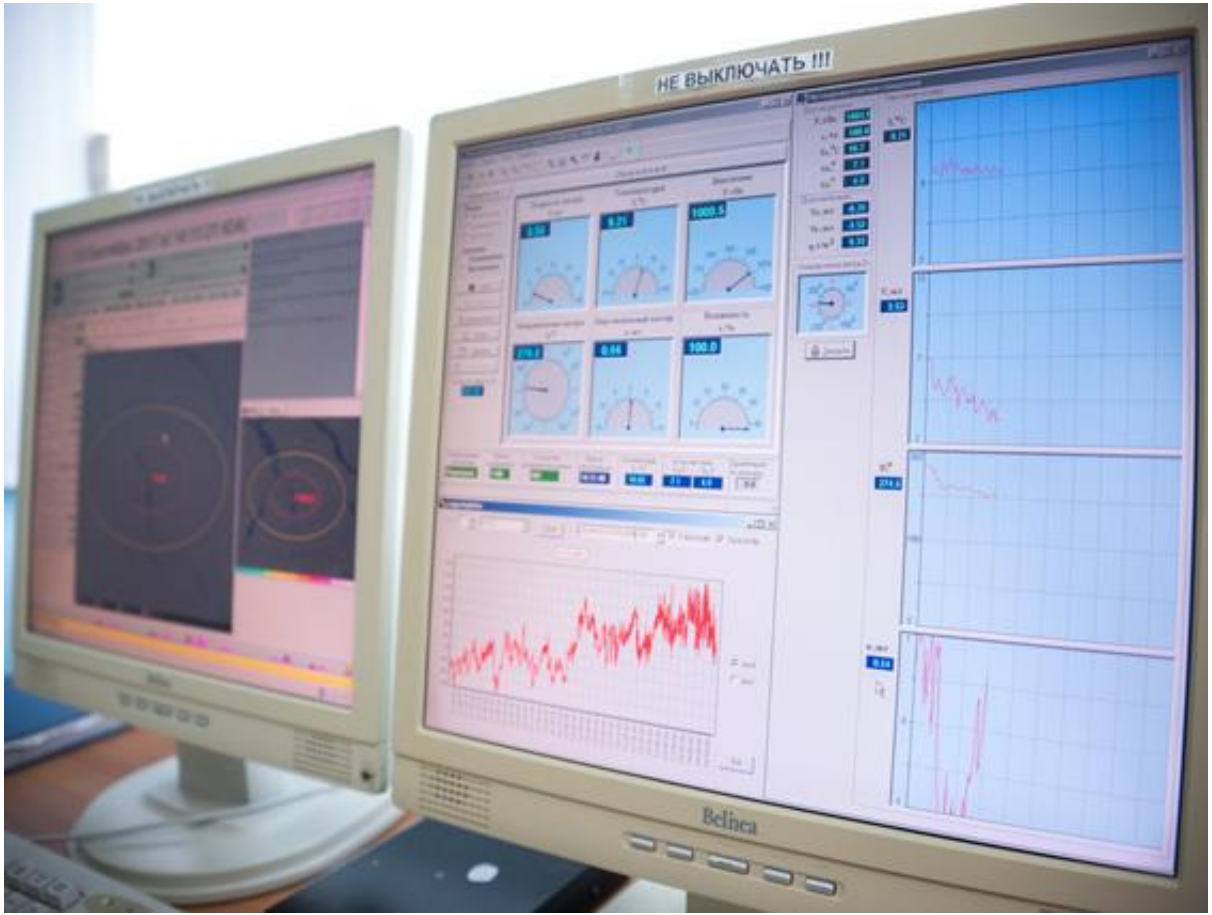
>2000
International
students

The structure of the Geology and Geography faculty

- Department of Dynamic Geology
- Department of Paleontology and Historical Geology
- Department of Mineralogy and Geochemistry
- Department of Petrography
- Department of Geography
- Department of Hydrology
- **Department of Meteorology and Climatology**
- Department of Local History and Tourism
- Department of Nature Management

Department of Meteorology and Climatology





Team

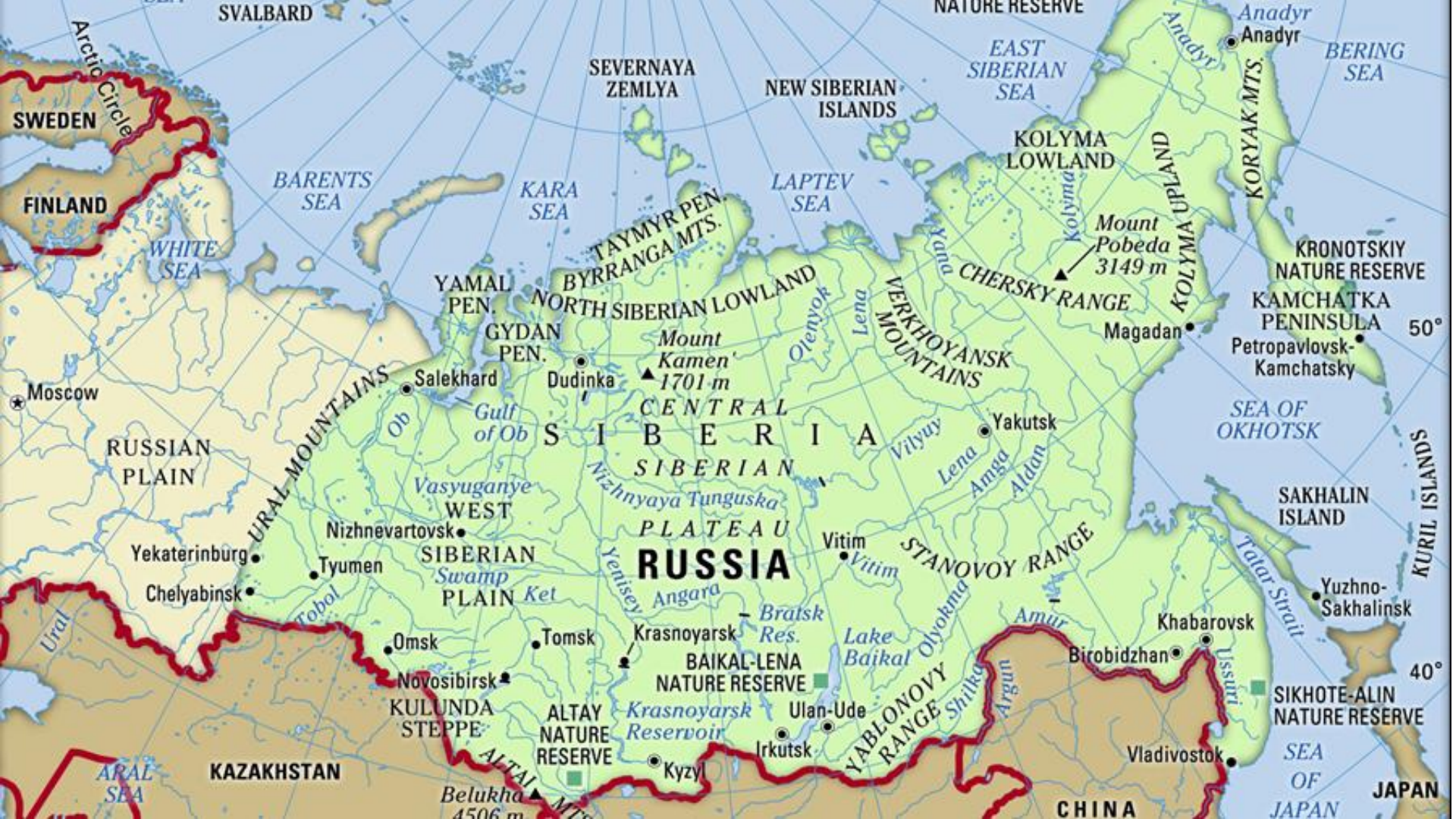
Professor Valentina Gorbatenko
Head of the Department of
Meteorology and Climatology

Daria Konstantinova
PhD

Olga Nosyreva
PhD

Olga Nechepurenko
Assistant professor

Yulia Mishenina
Junior Researcher


SVALBARD
NATURE RESERVE
Anadyr
Anadyr
Anadyr
BERING SEA
EAST SIBERIAN SEA
SEVERNAYA ZEMLYA
NEW SIBERIAN ISLANDS
KORYAK MTS.
Arctic Circle
SWEDEN
KOLYMA LOWLAND
KOLYMA UPLAND
BARENTS SEA
KARA SEA
LAPTEV SEA
Kolyma
FINLAND
TAYMYR PEN.
BYRRANGA MTS.
Mount Pobeda 3149 m
KRONOTSKIY NATURE RESERVE
WHITE SEA
YAMAL PEN.
NORTH SIBERIAN LOWLAND
Yana
CHERSKY RANGE
KAMCHATKA PENINSULA
50°
GYDAN PEN.
Olenyok
Lena
VERKHOYANSK MOUNTAINS
Magadan
Petropavlovsk-Kamchatsky
Mount Kamen' 1701 m
Moscow
Salekhard
Dudinka
URAL MOUNTAINS
CENTRAL
SEA OF OKHOTSK
Ob
Gulf of Ob
S I B E R I A
Vilyuy
Yakutsk
RUSSIAN PLAIN
SIBERIAN
Lena
Amga
Aldan
KURIL ISLANDS
Vasyuganye
WEST
Nizhnyaya Tunguska
SAKHALIN ISLAND
Nizhnevartovsk
PLATEAU
Vitim
STANOVOY RANGE
Yekaterinburg
Tyumen
SIBERIAN
RUSSIA
Tatar Strait
Yuzhno-Sakhalinsk
Swamp
Yenisey
Angara
Vitim
Chelyabinsk
PLAIN
Ket
Bratsk Res.
Khabarovsk
Ural
Tobol
Amur
Omsk
Tomsk
Krasnoyarsk
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Olyokma
Birobidzhan
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Novosibirsk
Ussuri
SIKHOTE-ALIN NATURE RESERVE
KULUNDA STEPPE
ALTAY NATURE RESERVE
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Ulan-Ude
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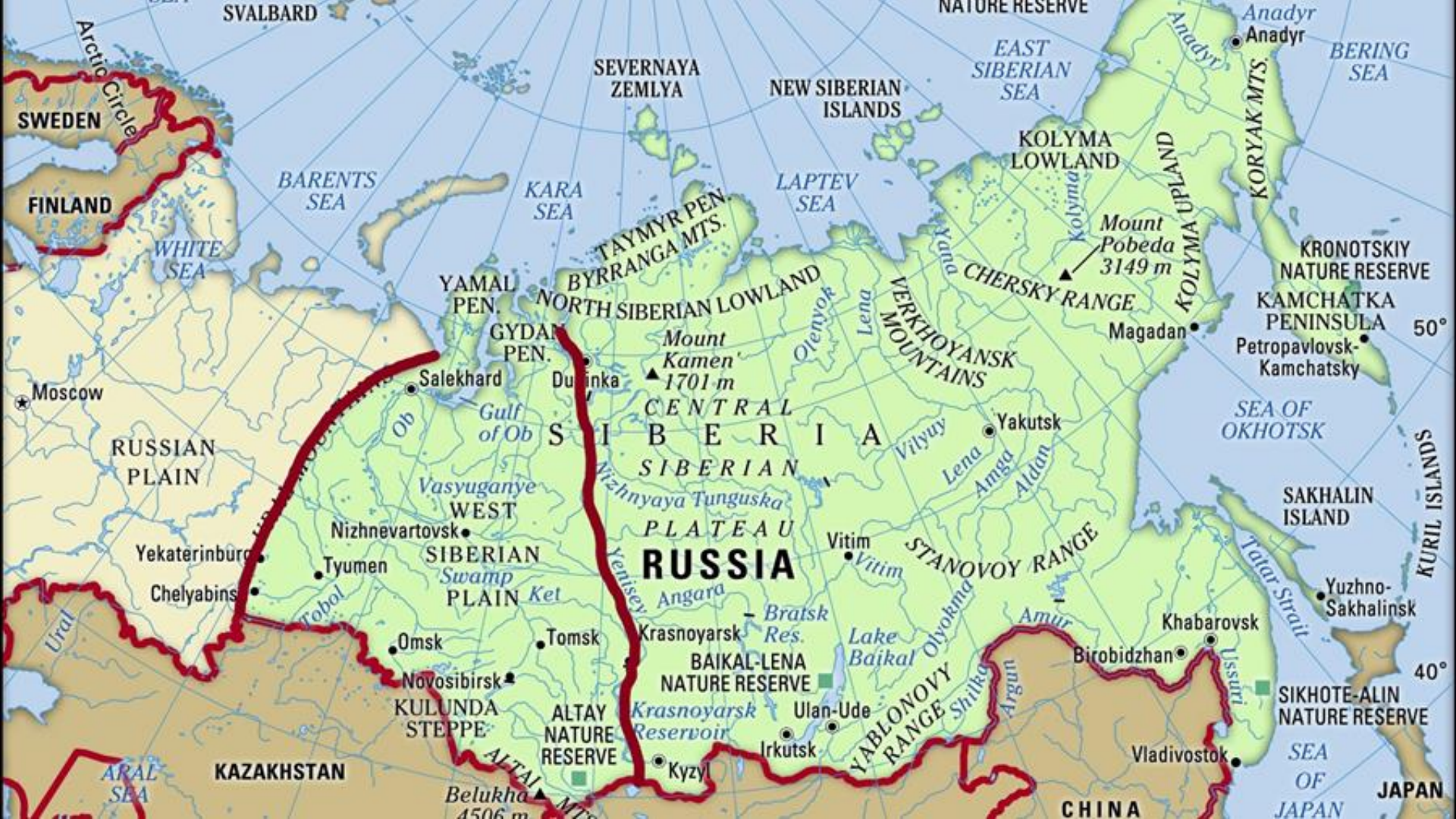
Belukha 4506 m
CHINA
JAPAN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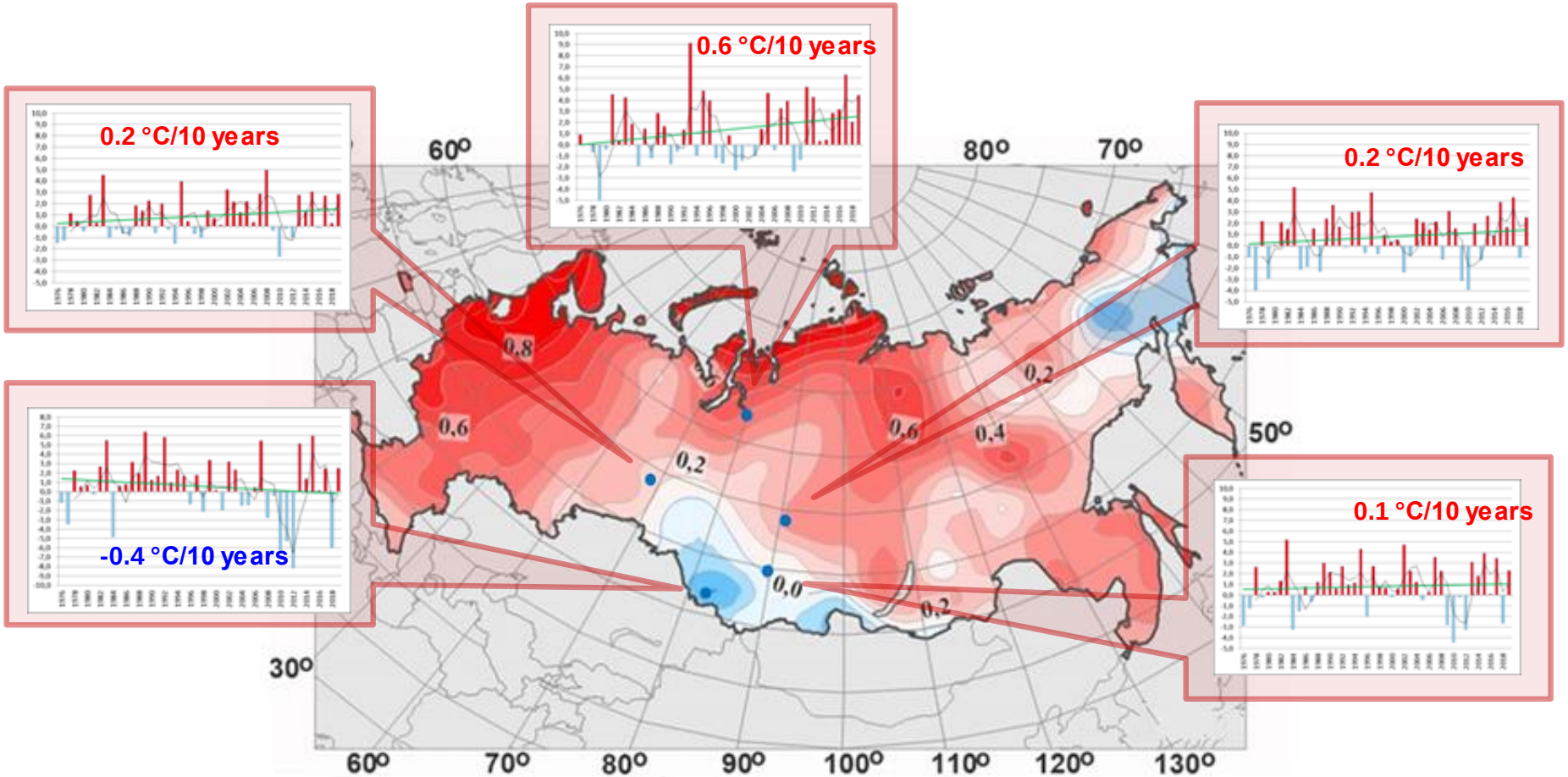
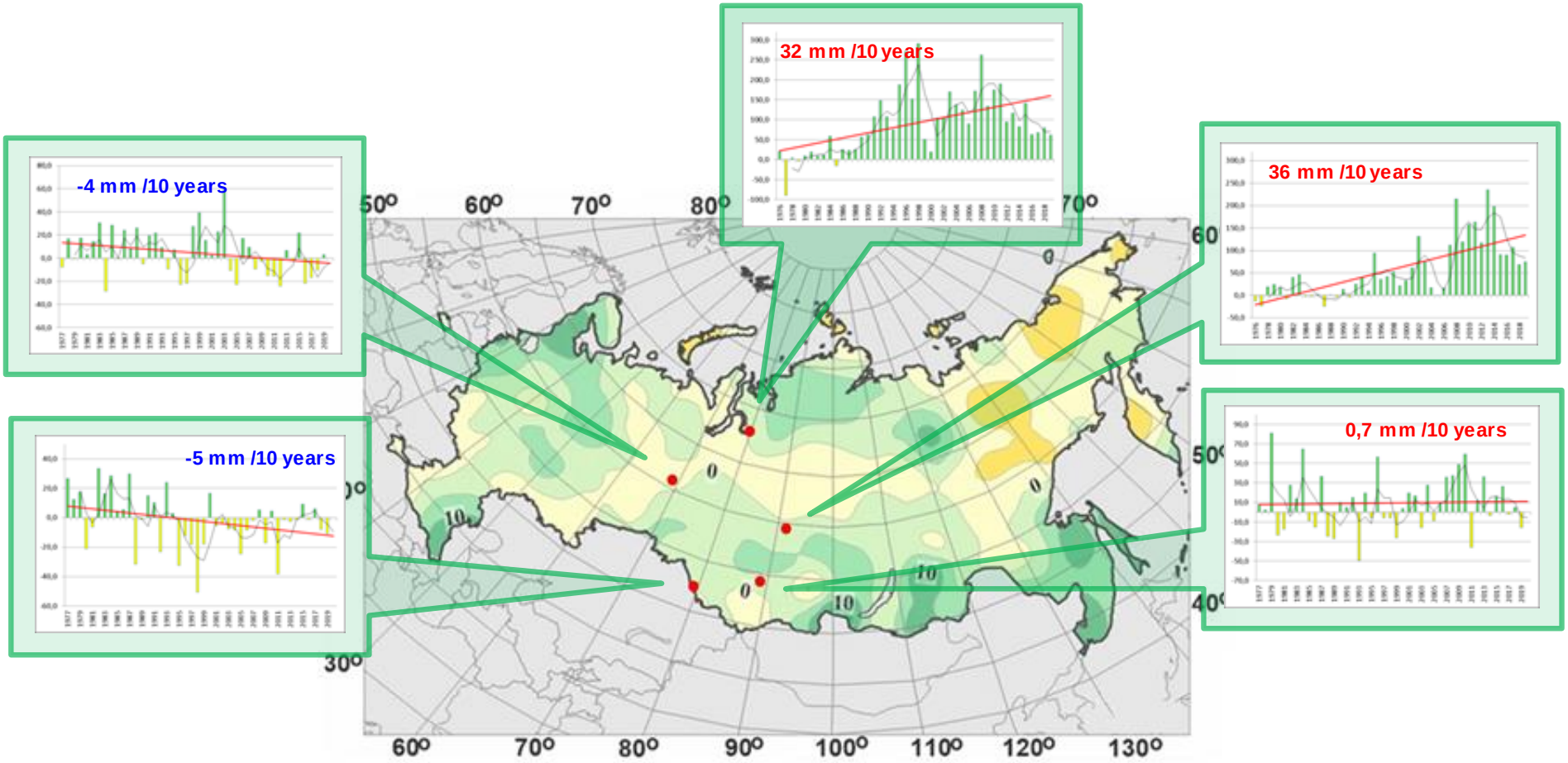


Map: the linear trend coefficients of the average temperature of surface air in the winter period, 1976-2016 гг. (°C/10 лет) https://meteoinfo.ru/climvar
Graphs: Anomalies of the average daily surface air temperature for the winter period, 1976–2019

*A REPORT ON CLIMATE FEATURES ON THE TERRITORY OF THE RUSSIAN FEDERATION IN 2019. – Moscow, 2020.



Map: coefficients of the linear trend of winter amounts of atmospheric precipitation, 1976-2016 (% / 10 years) https://meteoinfo.ru/climvar
Graphs: anomalies in winter precipitation totals, 1976–2019.

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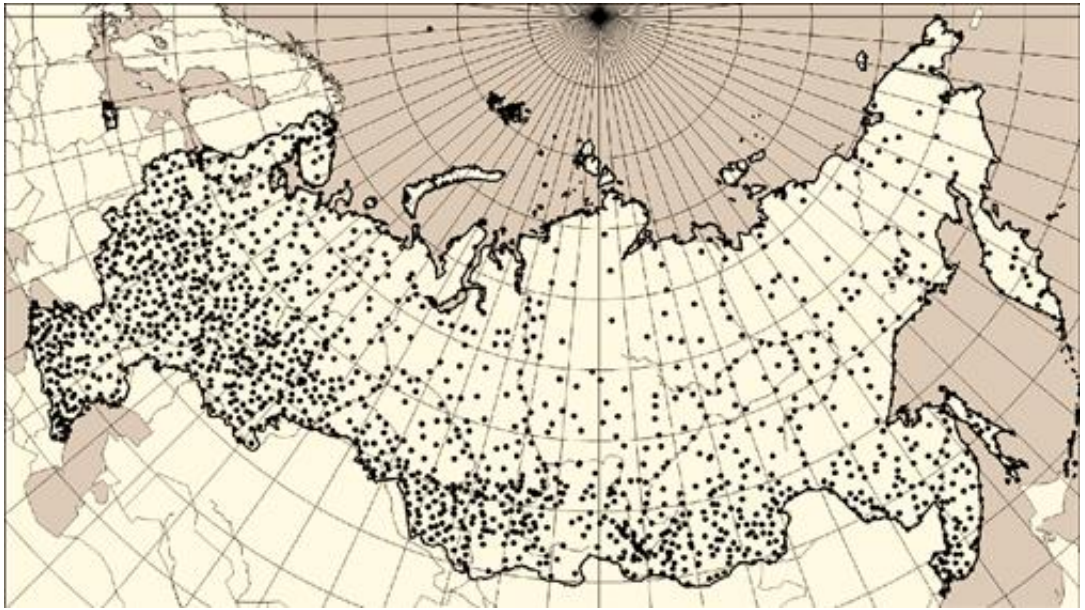
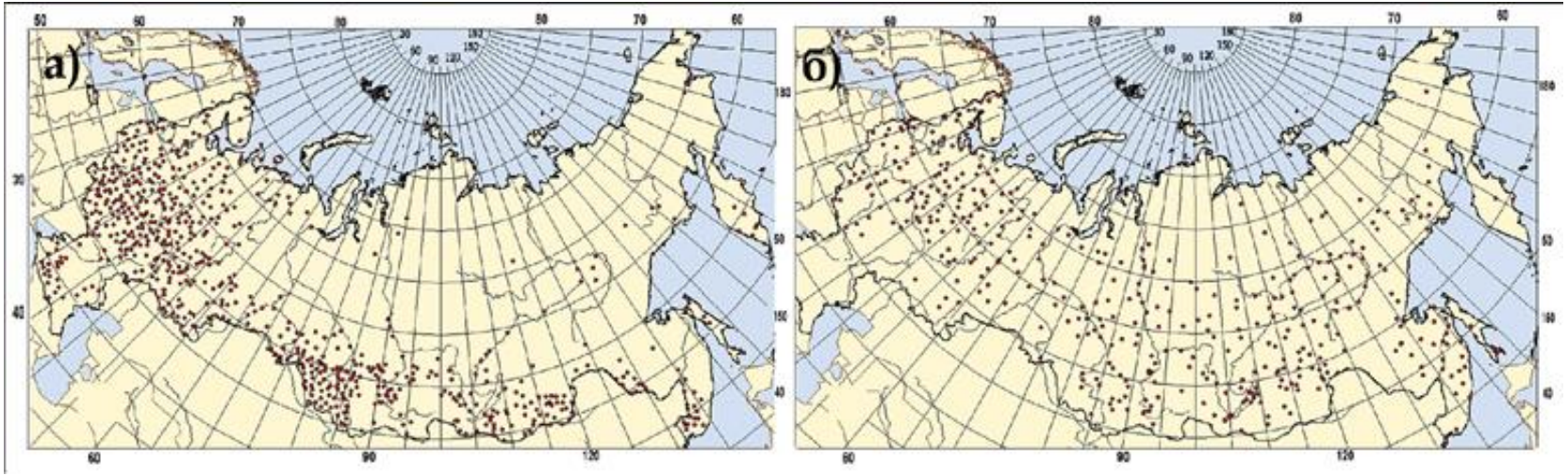
LONG-TERM MONITORING OF SNOW COVER CHARACTERISTICS BASED ON DATA FROM METEOROLOGICAL STATIONS

1238 weather stations with daily observations of snow cover



Long-term monitoring of snow cover characteristics based on data from meteorological stations

958 stations weather stations with data of route snow surveys in the field (a) and in the forest (b)



Snow surveys at the educational meteorological station of the Department of Meteorology and Climatology of TSU (assistant professor of the department O.E. Nechepurenko)

Snow surveys in the state reserve on the territory of the Kuznetsk Alatau

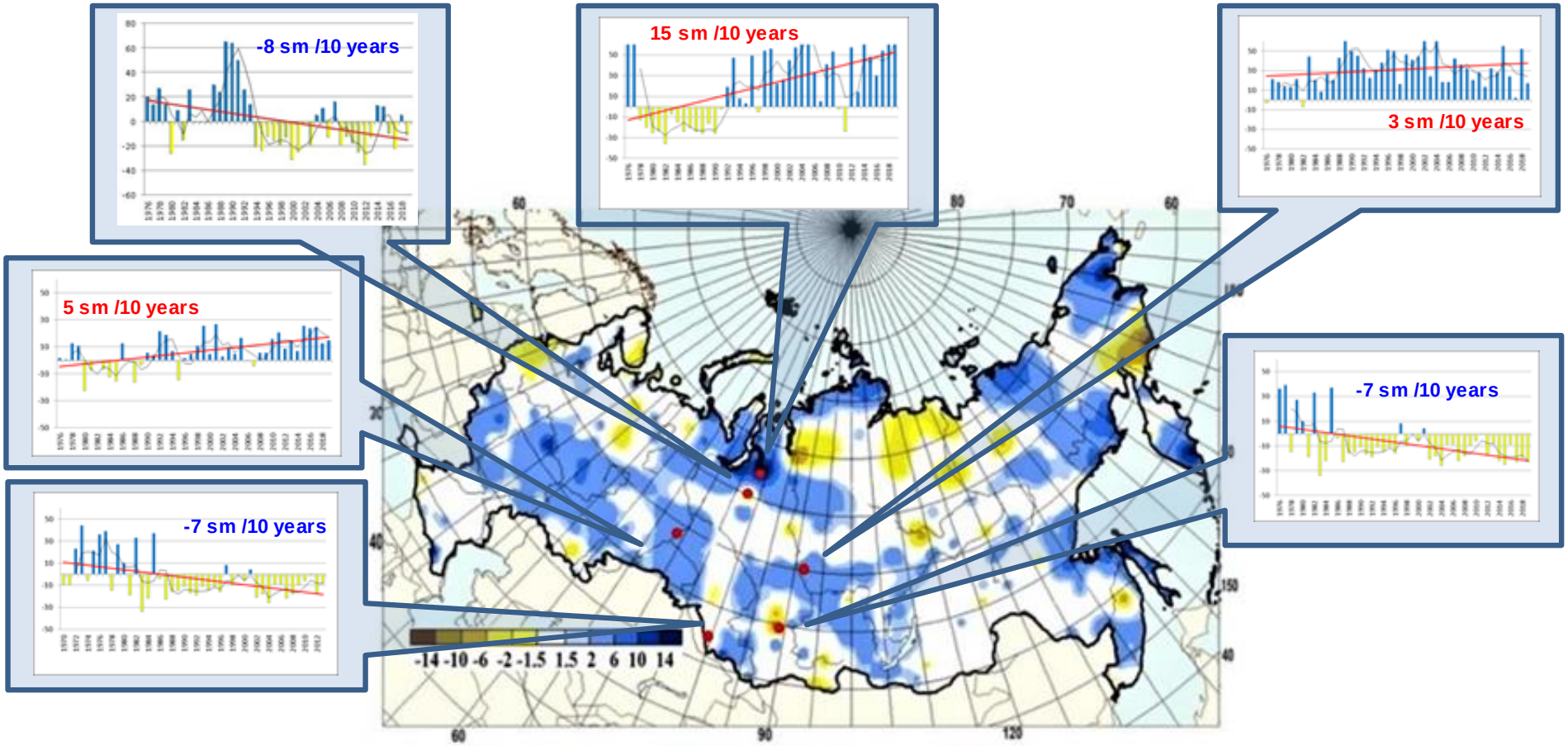
Measurement of snow depth in a cedar forest 14.03.2015 г.

Snow cover on the northern slope of arable land, 25.04.2015 г.

Jet erosion under different agricultural background (24.04.2016)

*Photoswere taken by students of the Department of Meteorology and Climatology at the key site of Luchanovo as part of scientific work

RESULTS OF MEASUREMENTS AT EXPERIMENTAL SITES



Map: coefficients of the linear trend (cm / 10 years) in the rows of the maximum snow depth for the winter period. 1976-2019
Graphs: anomalies of the maximum snow depth for the winter period. 1976-2019

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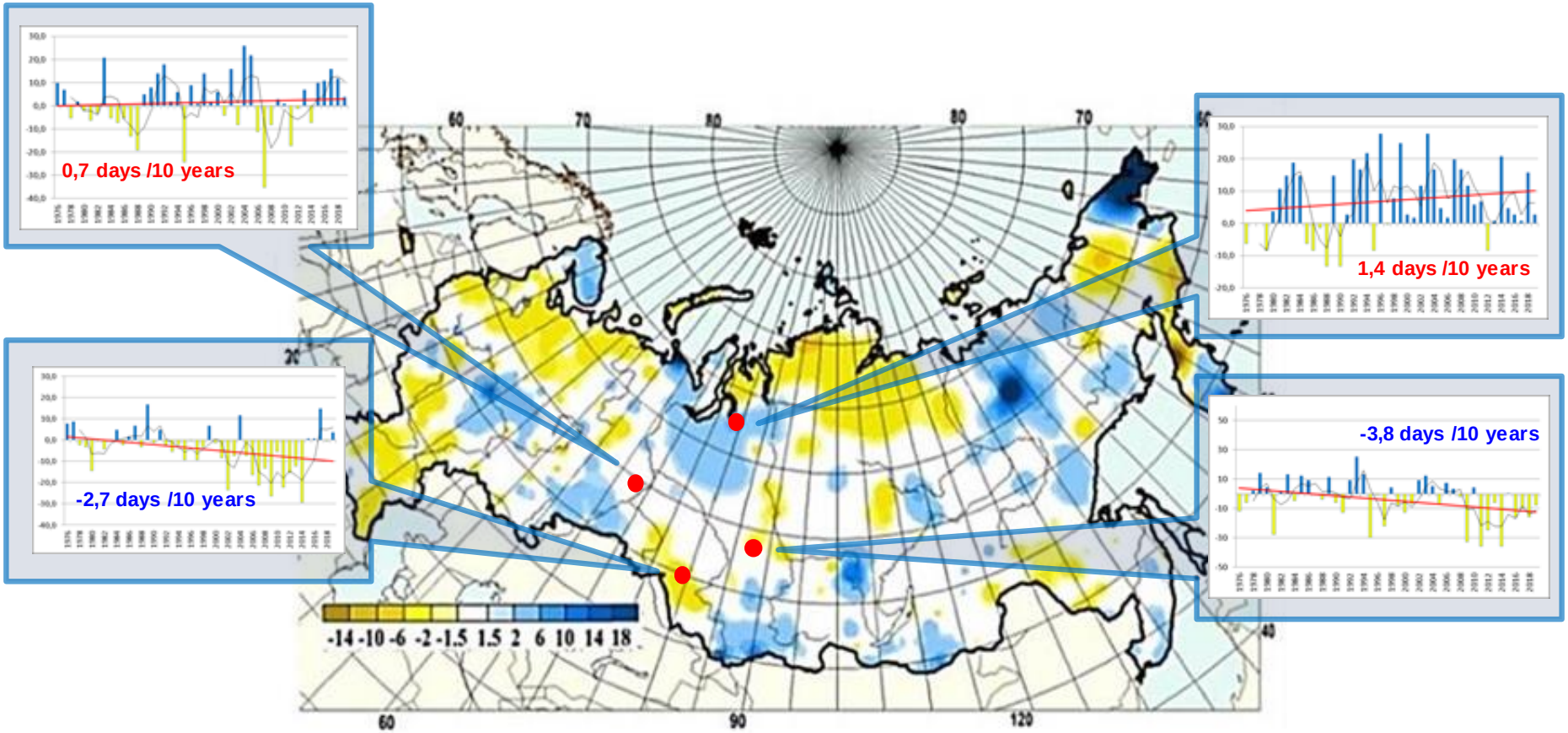

Map: Coefficients of the linear trend (days / 10 years) in the series of the number of days with the degree of coverage of the vicinity of the station with snow over 50%. 1976-2019

Graphs: Anomalies in the number of days with the degree of coverage of the vicinity of the station with snow over 50%. 1976-2019

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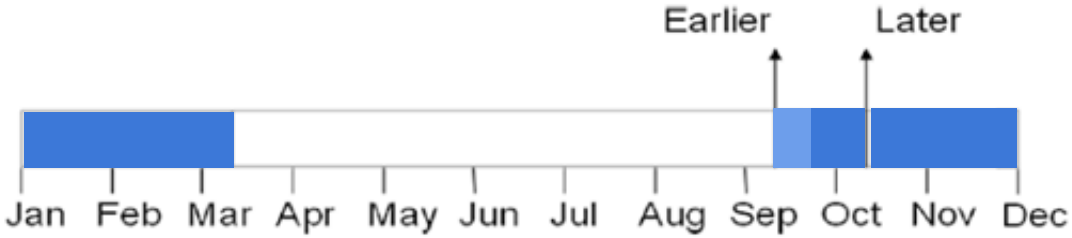
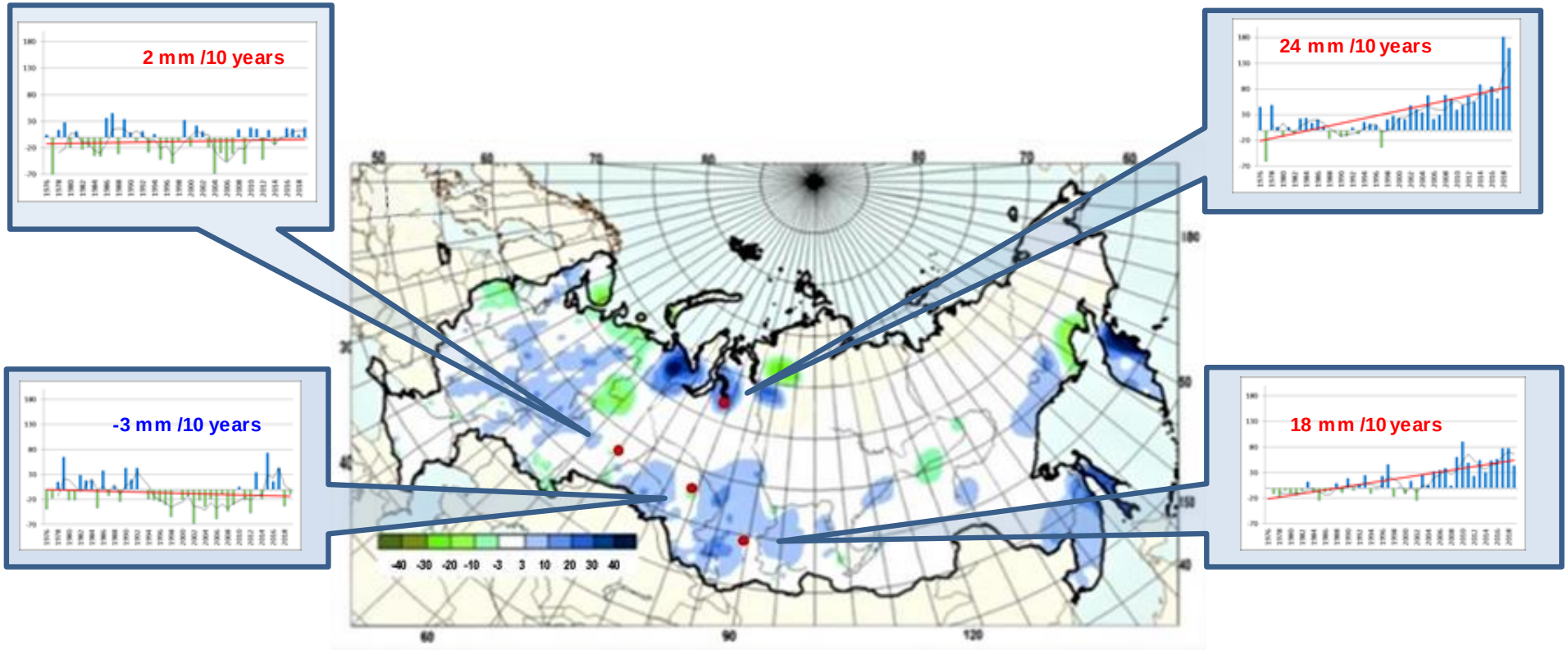


Fig. Appearance of snow covers for the south-east territory of Western Siberia

Occurrence of a snow cover in researched territory is observed in the middle of the third decade of September. The earliest case was observed in the middle of the second decade of September, latest – in the second decade of October.

Terms of formation of the steady snow cover as well as terms of occurrence of the first snow, strongly change from year to year with depending on character of weather. The time interval between these events makes usually 1-1.5 months. The time interval between destruction and disappearance a snow cover is the same.



Map: coefficients of the linear trend (mm / 10 years) in the rows of water reserves in snow for the winter in the field. 1976-2019
Graphs: anomalies in snow water storage for the winter in the field. 1976-2019

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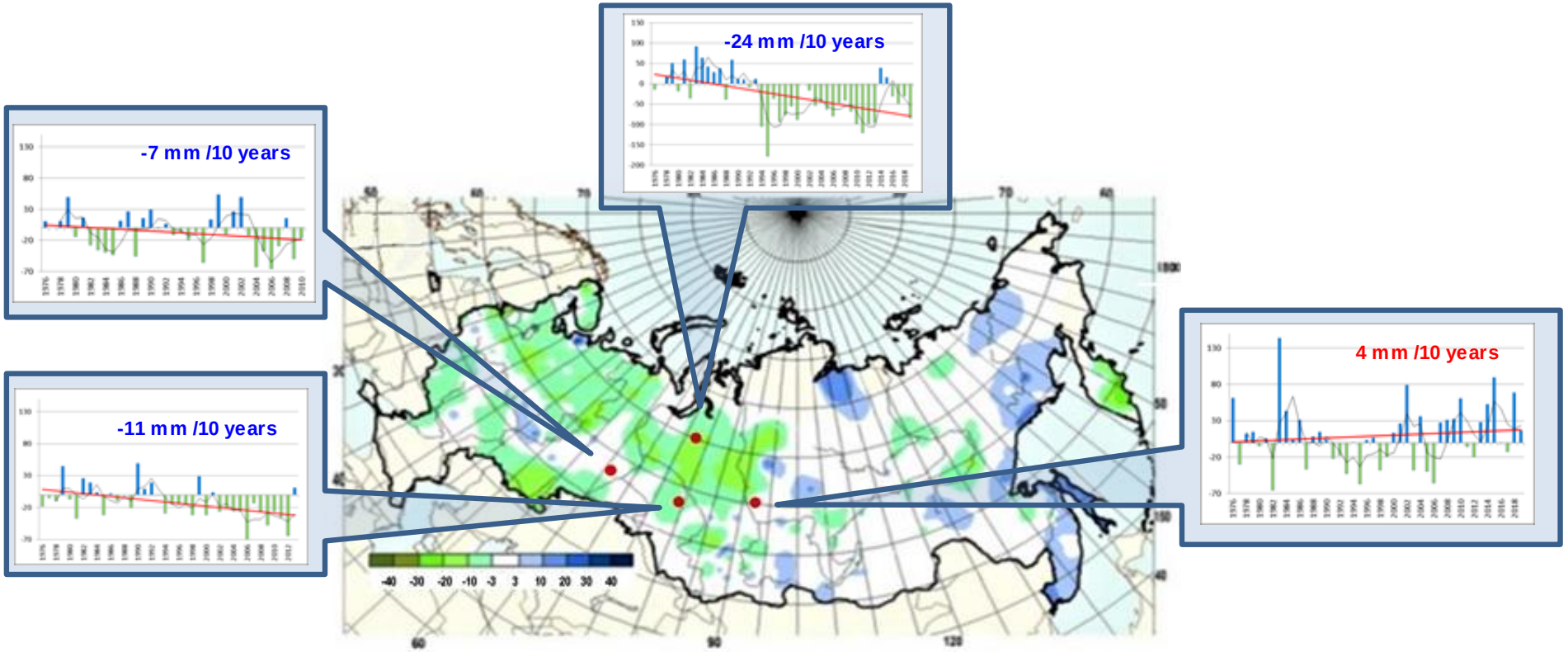

Map: Coefficients of the linear trend (mm / 10years) in the rows of water reserves in snow for the winter in the forest. 1976-2019
Graphs: Anomalies in the water reserve in snow for the winter period in the forest. 1976-2019

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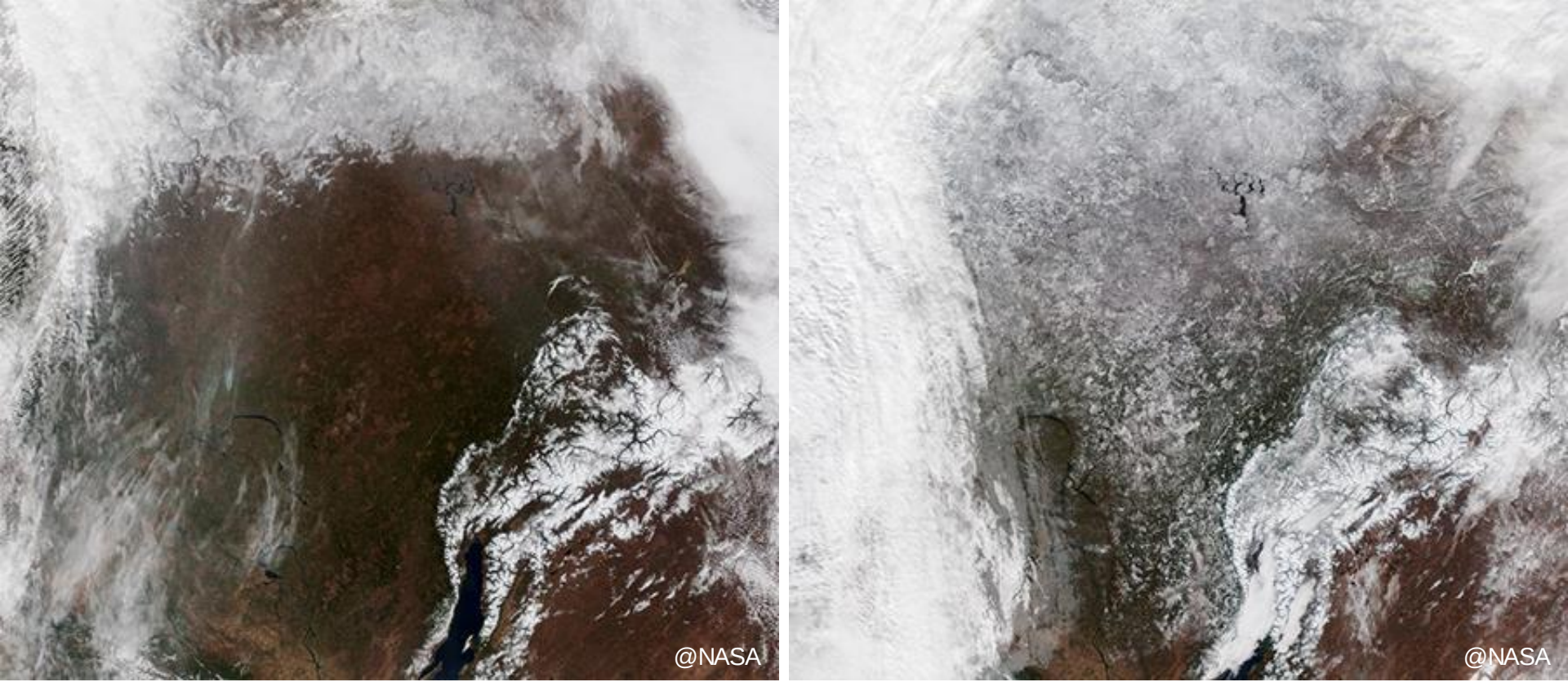
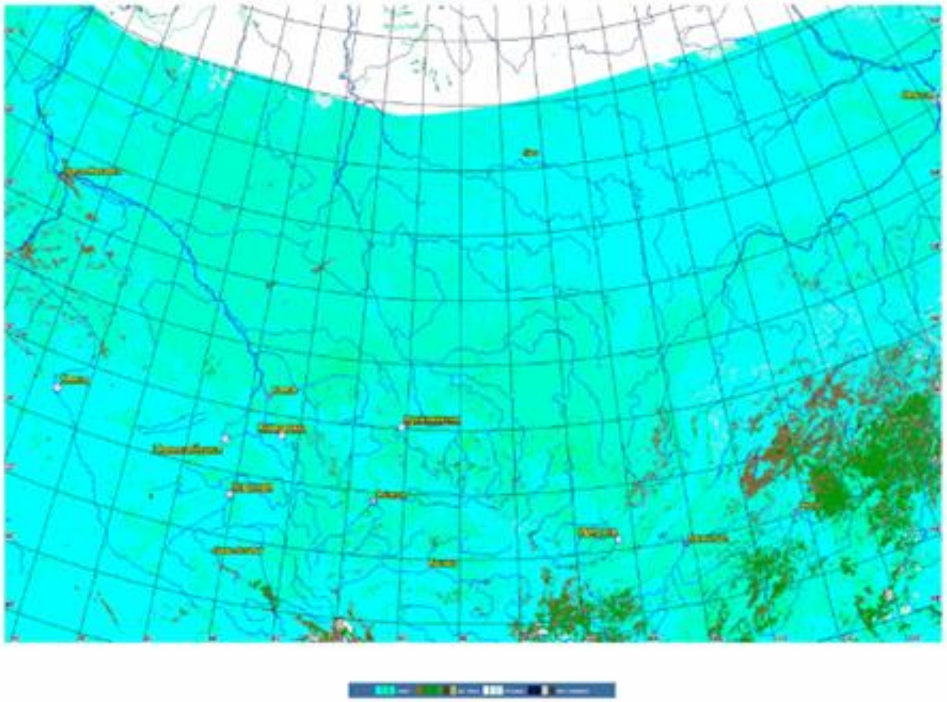
SATELLITE OBSERVATIONS

Parameters SNOW / ICE > SNOW COVER	MODIS Snow Cover 5-Min L2 Swath 500m	VIIRS/NPP Snow Cover 6-Min L2 Swath 375m
		
Product name:	MOD10_L2	VNP10
Platform(s):	Terra	SUOMI-NPP
Spatial Resolution:	500 m x 500 m	375 m x 375 m
Temporal Resolution:	5 minute	6 minute
Data Format(s):	HDF-EOS	NetCDF
Temporal Coverage:	24 February 2000 to present	19 January 2012 to present



Truecolor image V*IIRS (Suomi NPP).* South Siberia, October, 14 (left) and October, 29 (right) 2020.

Snow cover distribution
Scientific Research Center «Planeta»



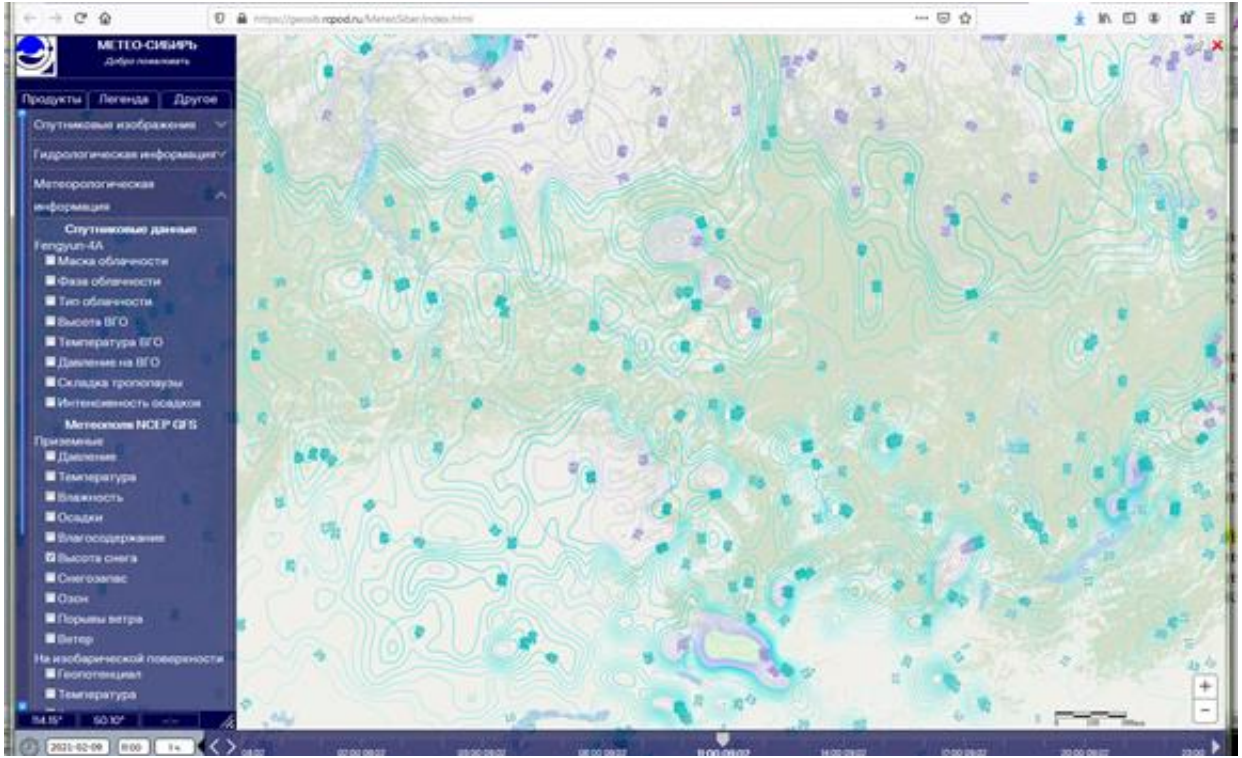
SuomiNPP/VIIRS, Terra/MODIS

Мониторинг распределения снежного покрова в Сибирском регионе (композит за 16 суток)

27.01.2021

Geoinformation service "Meteo-Siberia«

http://ppi.rcpod.ru:85/MeteoSiber/



Images in the visible and infrared ranges obtained from the:

- Electro-L №2
- Meteor-M №2
- Terra
- Aqua
- Suomi NPP
- NOAA-20

General conclusions

Snow cover plays an important role in shaping the climate in Russia. The snow cover monitoring technology developed at VNIIGMI-WDC allows regular detailed analysis of the state of the snow cover on the territory of the country, promptly tracking trends in changes in its characteristics.

It is possible to attract information on the state of the snow cover in general for the Russian Federation and individual regions, in particular for Western Siberia, according to space monitoring of the Earth, but due to large differences in dynamics and spatial distribution, it is necessary to constantly attract field observations at meteorological stations.


Thanks!
Any questions?
meteo@ggf.tsu.ru