


# Changes of climatological conditions of automobile transport functioning in north of European part of Russia

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# Purpose of the work

 ***investigation of spatial distribution and changes of some applied cold season characteristics which affect to automobile transport functioning in north-west Russia territory from 1951 to 2010 year***



# Investigated parameters



the solid precipitation sum and the number of weak, medium and extreme snowfalls -> **(0-2)**, **(2-5]** and **> 5 cm/day**

*- 1 cm new-fallen snow  $\approx$  1 mm of water*

the number of days with temperature below  $-25^{\circ}$  C

*- below this temperature the risk of various automobiles breakdowns increases*

the average temperature of the coldest pentad

*- 5 days in a row, parameter used in the design of road and other structures*

number of crossings of the freezing point by the air temperature

*- characterizes the probability of slipperiness occurrence*

# Data



➤ Meteorological data archive of 600 stations in the ex-USSR territory (RIHMI-RWC, [www.meteo.ru](http://www.meteo.ru))

—————→ daily data of air temperature and precipitation



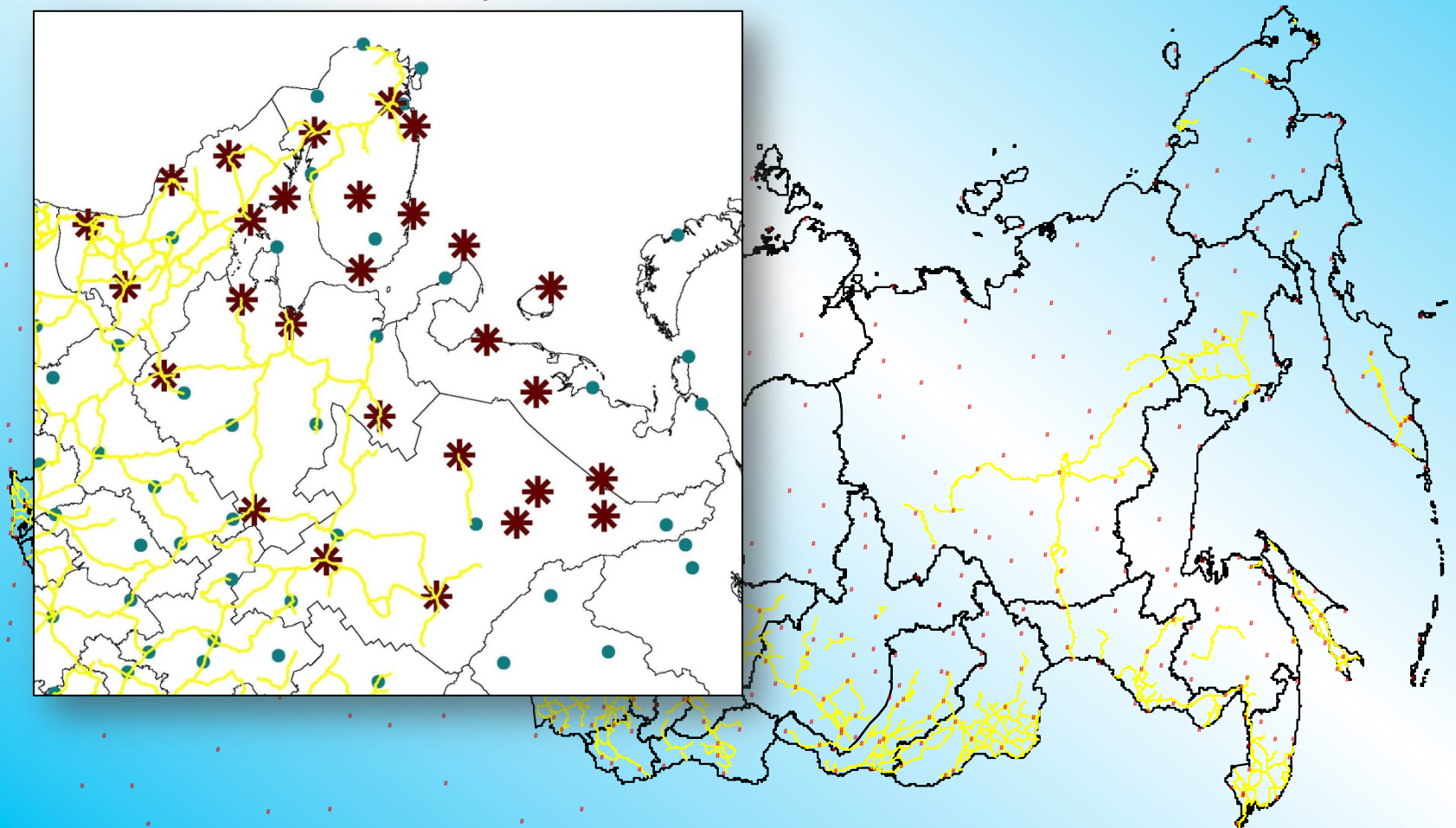




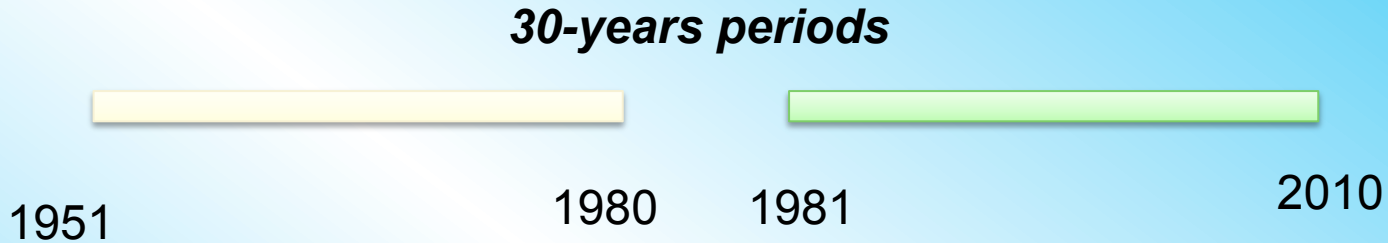
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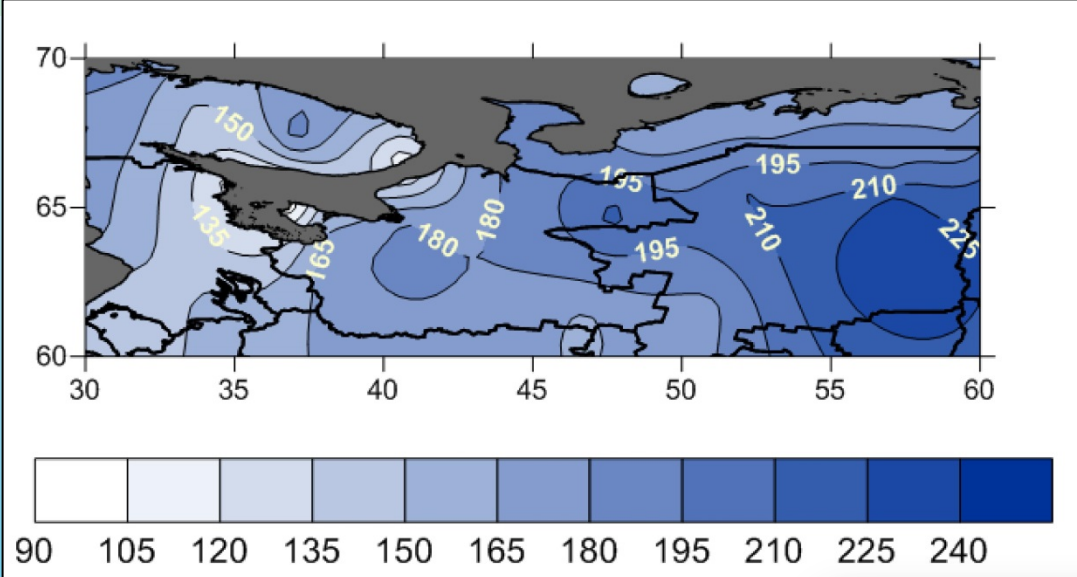
# Statistical treatment



- **Calculation of parameters mean meanings for each period, its variance and standard deviation**
- **Assessment of the statistical significance of changes**

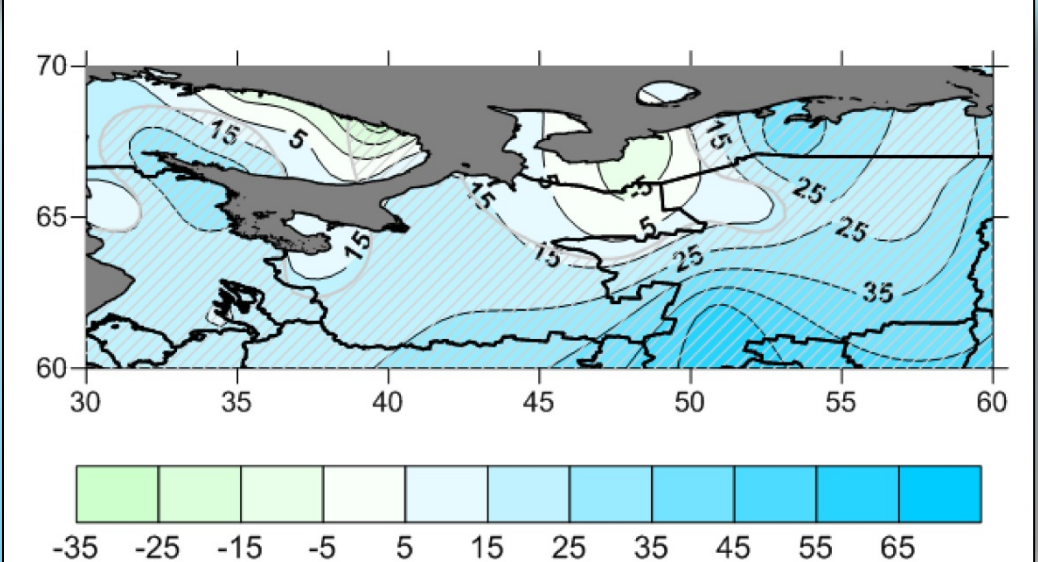


# The spatial distribution and changes of the solid precipitation



*Annual sum of the solid precipitation (mm) in 1951-2010*

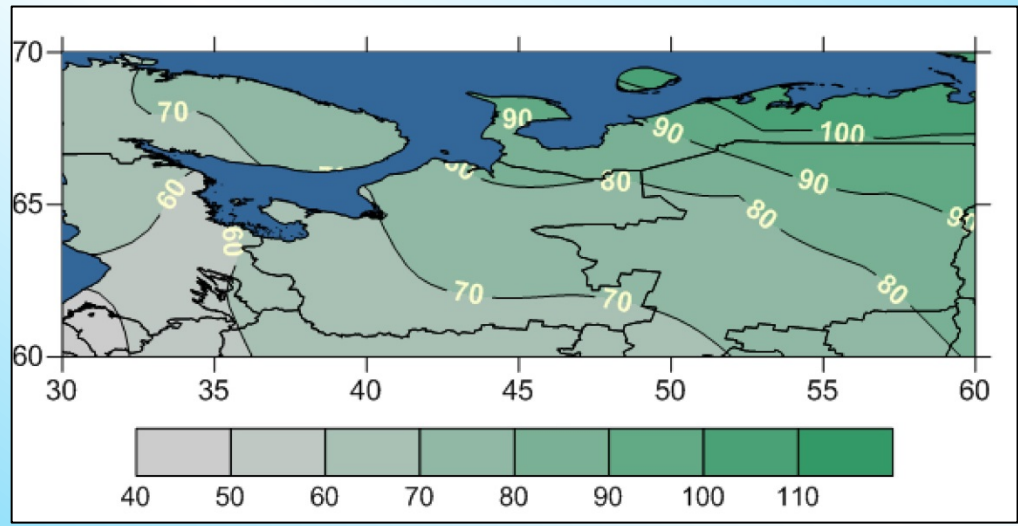
*Changes of solid precipitation annual sum in (1981-2010) vs. (1951-1980)*





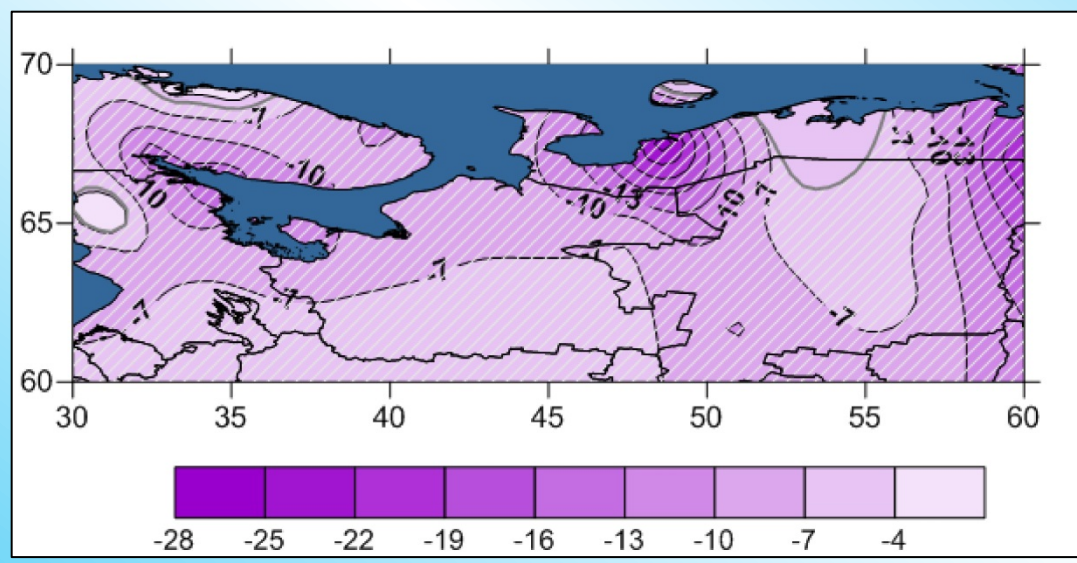


# The spatial distribution and changes of the weak snowfalls number



*Annual number of weak snowfalls (0-2 cm/day) in 1951-2010*

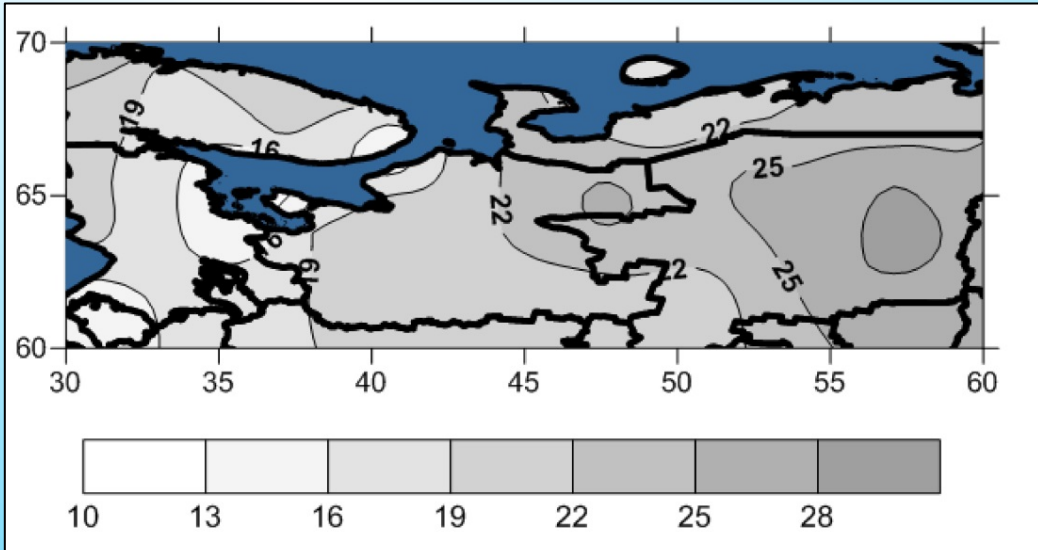
*Changes of annual number weak snowfalls in (1981-2010) vs. (1951-1980)*





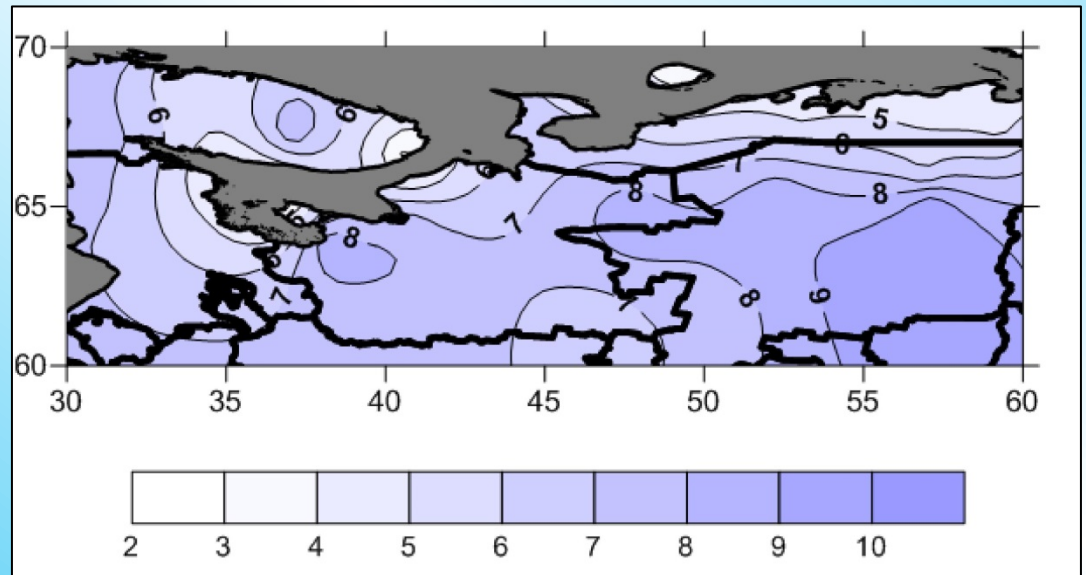


# The spatial distribution of the medium and extreme snowfalls number



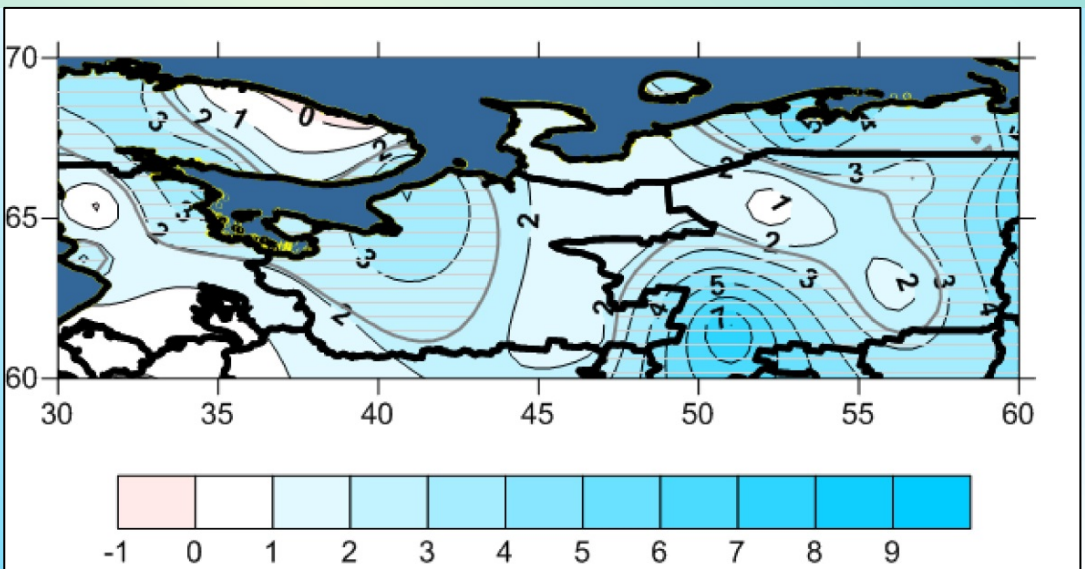
*Annual number of medium snowfalls (2-5 cm/day) in 1951-2010*

*Annual number of extreme snowfalls (>5 cm/day) in 1951-2010*



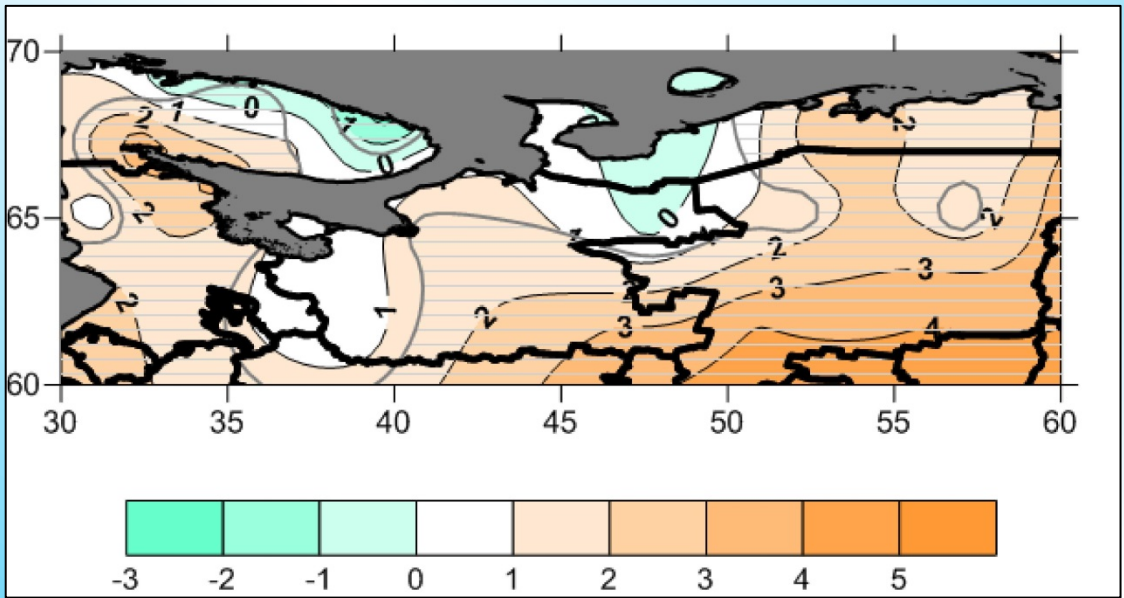


# The changes of the medium and extreme snowfalls number



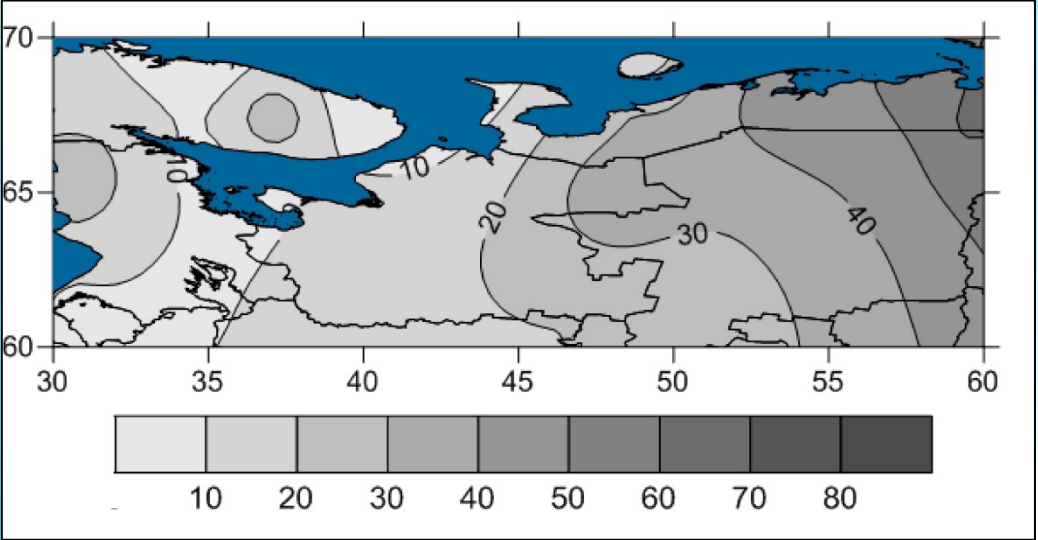
*Changes of annual number medium snowfalls in (1981-2010) vs. (1951-1980)*

*Changes of annual number extreme snowfalls in (1981-2010) vs. (1951-1980)*



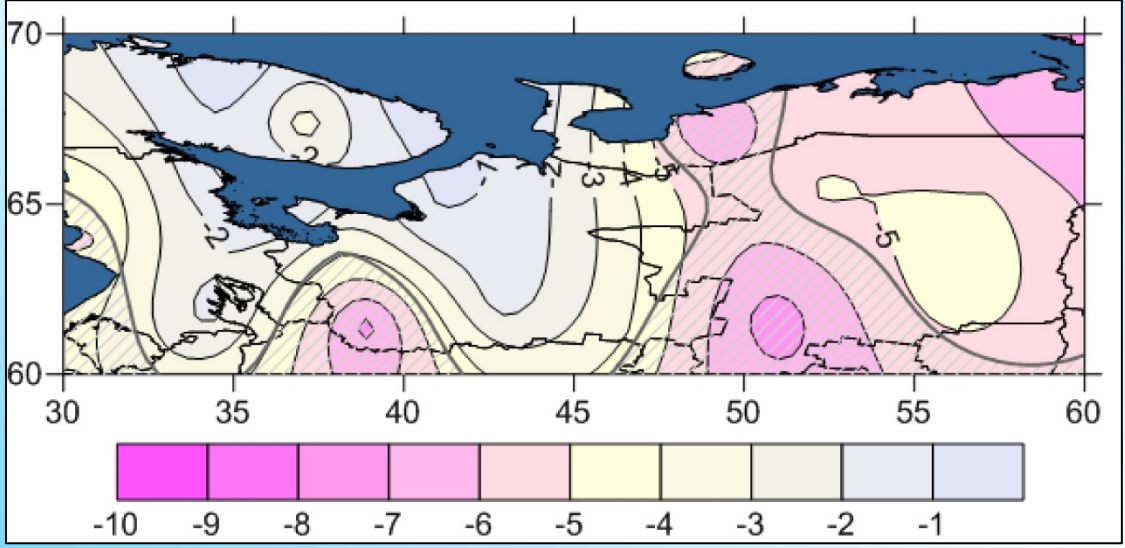


# The spatial distribution and changes of the extreme frost days number



*Annual number of the extreme frost days ( $T < -25^\circ$ ) in 1951-2010*

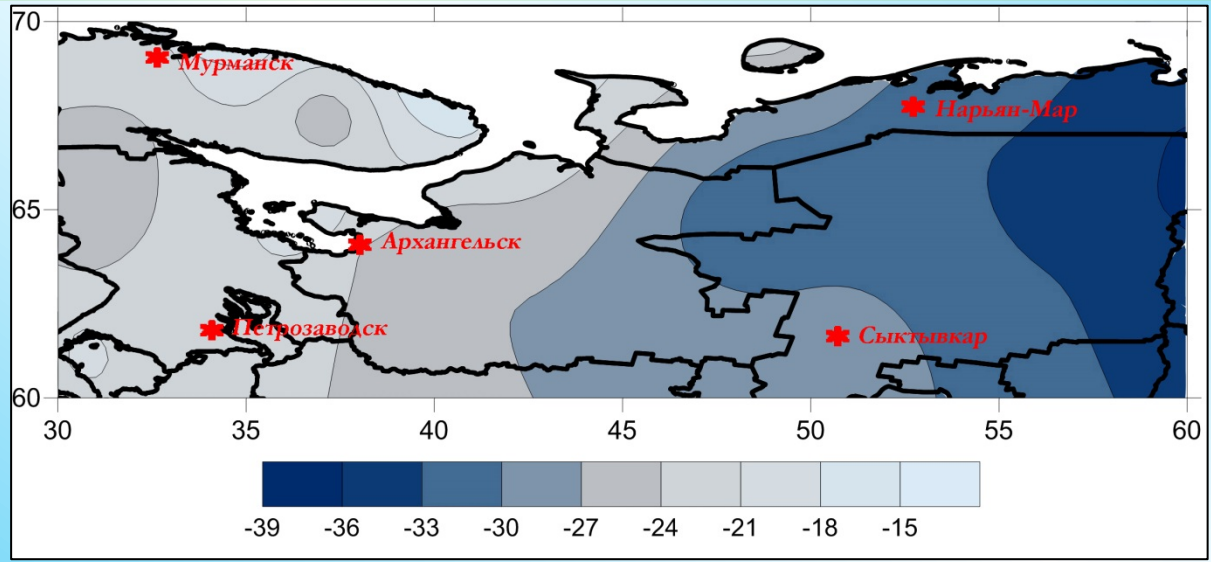
*Changes of the extreme frost days in (1981-2010) vs. (1951-1980)*





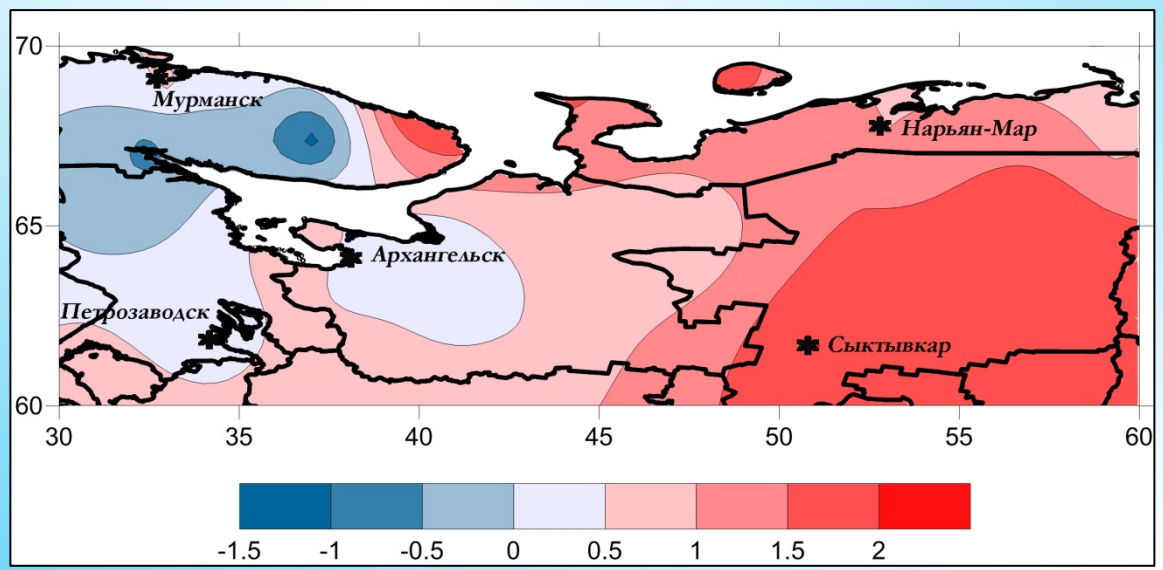


# The spatial distribution and changes of the coldest pentad average temperature



*The average temperature of the coldest pentad in 1951-2010*

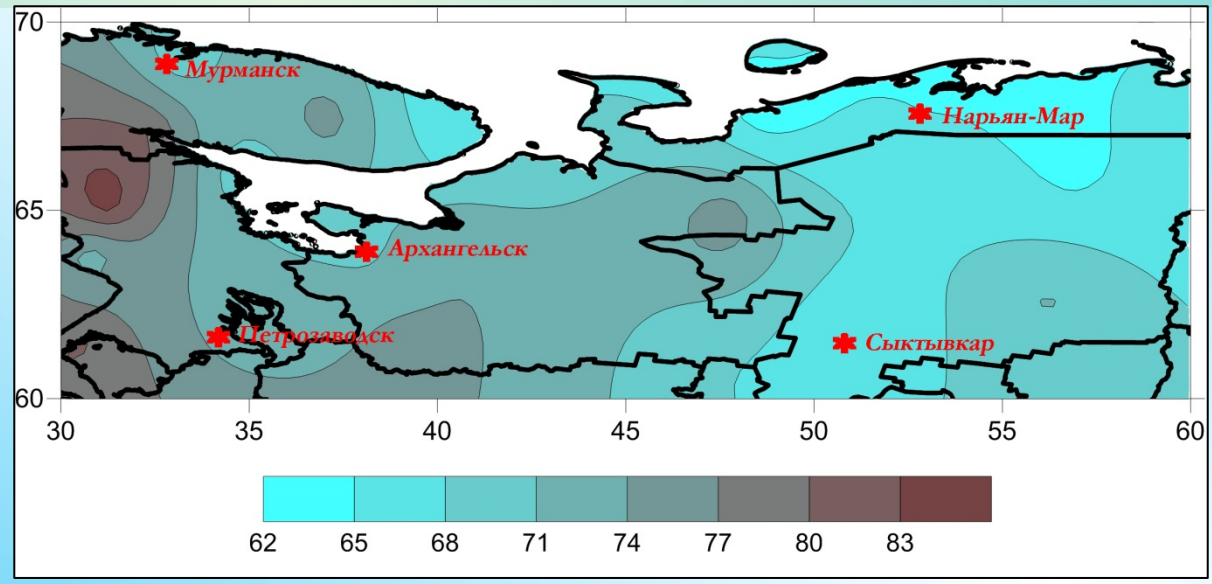
*Changes of the coldest pentad average temperature in (1981-2010) vs. (1951-1980)*





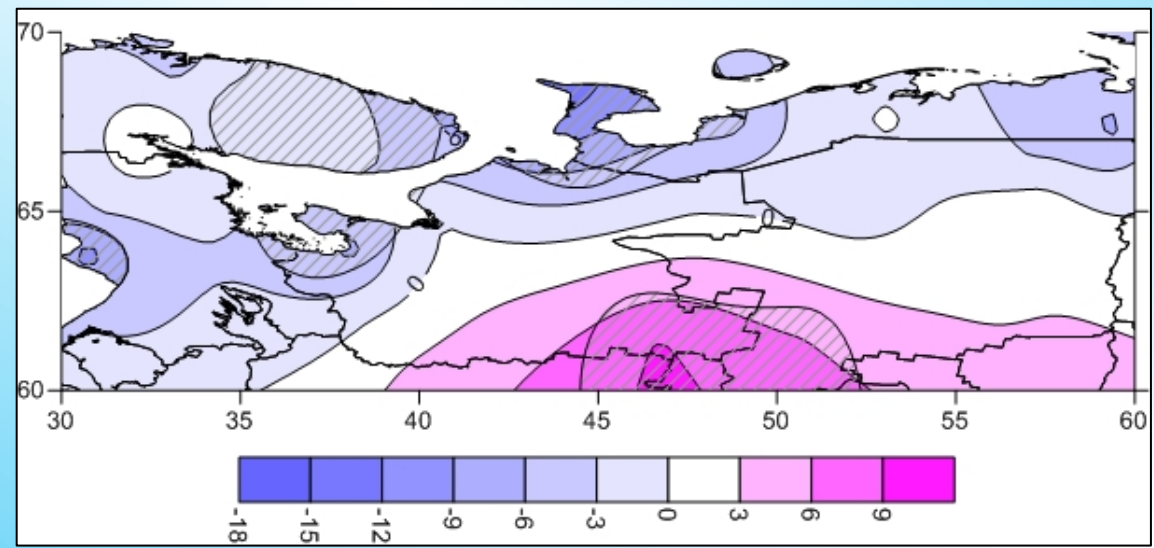


# The spatial distribution and changes of the number of crossings of the freezing point by air temperature



*Annual number of crossings of the freezing point by the air temperature in 0° C in (1951-2010)*

*Changes of the annual number of crossings of the freezing point by the air temperature in (1981-2010) vs. (1951-1980)*



# Results



- ✓ The tendency of the solid precipitation sum increase in (1981-2010) as compared with (1951-1980) has been detected in the major part of the investigated territory as well as increasing of number of medium and extreme snowfalls. But the number of weak snowfalls decreased statistically significantly on the entire territory. The increasing of solid precipitation sum and number of medium and extreme snowfalls has negative influence on automobile transport functioning.
- ✓ Tendency of the decreasing of number of days with temperature below  $-25^{\circ}\text{C}$  occurred on investigated territory. This tendency have positive influence on this branch of the economy.
- ✓ The number of crossings of the freezing point by the air temperature changed irregularly.

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**Thanks for your attention!**