

*Institute of Geography, Russian Academy of Science
Laboratory of Climatology
Moscow*

Contemporary changes of applied climatological characteristics in Russia

**Alexandra V. Borzenkova
Andrey B. Shmakin**

The purpose of the work

*investigation of some applied cold season characteristics
changes in Russia territory from 1950 to 2006 year:*

- heating period duration (HPD) - steady period with $T < 8$ C
- heating period intensity - the energy consumption index (ECI)

$$ECI = \sum |T - 20|$$

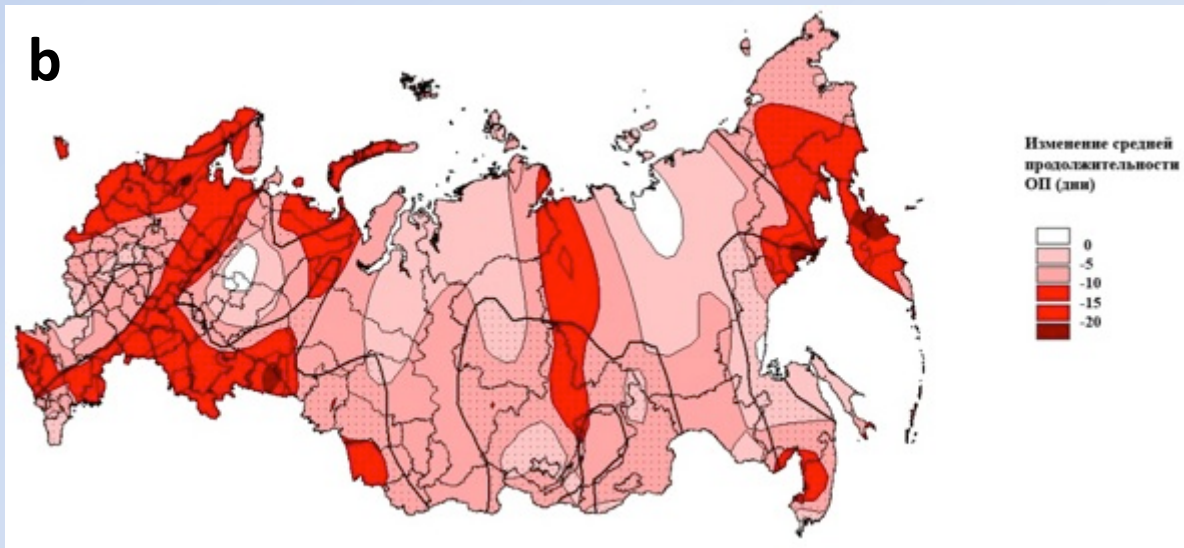
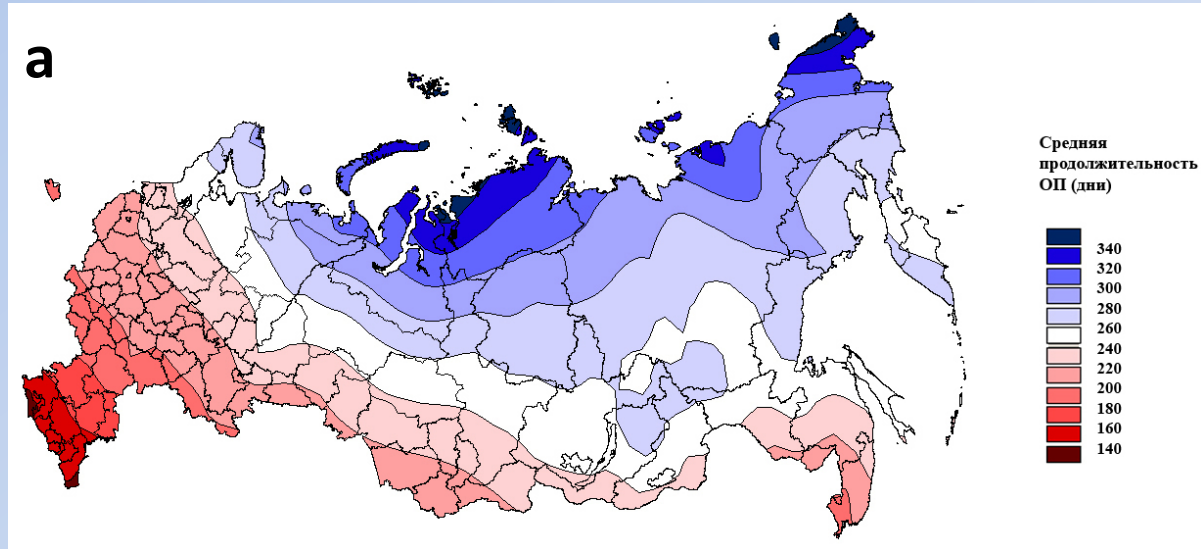
- the amount of precipitation under negative air temperature
- the weak, medium and extreme snowfalls number

Data processing

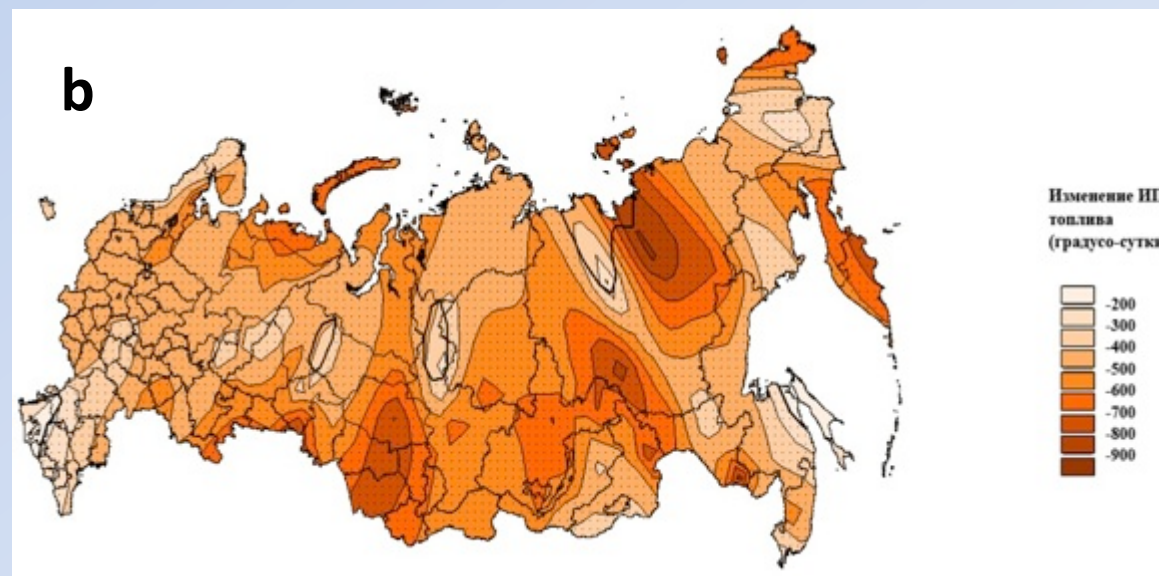
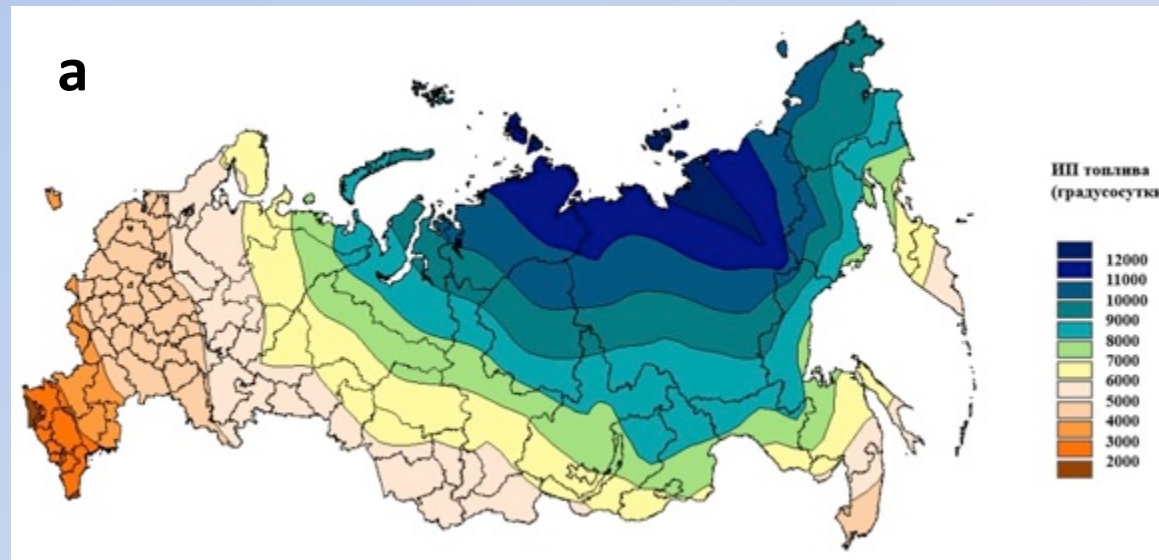
- **Calculation of using parameters**
- **Statistical treatment:**
 - “base” period (1950-1980)
 - period of “modern warming” (1989-2006)

[Shmakin, Popova, 2006]
- **Calculation of correlation coefficients between ECI, snow amount and atmosphere circulation indices NAO, PNA and Scand**

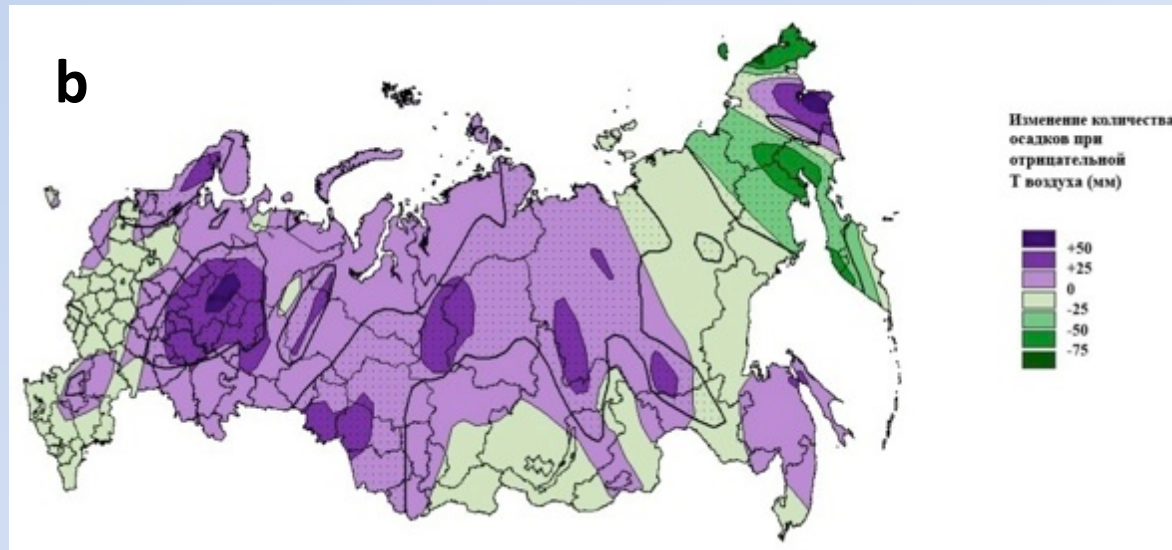
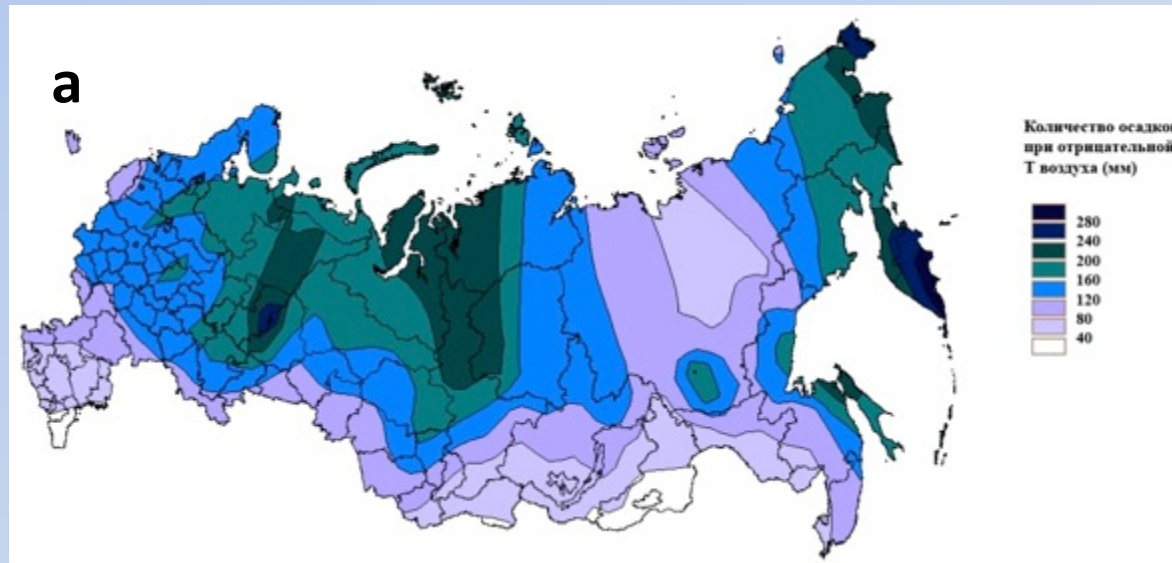
The spatial distribution (a) and changes (b) of heating period duration



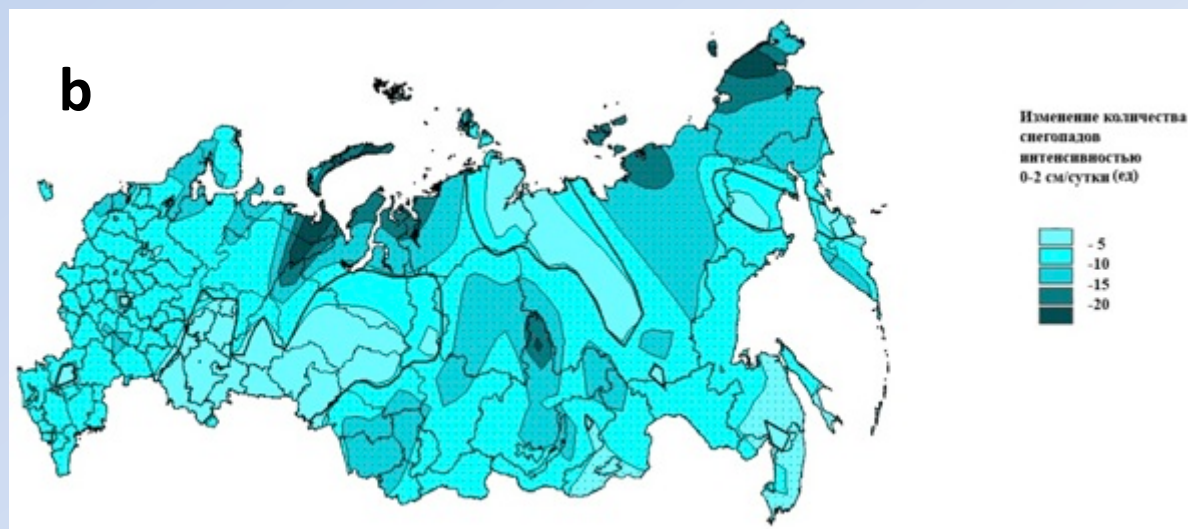
The spatial distribution (a) and changes (b) of energy consumption index



The spatial distribution (a) and changes (b) of the precipitation under negative air temperature



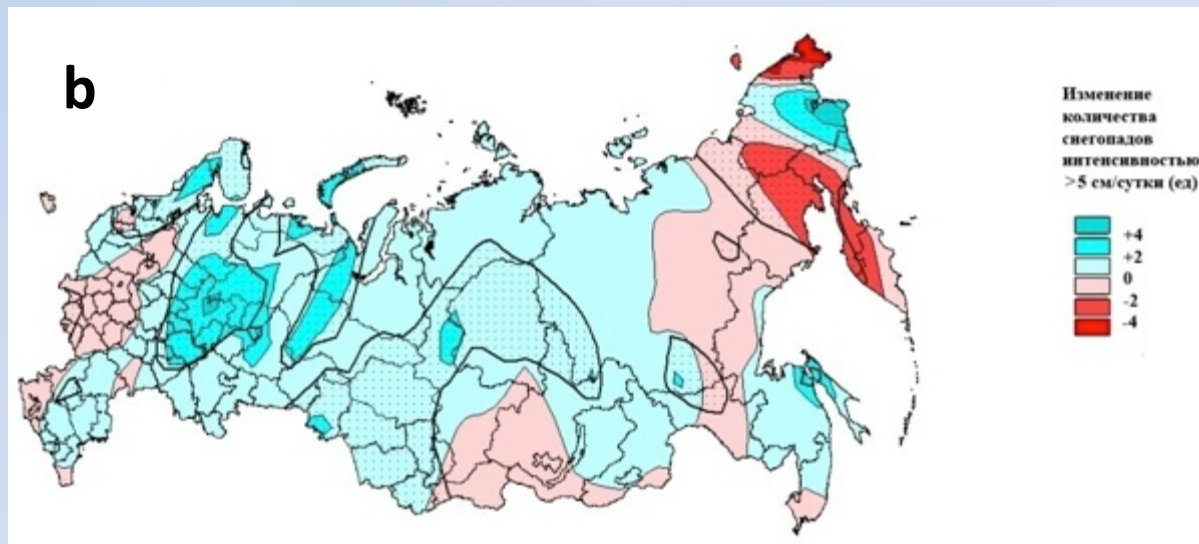
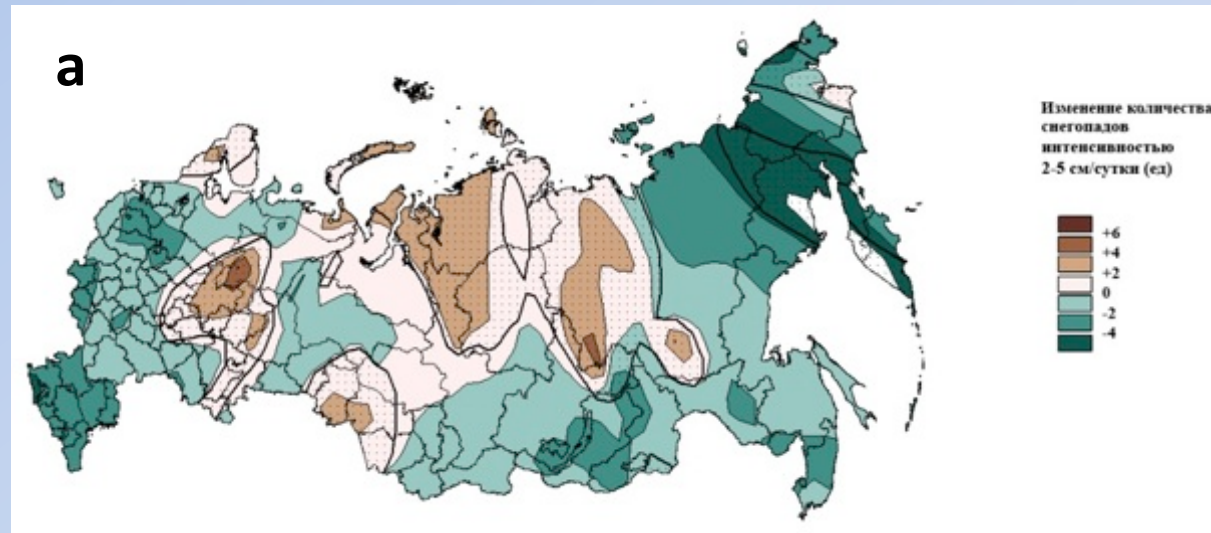
The spatial distribution (a) and changes (b) of the weak (0-2 cm/day) snowfalls



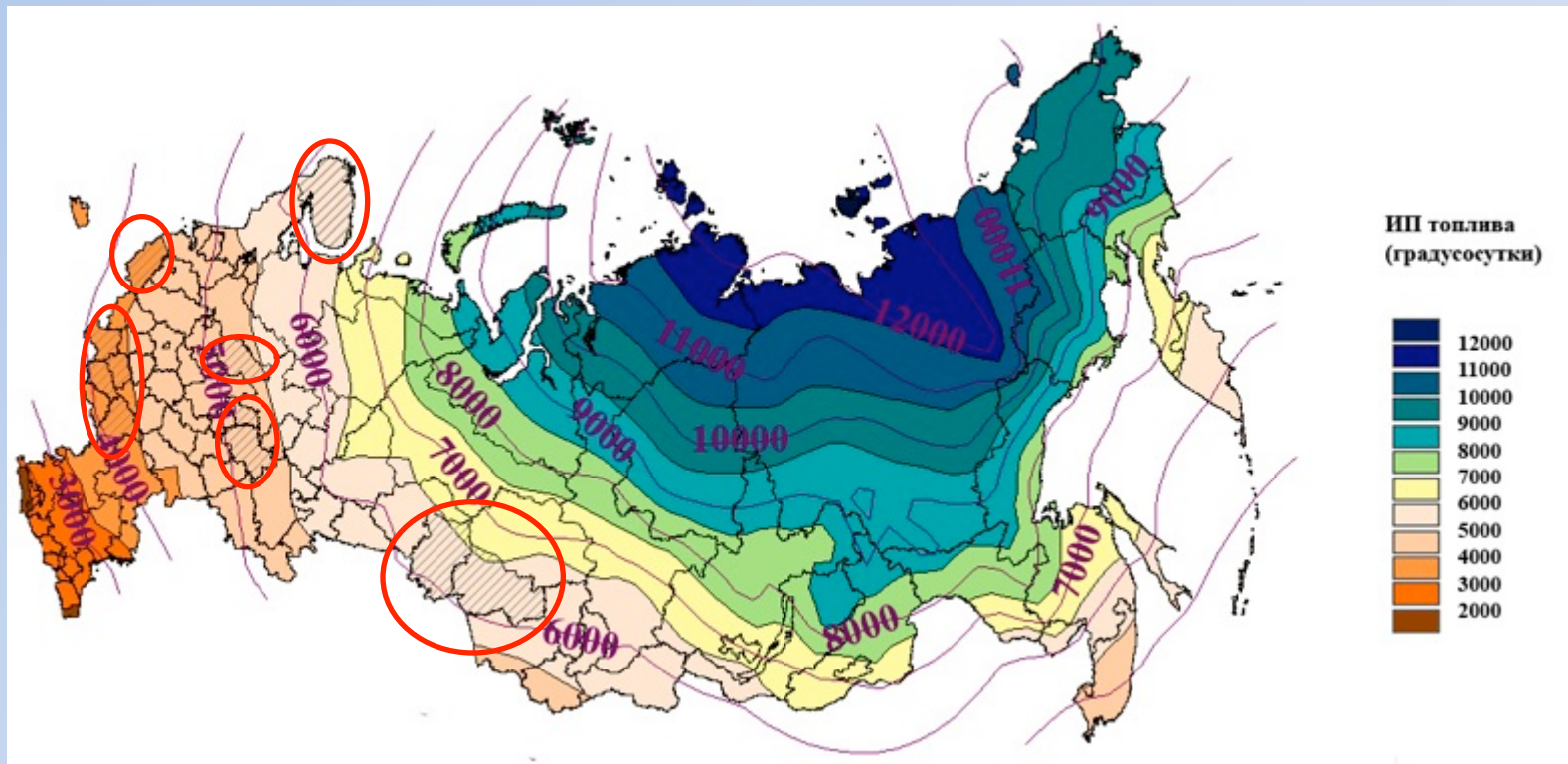
The spatial distribution of the medium (2-5 cm/day) and heavy (more 5 cm/day) snowfalls



The changes of the medium (2-5 cm/day) and heavy (more 5 cm/day) snowfalls



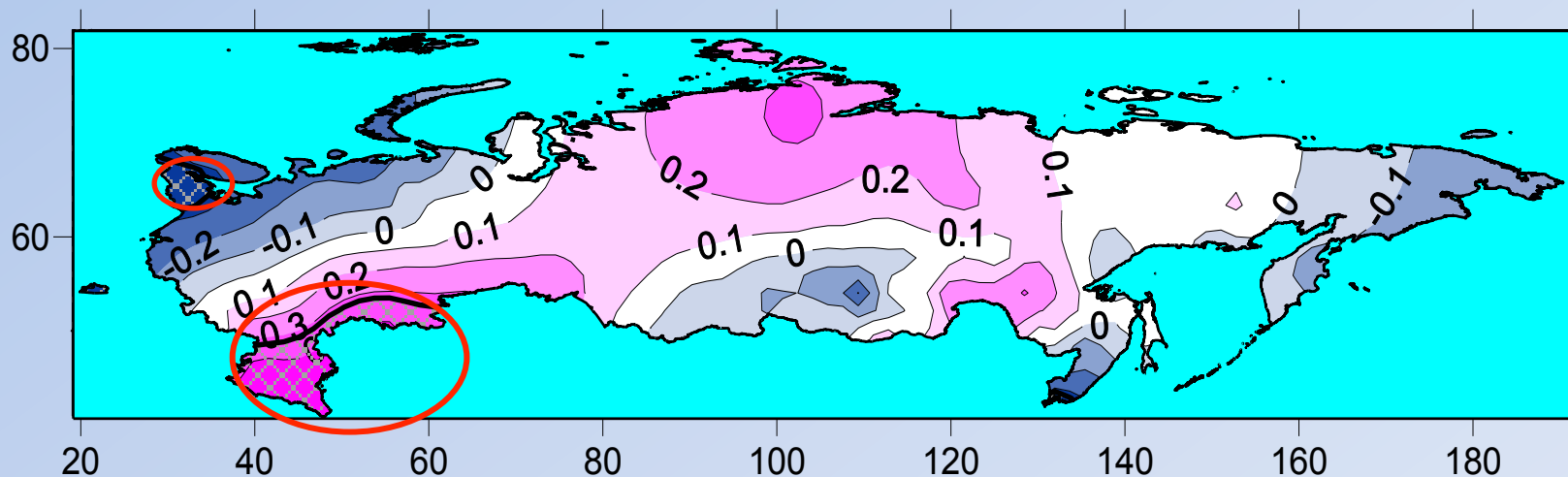
The subjects of Russian Federation which completely or almost completely have moved from one gradation of investigated characteristics to another in the period of “modern warming” (1989-2006) as compared with the “base” period (1950-1980)



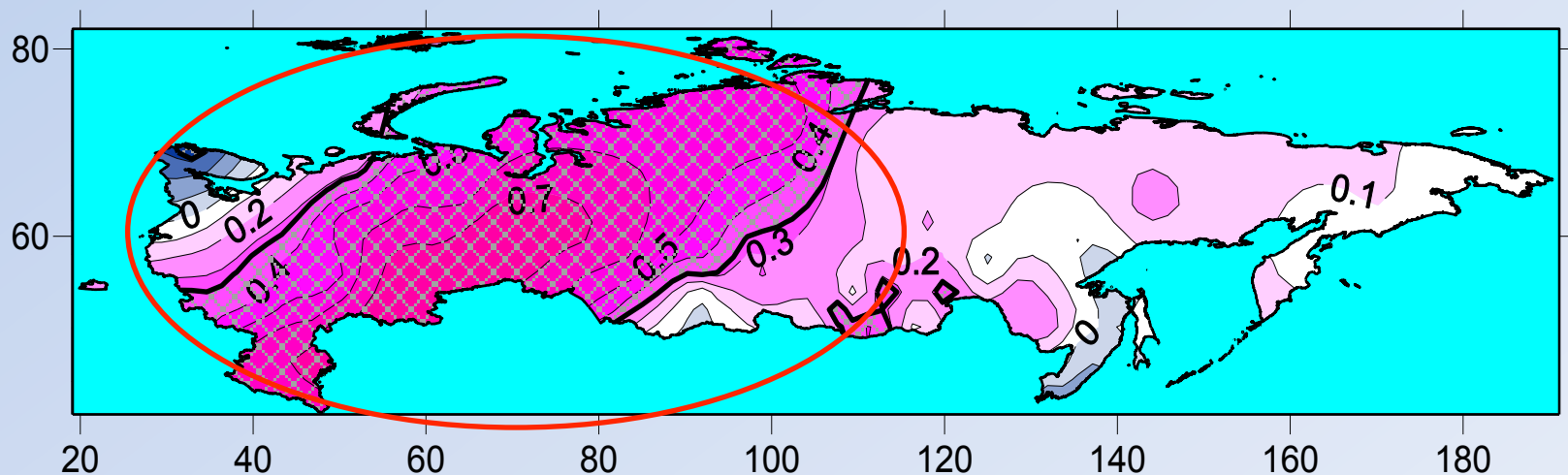
The average spatial distribution of ECI, degree days, in 1950-1980 (isolines) and 1989-2006 (filling colors)

The correlation between ECI and atmosphere circulation indices NAO(a) and SCAND(b) in 1950-1974

a

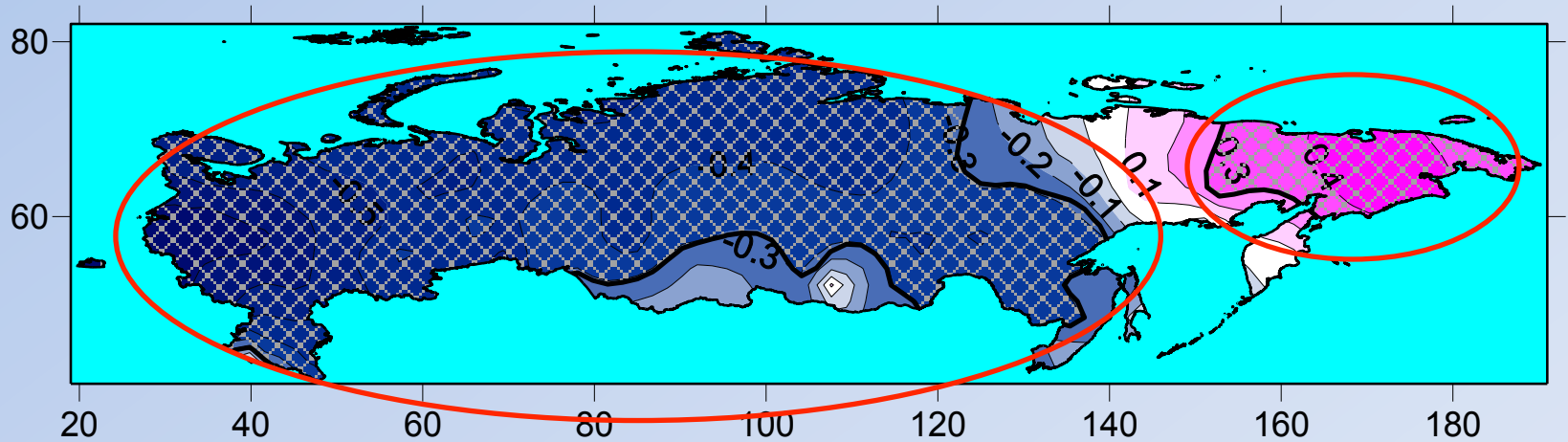


b

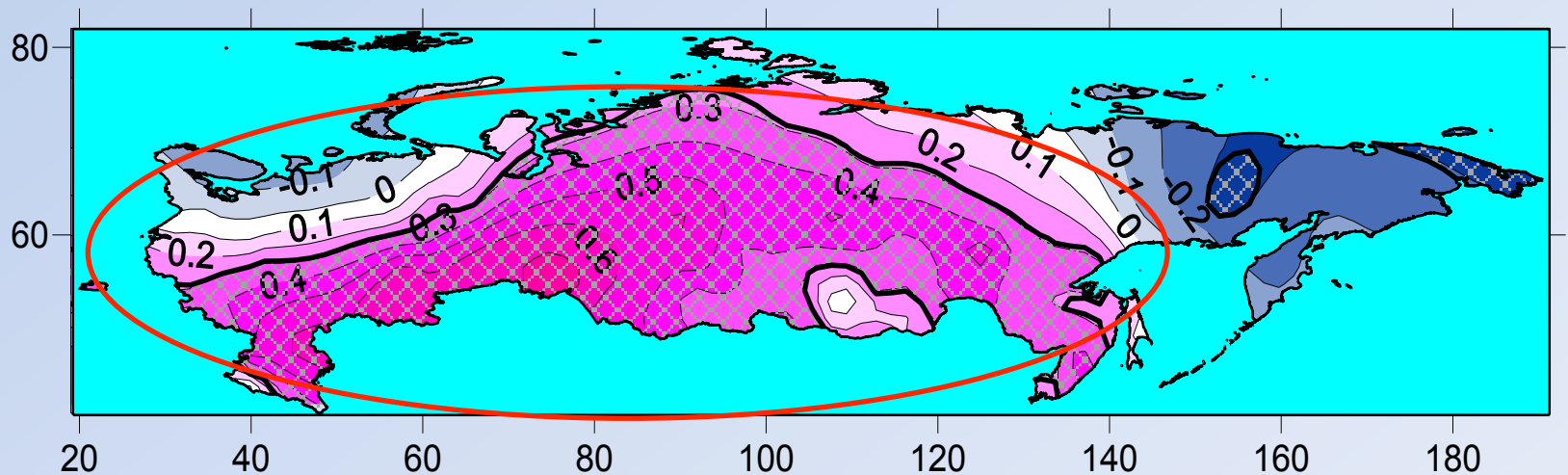


The correlation between ECI and atmosphere circulation indices NAO(a) and SCAND(b) in 1975-2006

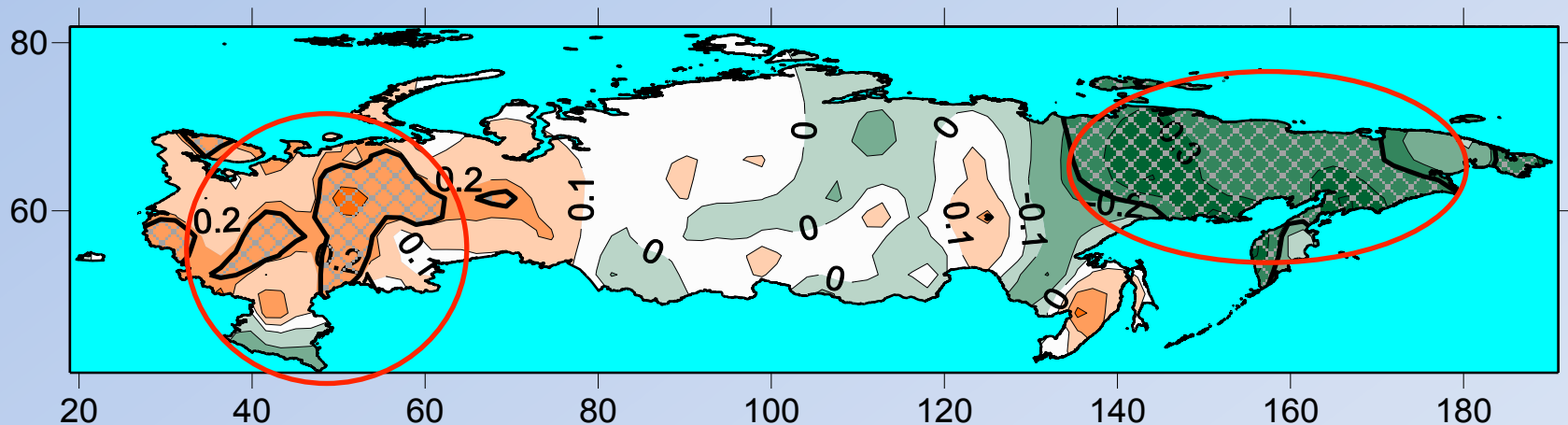
a



b



The correlation between snow amount and atmosphere circulation index PNA in 1950-2006



The correlation between parameters and atmosphere circulation indices

NAO did not play a significant role in shaping the field of ECI before the 1975 and the mechanism SCAND clearly dominate at that time. Period after 1975 has been characterized by a significant increase in the positive phase of NAO while SCAND remained to have some influence. PNA in Russia reveals itself not so much. The correlation between the amount of precipitation under negative air temperature and atmosphere circulation indices is weak.

Conclusions

- The spatial distribution of HPD is latitudinal. The distribution character of ECI exhibits a latitudinal pattern with the longitudinal component.
- The reduction of HPD in 1950-2006 has occurred almost on whole territory of Russia and are statistically significant on the half of Russia territory. The reduction of ECI is substantial and statistically significant on the almost all Russia territory except some little areas.
- The amount of precipitation under negative air temperature more depends on the extreme snowfalls then on the weak snowfalls.
- The tendency of the snow amount increase in 1989-2006 as compared with 1950-1980 has been detected on almost whole area of the country. The number of weak snowfalls increased statistically significantly on the most parts of Russia.
- The case of applied climate characteristics changes for investigated period is the variation of atmosphere circulation condition, which particularly obviously occurred in the changes of ECI. The correlation between the amount of precipitation under negative air temperature and atmosphere circulation indices is weakly.