



Reconstruction of the climatic characteristics in the Altai Mountains and glaciers response to their changes

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The Altai Mountains

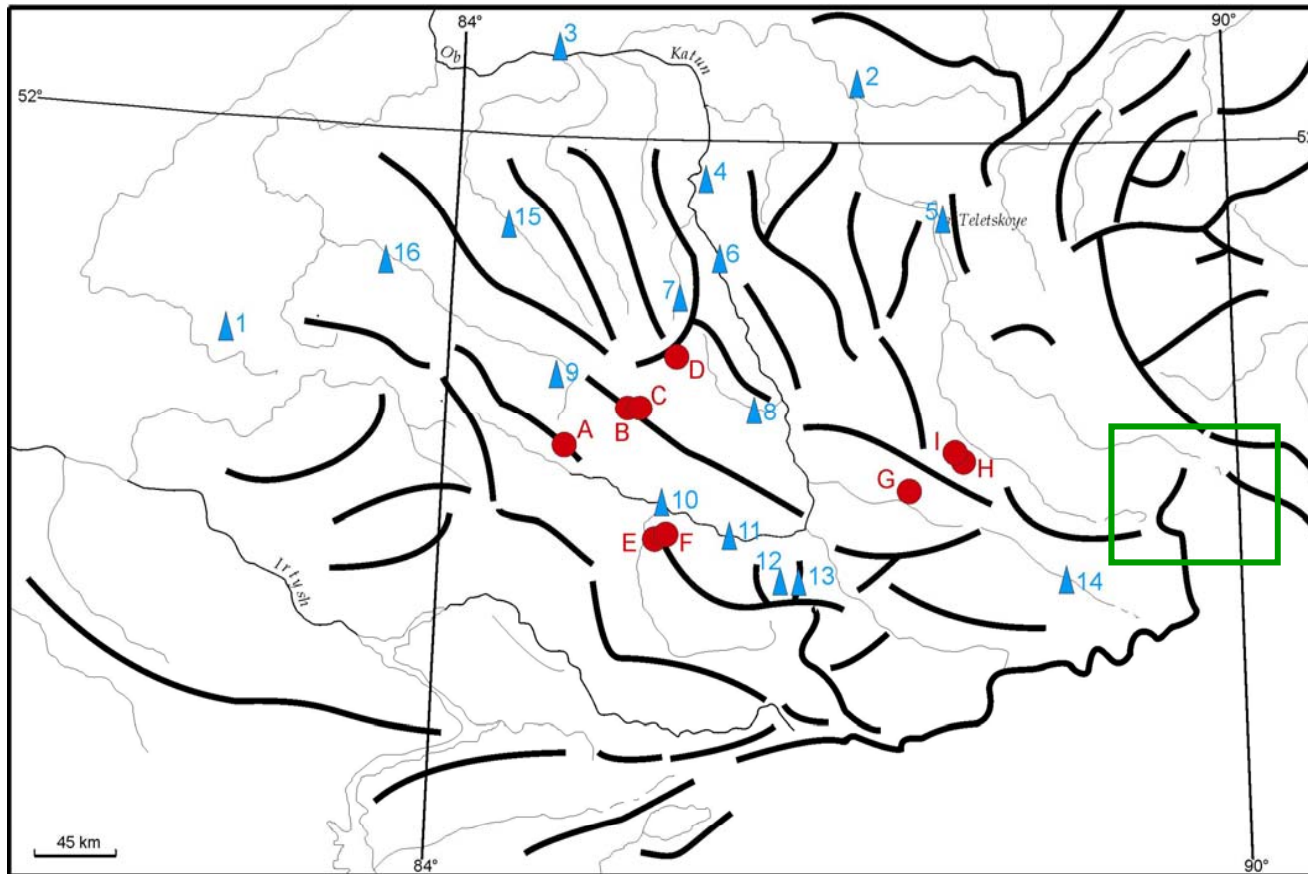


PURPOSE and OBJECTIVES

Revealing the causes of the regional climate changes and the Alpine landscapes response to these changes with the prediction of landscape dynamics.

- To analyze seasonal temperature and precipitation time series during the instrumental period
- To reconstruct climatic characteristics applying dendroclimatological methods
- To emphasize the regional aspect of climate changes against the background of global climate change
- To follow up how glaciers respond to these changes

DATA and METHODS



Instrumental data from
14 meteorological stations
(1935-2004)

WSL dendro database,
Switzerland

Moraine
complexes from the
Mongun-Taiga mountain
massif

▲ Meteorological stations in the Altai Mountains

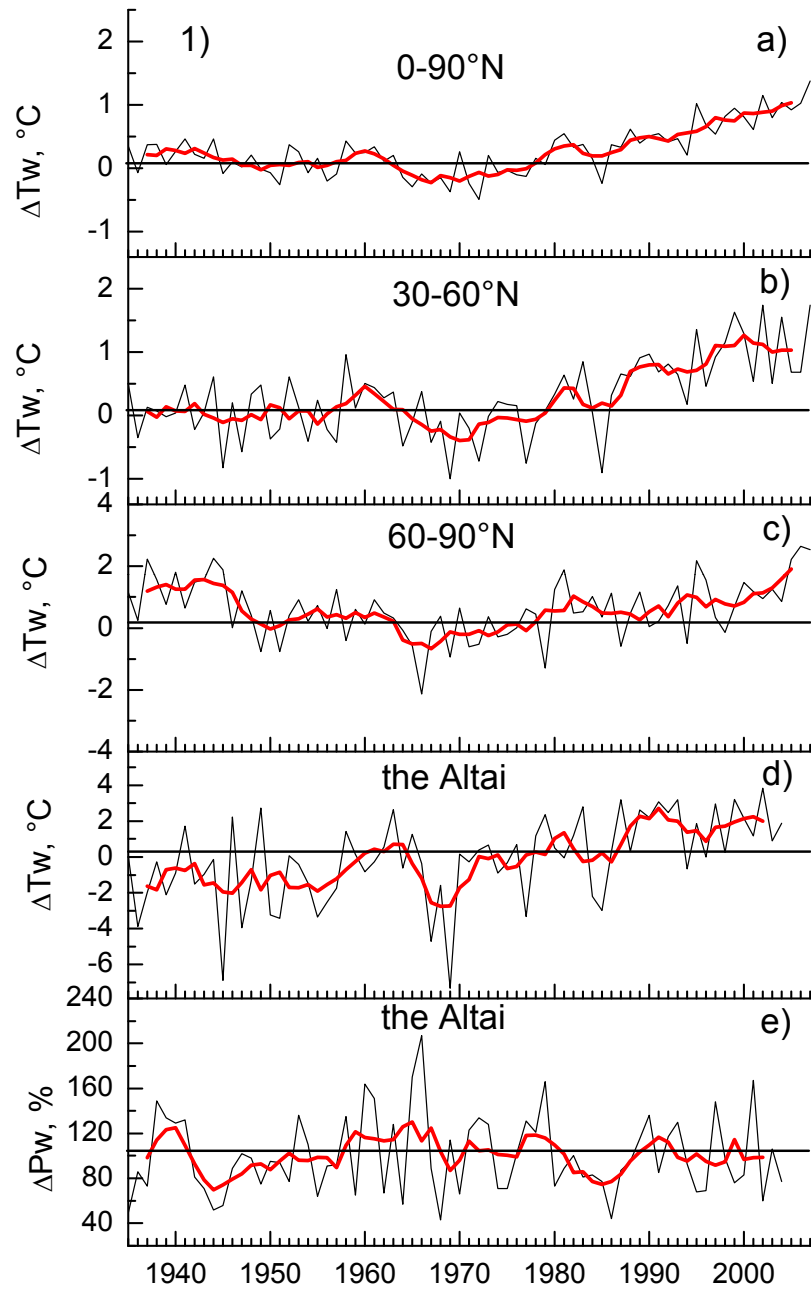
● The location of the tree-ring sites (WSL dendro database)

- | | |
|-----------------------------|------------------------------|
| 1 - Zmeinogorsk (353 m asl) | 8 - Ust-Kan (1037 m asl) |
| 2 - Turochak (326 m asl) | 9 - Onguday (832 m asl) |
| 3 - Biysk (227 m asl) | 10 - Ust-Koksa (978 m asl) |
| 4 - Kizil-Ozek (326 m asl) | 11 - Katanda (949 m asl) |
| 5 - Jailu (480 m asl) | 12 - Kara-Turek (2596 m asl) |
| 6 - Chemal (420 m asl) | 13 - Ak-Kem (2056 m asl) |
| 7 - Shebalino (860 m asl) | 14 - Kosh-Agach (1760 m asl) |

- | | |
|---------|---------|
| A - KIR | F - UKH |
| B - JAE | G - AKT |
| C - JAW | H - UUL |
| D - CEM | I - UUB |
| E - UKV | |

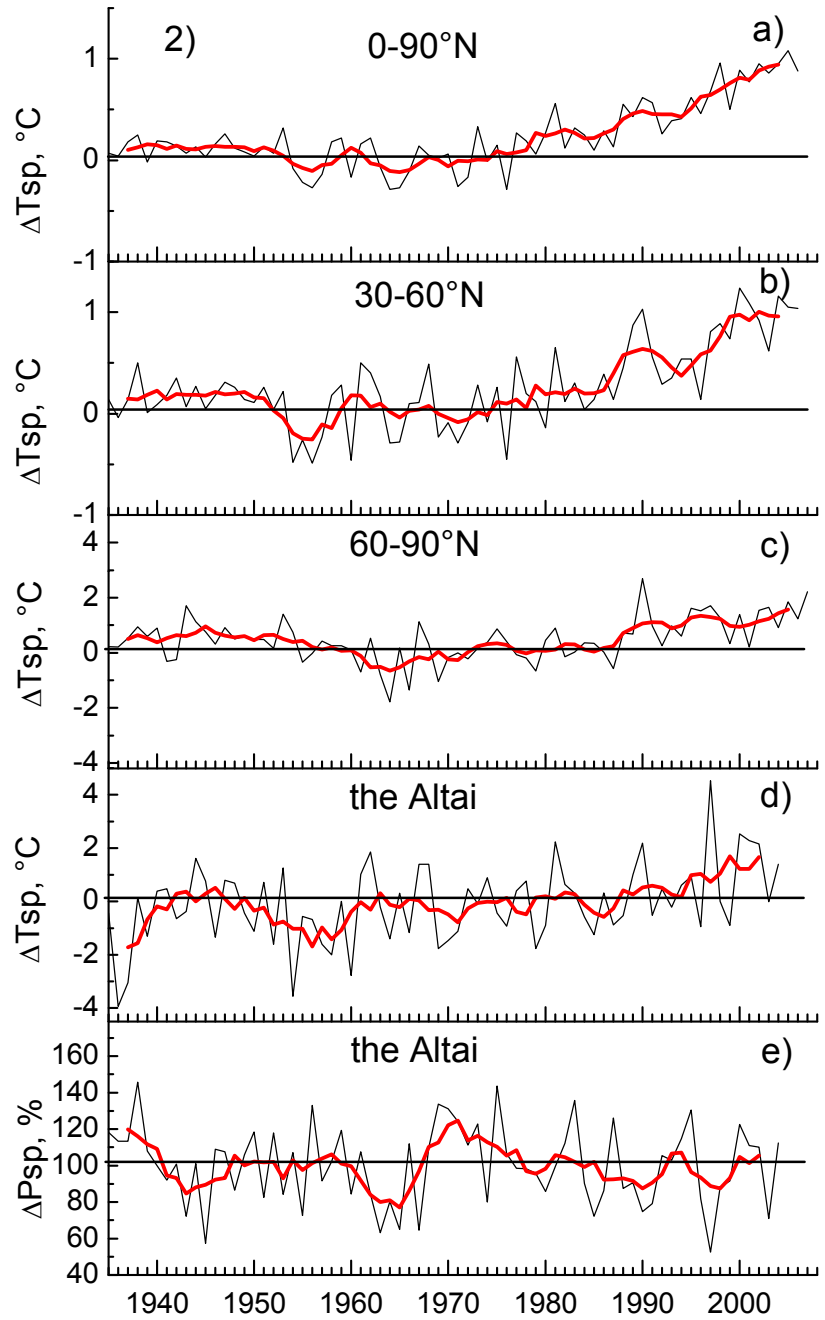
- Dendroclimatological methods;
- Glaciation reconstruction by mapping, aerial photo and satellite imagery interpretation;
- Statistical analysis

Winter



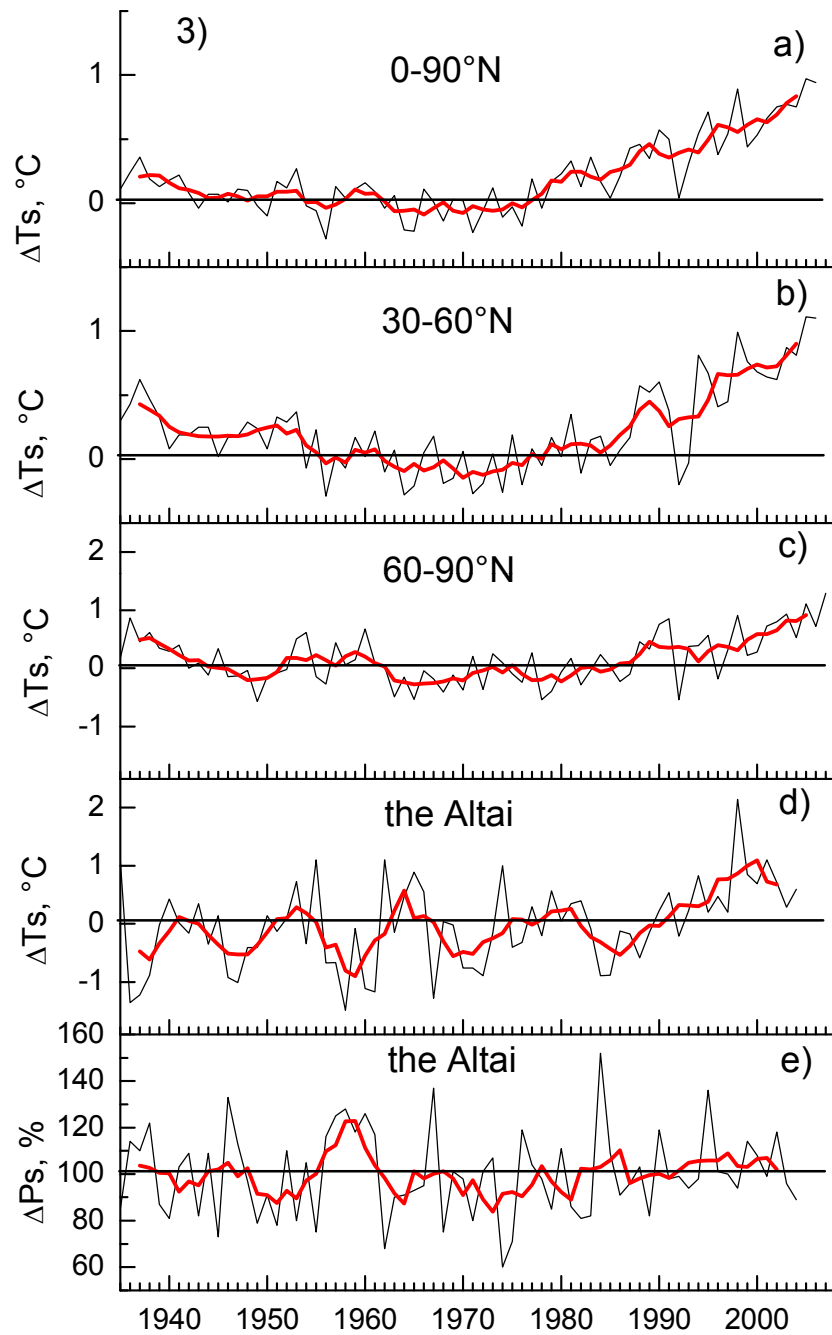
Lugina et al.
2006

Spring



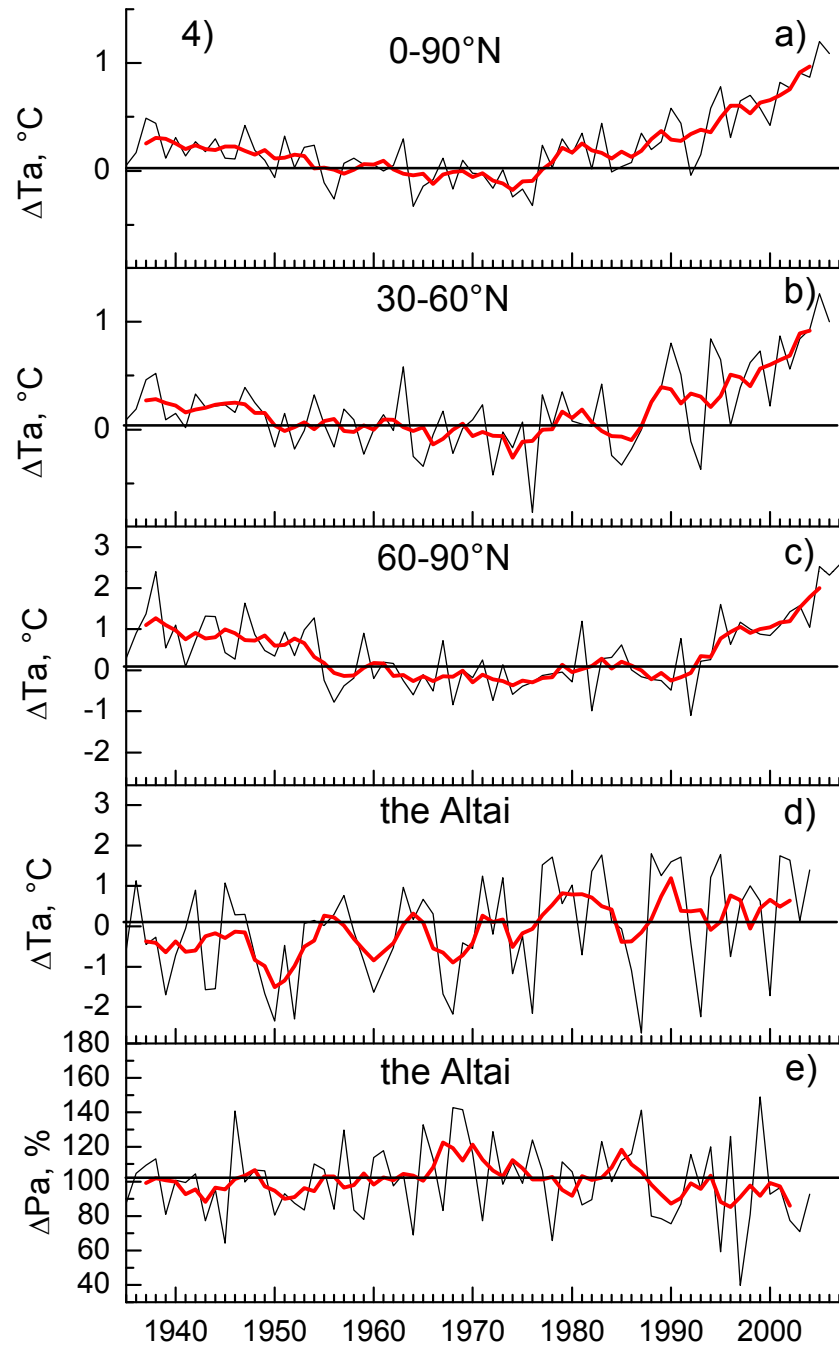
Lugina et al.
2006

Summer



Lugina et al.
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Autumn

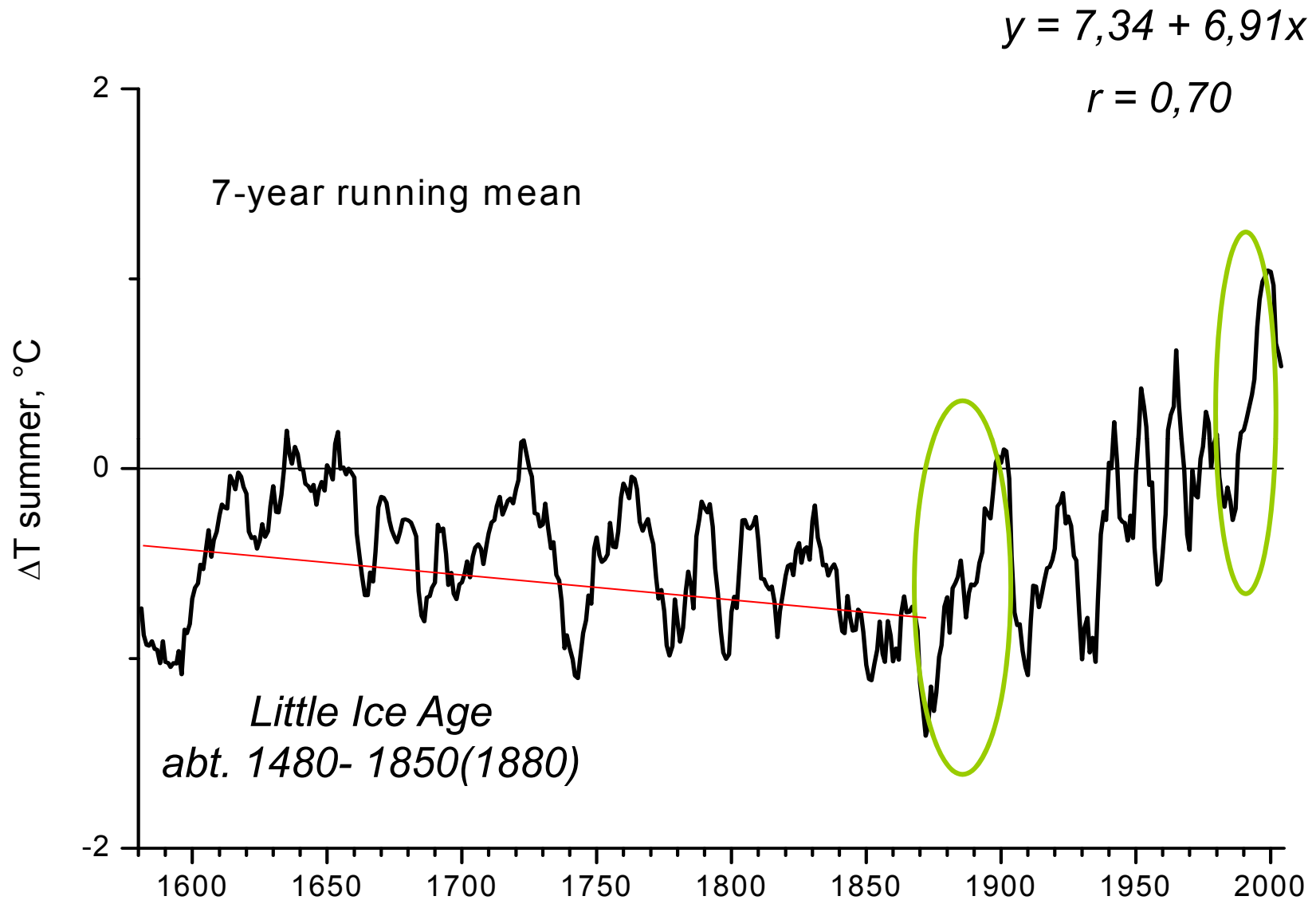


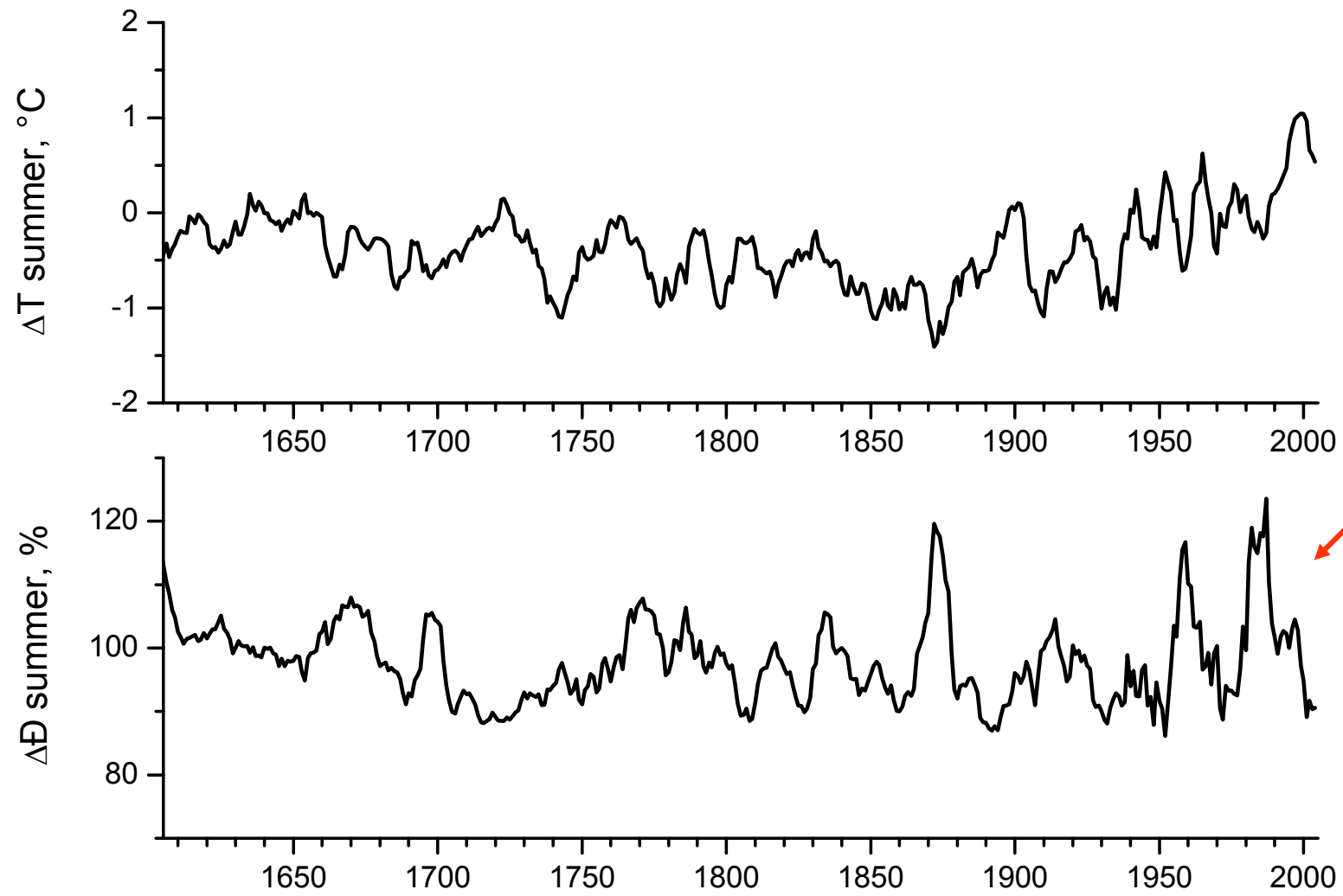
Lugina et al.
2006

Correlation coefficients

		<i>Spring</i>	<i>Winter</i>
<i>The Altai Mountains</i>	<i>Middle latitudes</i>	<i>0.68</i>	<i>0.76</i>
	<i>Northern Hemisphere</i>	<i>0.54</i>	<i>0.60</i>

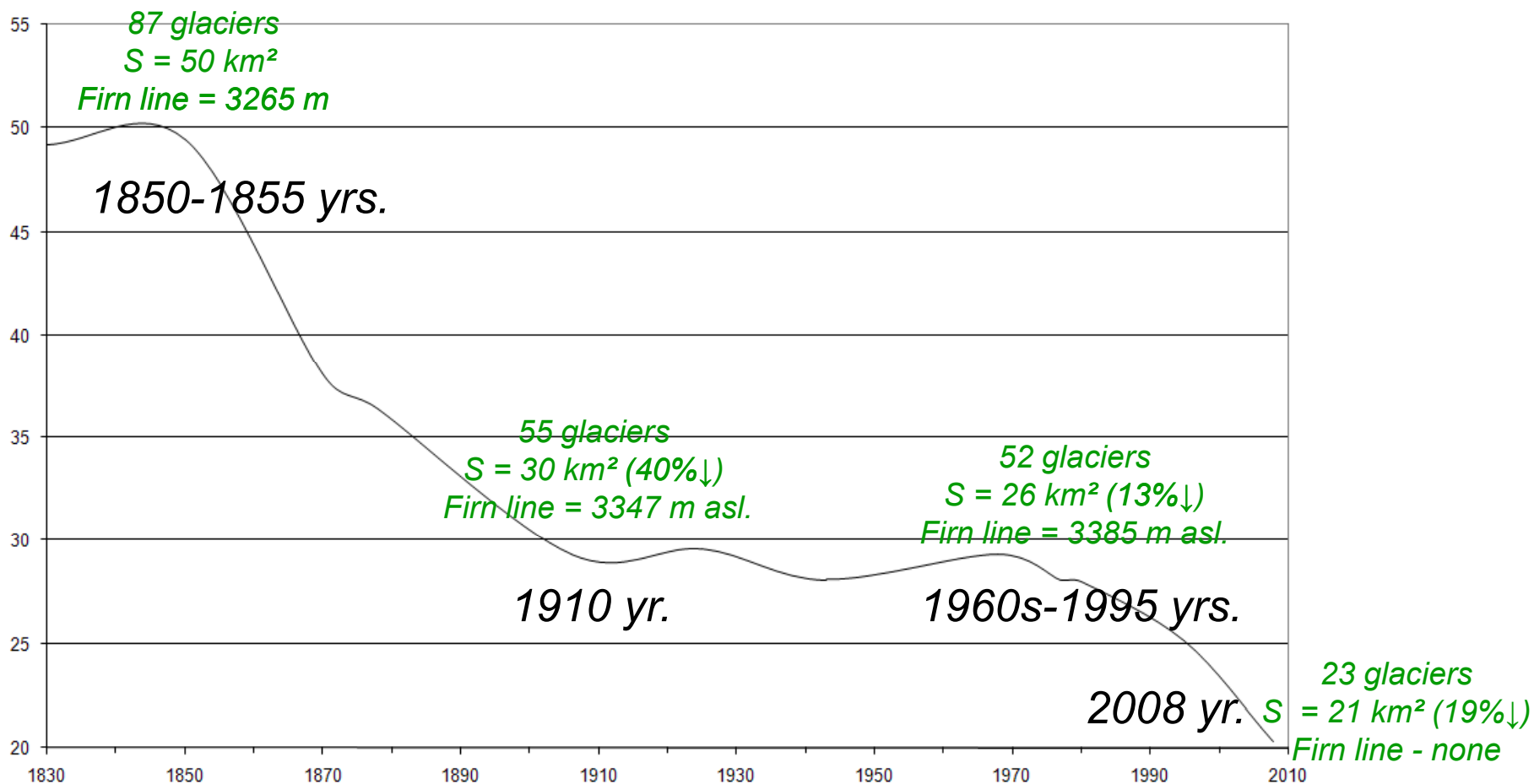
Season	Warming rate, °C/10 years		
	The Altai Mountains		The Northern Hemisphere
	1955-2004	1975-2004	1975-2004
Winter	0,77	0,85	0,35
Summer	0,21	0,38	0,28
Spring	0,41	0,64	0,30
Autumn	0,22	0,17	0,33







Glaciers fluctuations of one of the Altai mountains massifs (Mongun-Taiga) after the Little Ice Age Maximum



Authors: Moskalenko I., Ganushkin D. and Chistyakov K.

SUMMARY

- There is quite significant difference between seasons in climate change in this intracontinental region.
- At the turn of the 20-21 centuries the tendencies in summer, winter and spring temperature increase have changed. The mean autumn temperature continue to increase slowly.
- Modern range of the mean summer temperature over the Altai Mountains is higher on 2,5°C comparing to the temperature minimum at the last stage of the Little Ice Age. There were intervals with the similar abrupt increase of mean summer temperature as during the present, for example, in the second half of the 19th century.
- There were several stages of deglaciation from the Little Ice Age maximum in the Altai Mountains. Now the air temperature stops to increase in this region. But even in that case the glaciers will continue to retreat because of the inertance of the glacial systems and at the same time because of the predominance of the small forms of glaciation.

OUTLOOK

- We are expecting new dendrochronological data for the additional precipitation reconstructions.
- The South-East Altai climate is quite extreme - cold winters and insignificant precipitation, so the snow cover doesn't protect soil from deep freezing, that results in the relationship between the winter temperature and the tree-ring growth.
But the question is - how to eliminate the influence of the summer temperatures on the tree-ring growth while reconstructing winter temperature?

