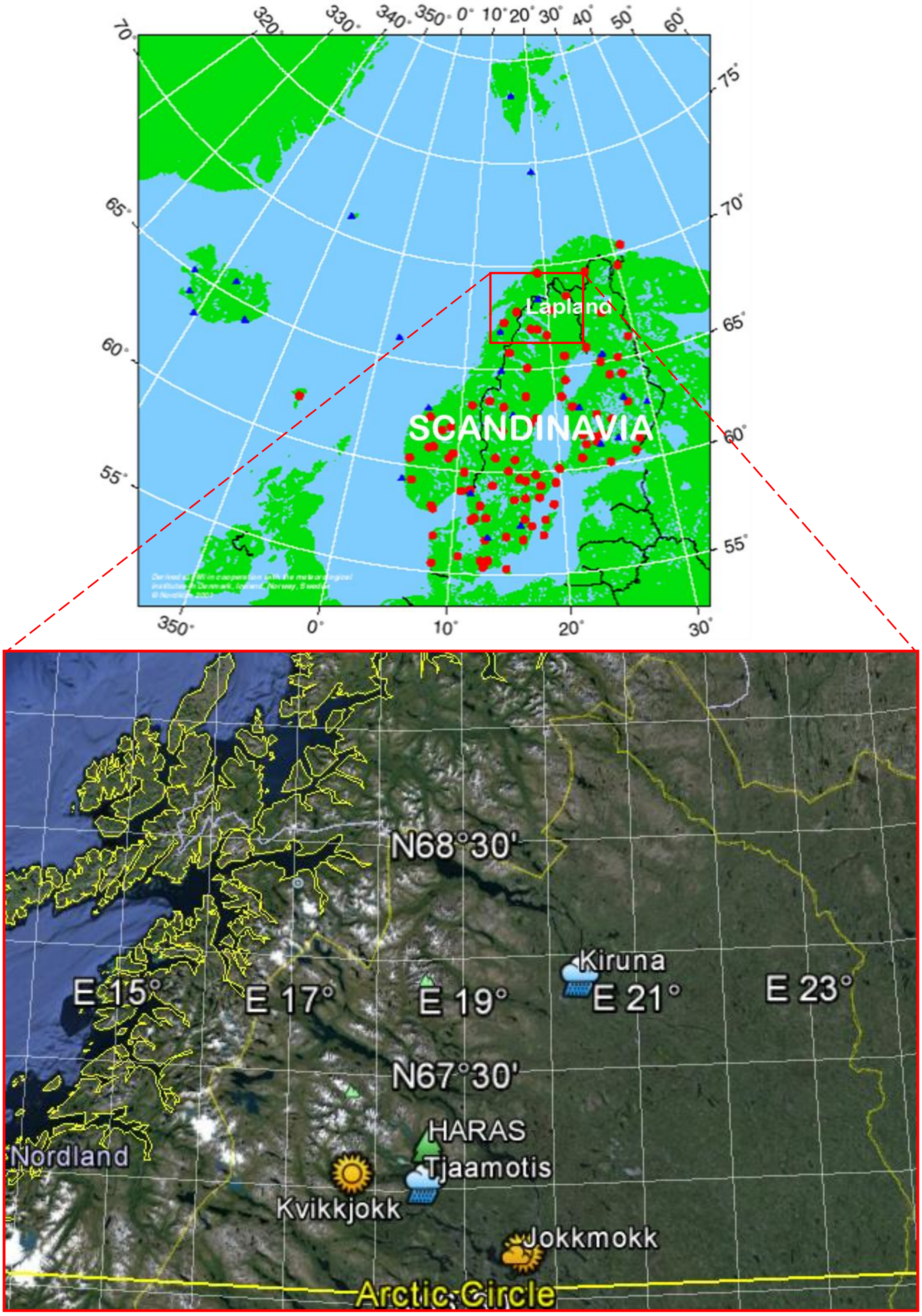


Fig. 1 Location of Hårås plot, Kvikkjokk, Tjåmotis and Kiruna meteorological stations in the Swedish part of Lapland. Meteostation map of the NORDKLIM datadase: stations with data series longer than 90 years ●, shorter than 90 years ▲ (Modified from: Tuomenvirta et al., 2001)

REFERENCE:

Tuomenvirta, H., Drebs, A., Førland, E., Tveito, O.E., Alexandersson, H., Laursen, E.V., Jónsson, T., 2001: Nordklimdata set 1.0, KLIMA Report no. 08/01, DNMI, 26 p

Tab. 1 Properties of climatic databases and labels of evaluated data sets

Database properties Name*, Location / Distance / Grid, References		Label of the data sets			
		Temperature (1902 – 2001)		Precipitation (1910 – 1997)	
		Month	Season	Month	Season
Observed	**, Tjaamotis (66°55' N 18°32' E) / 18 km, ***	-	-	P18	$P18_{agr}$
	, Kvikkjokk (66°57' N 17°44' E) / 40 km, *	T40	$T40_{agr}$	P40	-
	, Jokkmokk (66°37' N 19°38' E) / 70 km, *	T70	-	P70	-
	, Kiruna (67°49' N 20°20' E) / 110 km, *	-	-	P110	$P110_{agr}$
Modelled	CRU TS 3.23, 0.5°, Harris et al. (2014)	T_CRU	T_CRU_{agr}	P_CRU	P_CRU_{agr}
	GISS 250 T2m/SST anom, 1°, Hansen et al. (2010)	GISS	-	-	-
	Luterbacher et al. Temperature, 0.5°, Luterbacher et al. (2004)	-	LT	-	-
	GPCC V7 0.5, 0.5°, Schneider et al. (2015)	-	-	GPCC	-
	Pauling et al. Precipitation, 0.5°, Pauling et al. (2006)	-	-	-	PP

* Names of modelled databases related to Climexp.KNMI (2014), ** NORDKLIM, *** SHMI (2014)

Climate characteristics of the studied area

According to the Köppen-Geiger climate classification (Kottek et al. 2006) belongs the studied area to the subpolar climate *Dfc*. The climate of the area is characterized by long, usually very cold winters, and short, cool to mild summers. Based on the measured meteorological data from the station Kvikkjokk (between the years 1890 – 2001) the Walter climate diagram has been constructed in order to express the climate features in the area (Fig. 2).

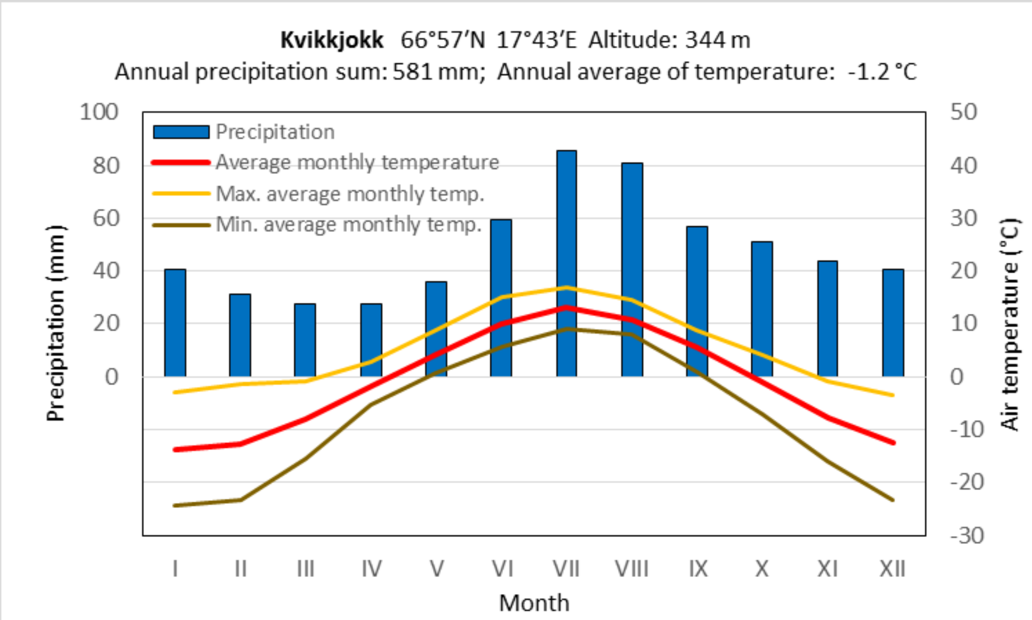


Fig. 2 Walter climate diagram for the station Kvikkjokk (time period 1890 –2001)

As shown in the Fig. 2 climate has humid character. Annual precipitation amount is 581 mm. Minimum precipitation sum is observed in March and April (28 mm) and maximum in July (86 mm) respectively. Annual average of temeperature is -1,2°C. Maximum monthly average temperature is observed in July (16.8 °C) and minimum in January (-13.9 °C) respectively. The absolute coldest monthly average temperature was recorded in January 1893 (-24.4 °C) and maximum average monthly temperature was in July 1937 (16.8 °C). Because of the humid climate and relatively low average air temperature due to energy balance of high latitudes it is anticipated that the main climate driver for ecological processes in the studied area is air temperature. This is confirmed also by Holtmeier et Broll (2005).

REFERENCES:

Holtmeier, F. K., & Broll, G., 2005: Sensitivity and response of northern hemisphere altitudinal and polar treelines to environmental change at landscape and local scales. Global Ecology and Biogeography, 14(5), 395-410.

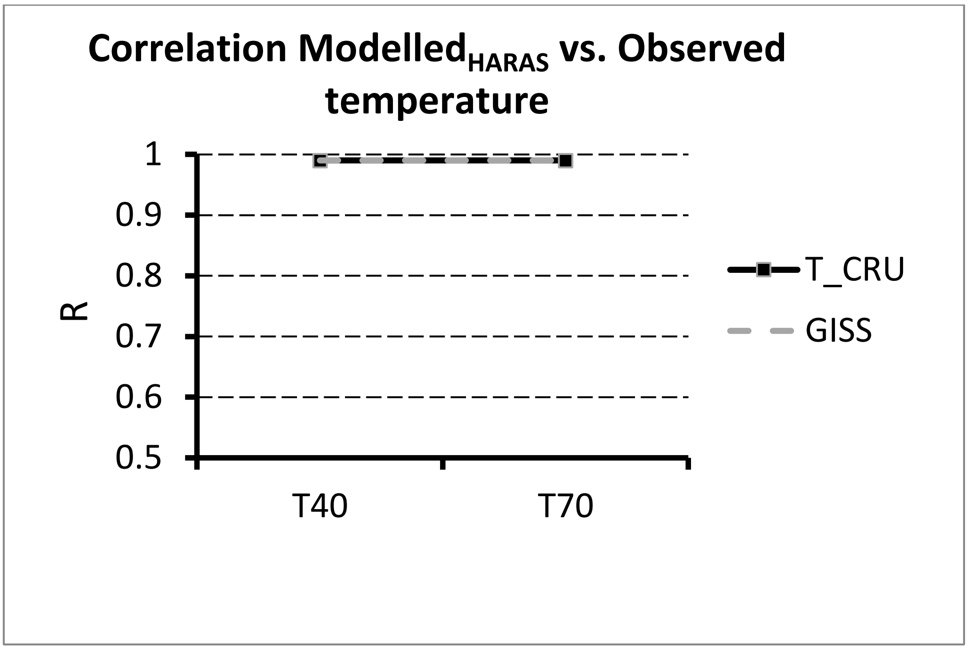
Kottek, M., J. Grieser, C. Beck, B. Rudolf, and F. Rubel, 2006: World Map of the Köppen-Geiger climate classification updated. Meteorol. Z., 15, 259-263.

Tab. 2 Statistical evaluation of the differences between the observed and modelled data of monthly and seasonal temperatures (** significant value at α=1 %). T40 data set is used as a reference data.

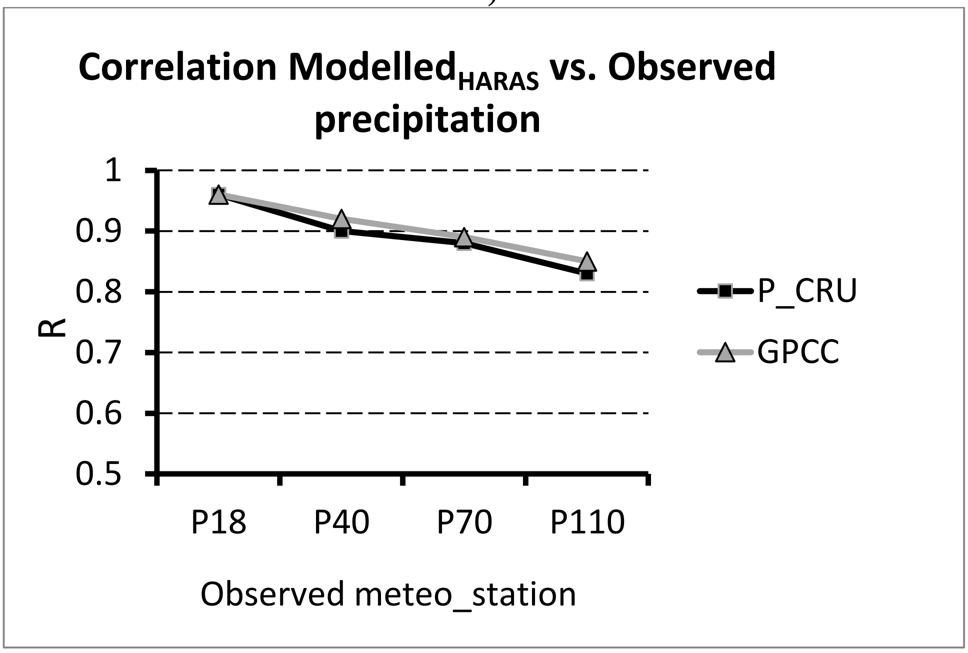
	Temperature			
	T_CRU	**GISS**	**T_CRUagr**	**LT**
Mean bias [°C]	-1.43**	0	-1,43**	-1.39**
Mean error [°C]	±0.69	±1,55	±1,17	±1.19
Mean quadratic error [°C]	±1.59	±1,55	±1,85	±1.83

Tab. 3 Statistical evaluation of the differences between the observed and modelled data of monthly and seasonal precipitation totals (** significant value at α=1 %). P18 data set is used as a reference data.

	Precipitation			
	P_CRU	**GPCC**	**P_CRUagr**	**PP**
Mean bias [mm]	4.62**	-0,73**	14,1	15.75**
Mean error [mm]	±5.12	±6,77	±17,05	±31.84
Mean quadratic error [mm]	±6.90	±6,81	±22,07	±35.52

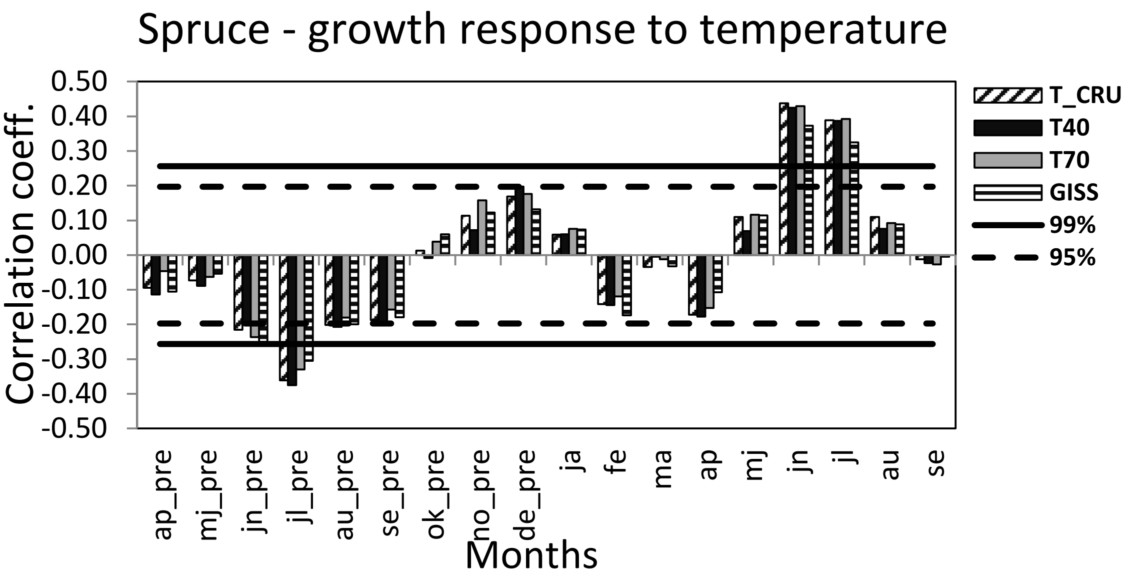


a)

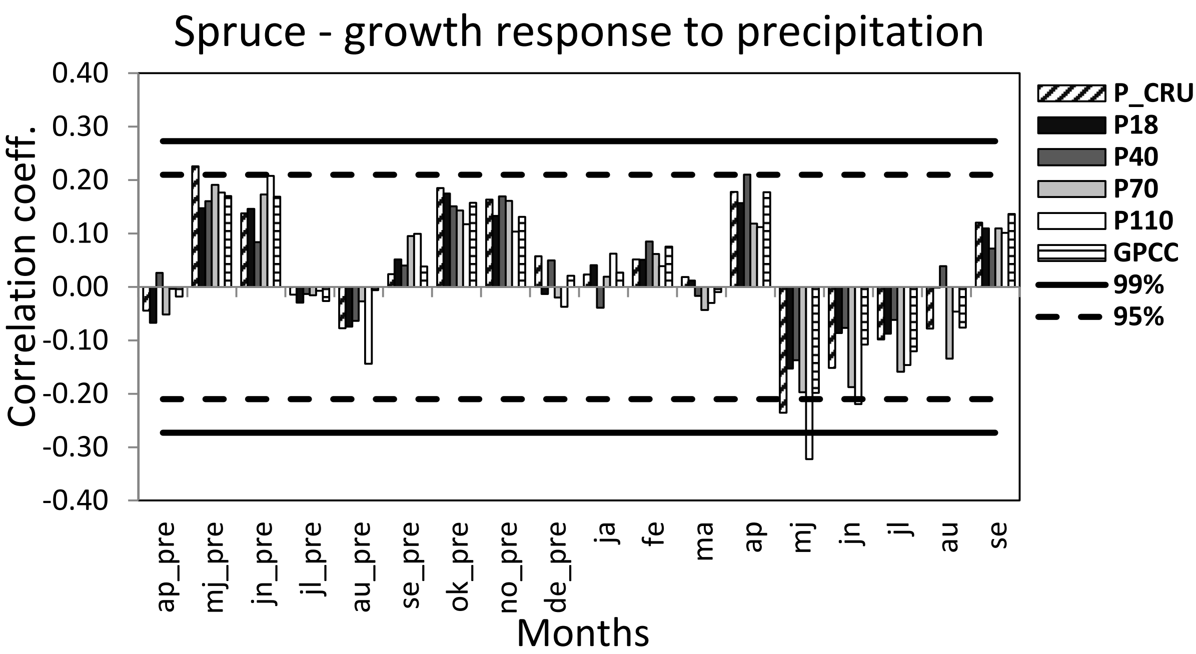


b)

Fig. 3 Change of correlation coefficients between a) modelled monthly temperatures for Haras locality (T_CRU and GISS) and observed monthly temperatures (T40 and T70), b) modelled monthly precipitation for Haras locality (P_CRU and GPCC) and observed monthly precipitation (P18, P40, P70 and P110), related to increasing distance of meteostations from Haras locality.

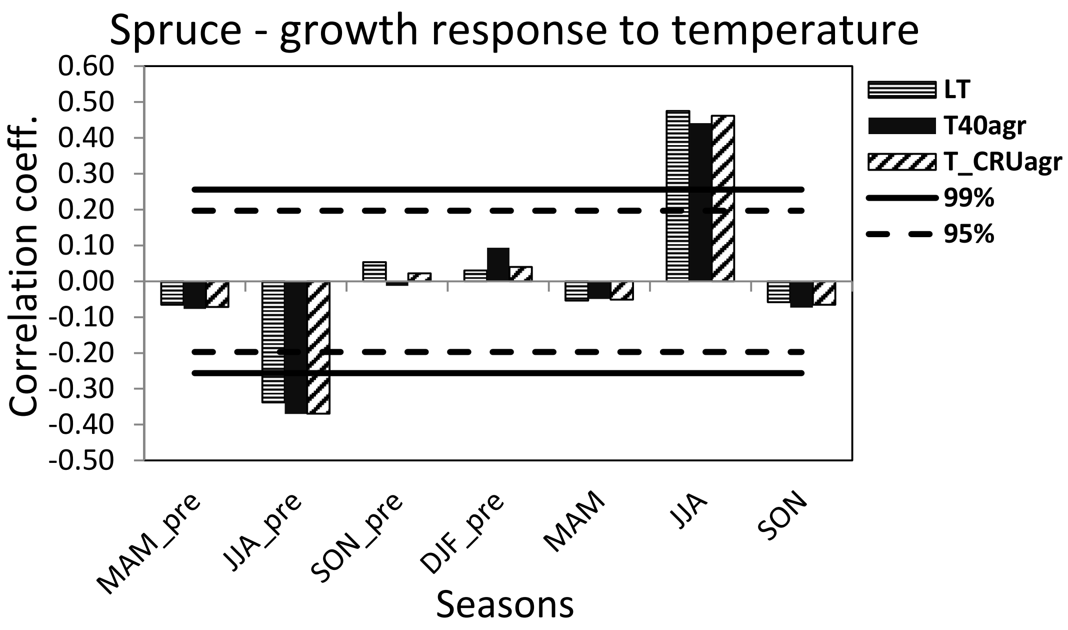


a)

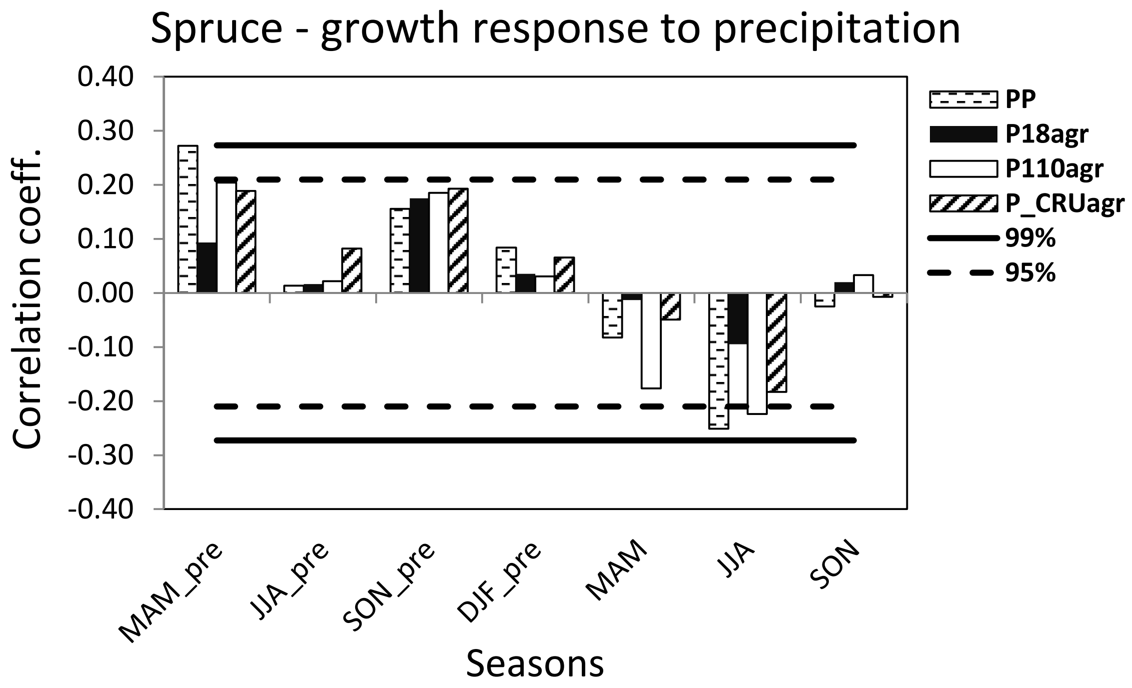


b)

Fig 4 Growing response of spruce radial increment to data sets of a) monthly average temperature, b) monthly precipitation totals databases

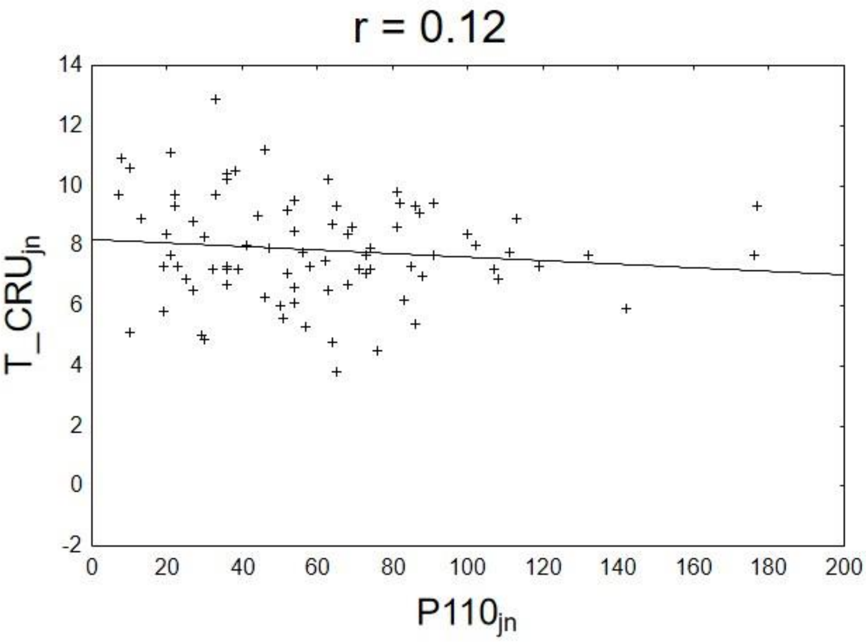


a)

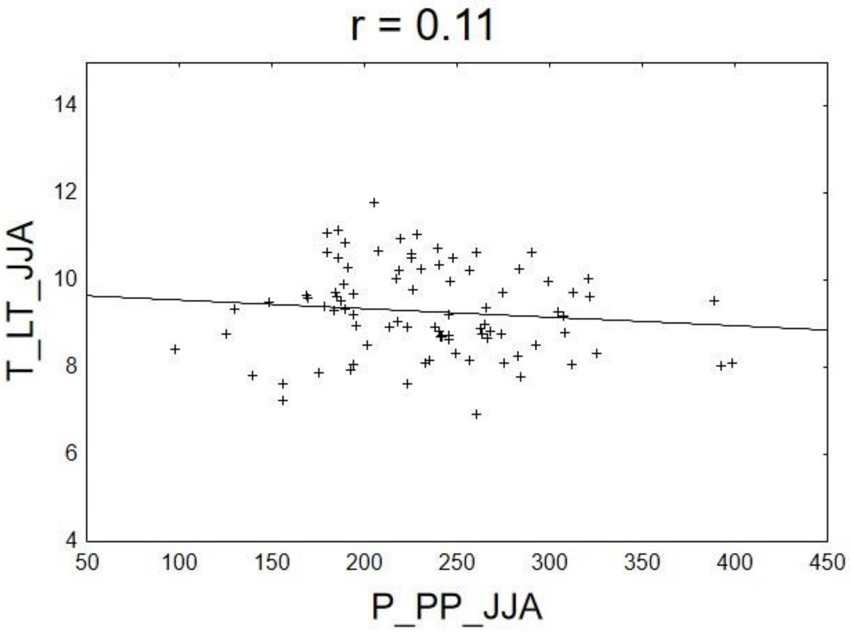


b)

Fig 5 Growing response of spruce radial increment to data sets of a) seasonal average temperature, b) seasonal precipitation totals databases



a)



b)

Fig. 6 Correlation between temperature and precipitation common with overlapping a) month (Jun), b) season (JJA) significant for radial increment formation. Low correlation between the climatic characteristics in both cases (r=0.12 and r=0.11) confirms that climate regime for growing processes of spruce is not inversely proportional function of precipitation and temperature.