DIFFERENT APPROCH FOR ANALYSING THE NEAR-SURFACE AIR TEMPERATURE AT KING GEORGE ISLAND AS REVEALED BY FREI STATION

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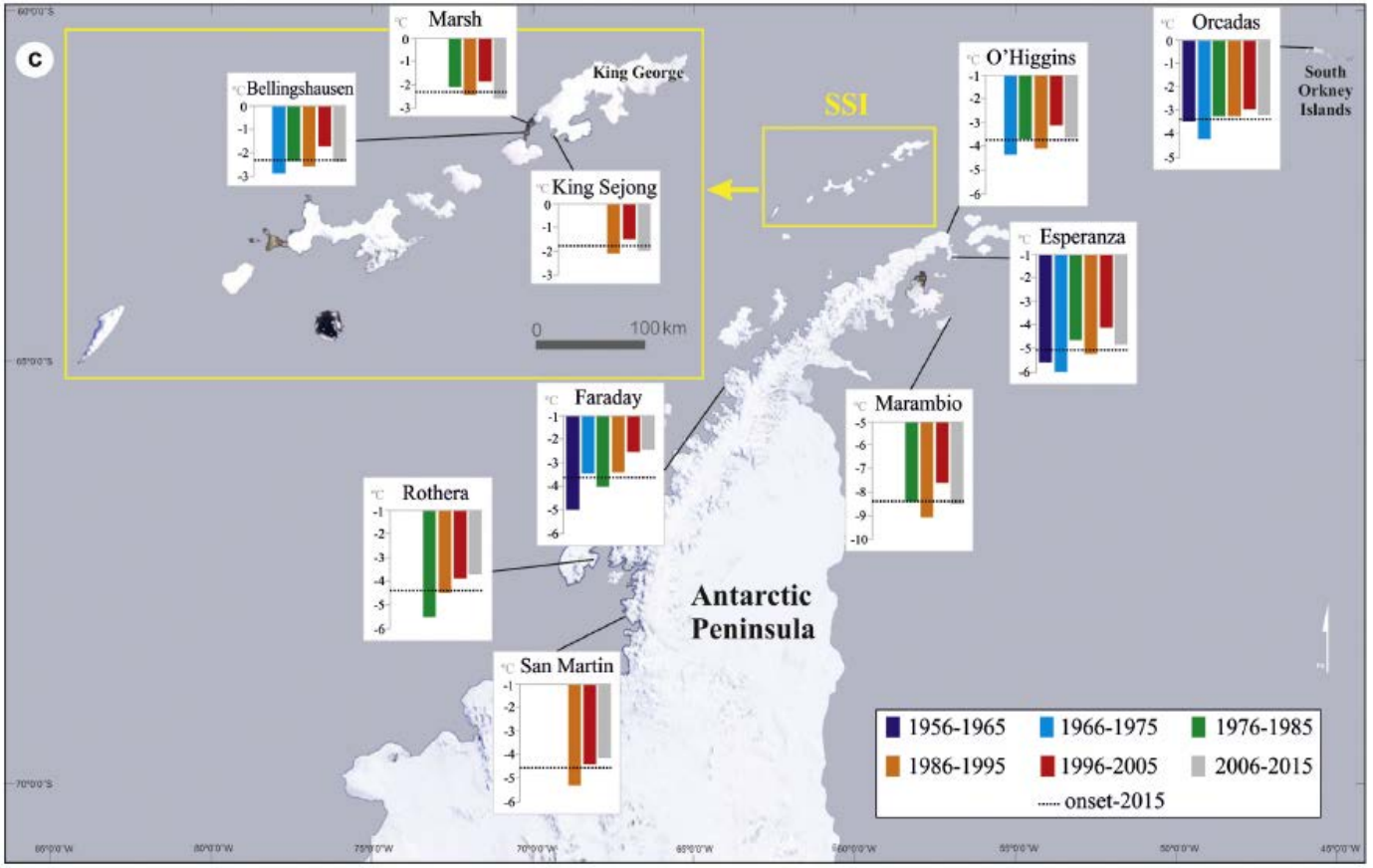
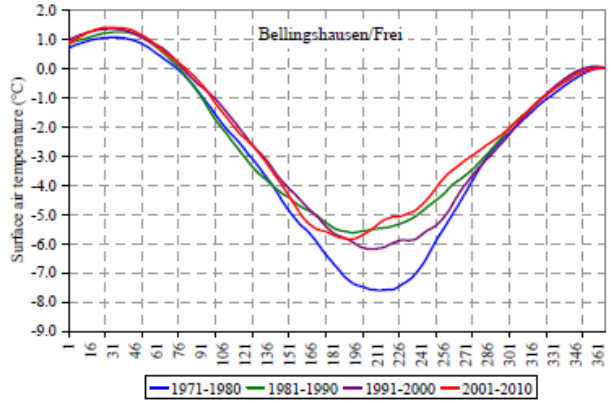
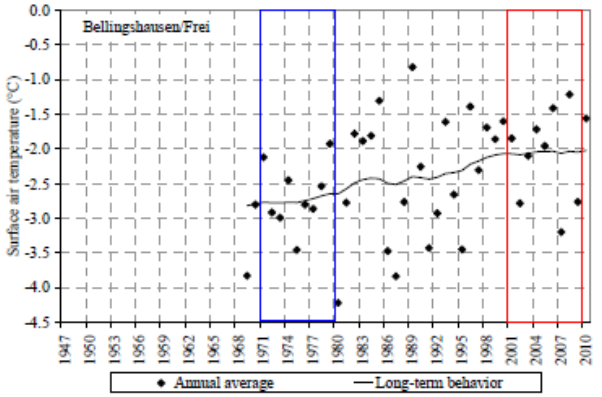
Introduction

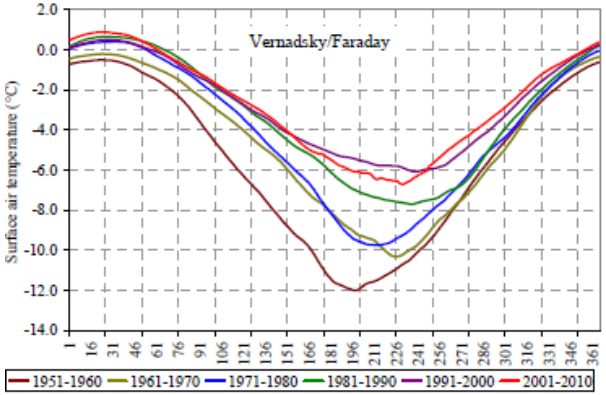
The Antarctic Peninsula is one of the regions on Earth where air surface temperatures have experienced substantial warming at higher rate than global average during the second half of the 20th century, although during the last 15 years or so, this warming has declined or even a slight no significant cooling has been detected

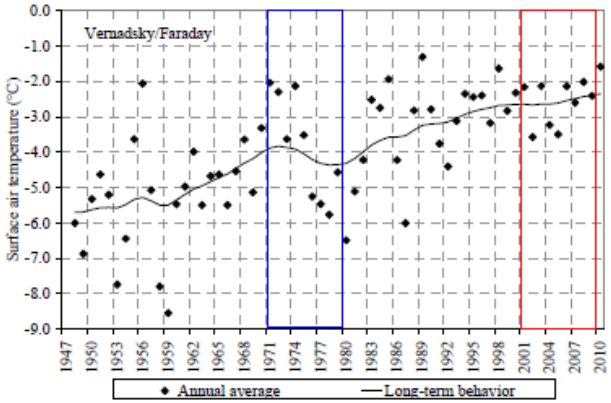


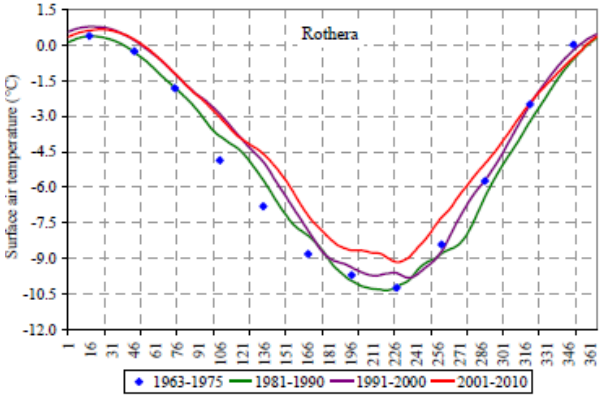
Oliva et al. 2016. Science of the Total Environment

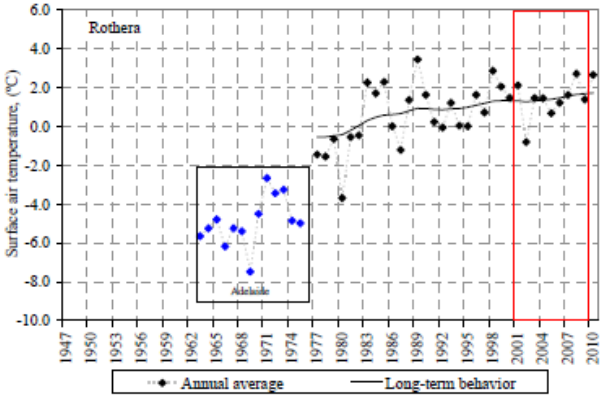




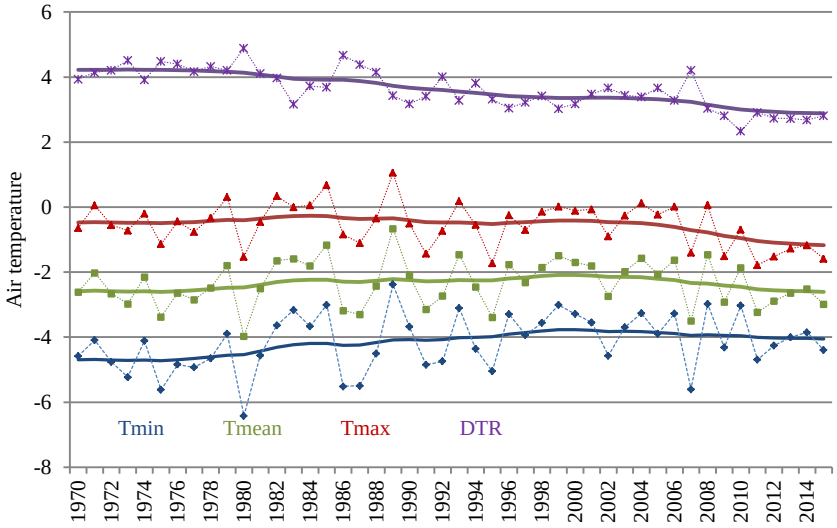




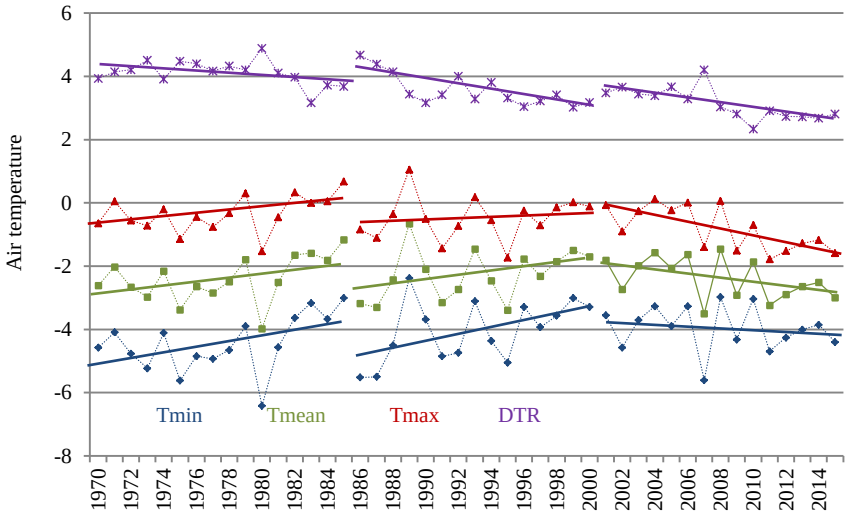




Carrasco, 2013, in Atmospheric and Climate Sciences



Near-surface air temperature behavior at Frei station. Dashed lines are annual means while solid curves are the tendency given by an exponential filter.



Same as Figure 2. Dashed lines are annual means while solid lines are the linear trends for the 1970-1985, 1986-2000 and 2001-2015 periods.

Decadal trends of the mean and extremes air temperature and the diurnal temperature range at Frei station for the 1970-2015 period. Bold numbers means statistical significant at 5%.

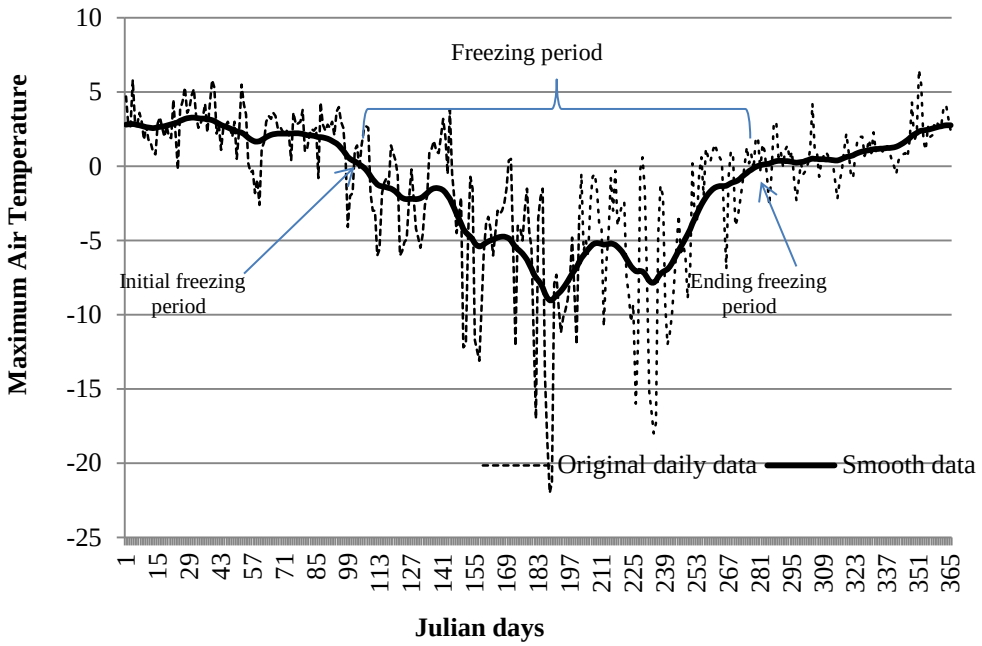
Season	T_{min}	T_{max}	T_{mean}	DTR
Summer	-0,02	**-0,26**	-0,14	**-0,24**
Autumn	0,03	-0,03	0,14	**-0,35**
Winter	**0,47**	0,00	**0,23**	**-0,47**
Spring	0,08	**-0,28**	-0,10	**-0,36**
Annual	0,21	-0,15	0,03	**-0,35**

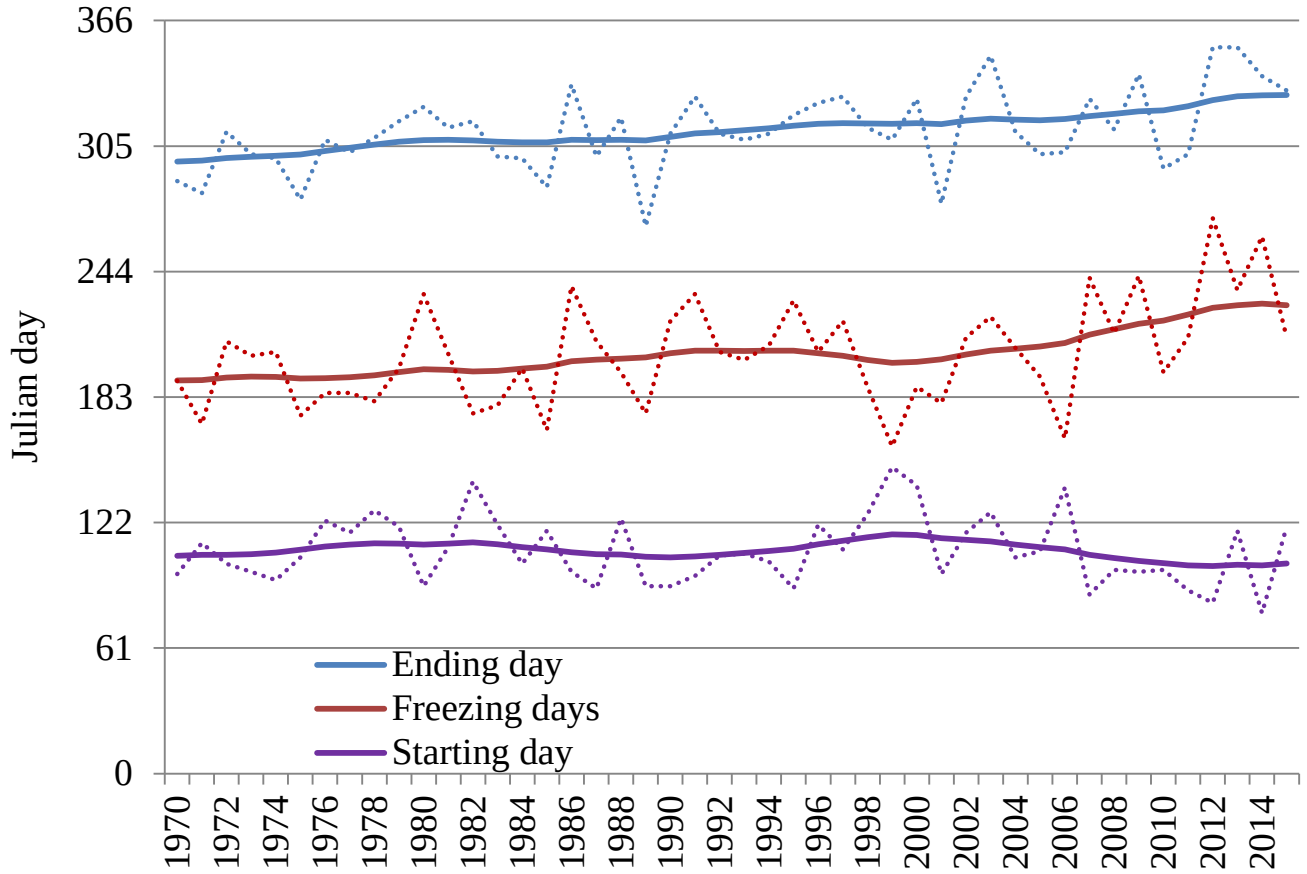
Different approach is introduced for studying the air temperature behavior recorded at Frei Station.

Near-surface minimum and maximum air temperatures (Tmin and Tmax) data are analyzed from 1970 to 2015. The daily data also allow estimating the starting and ending freezing season. This period is defined as all days when the Tmax is permanently below zero degree, after filtering out the daily variability.

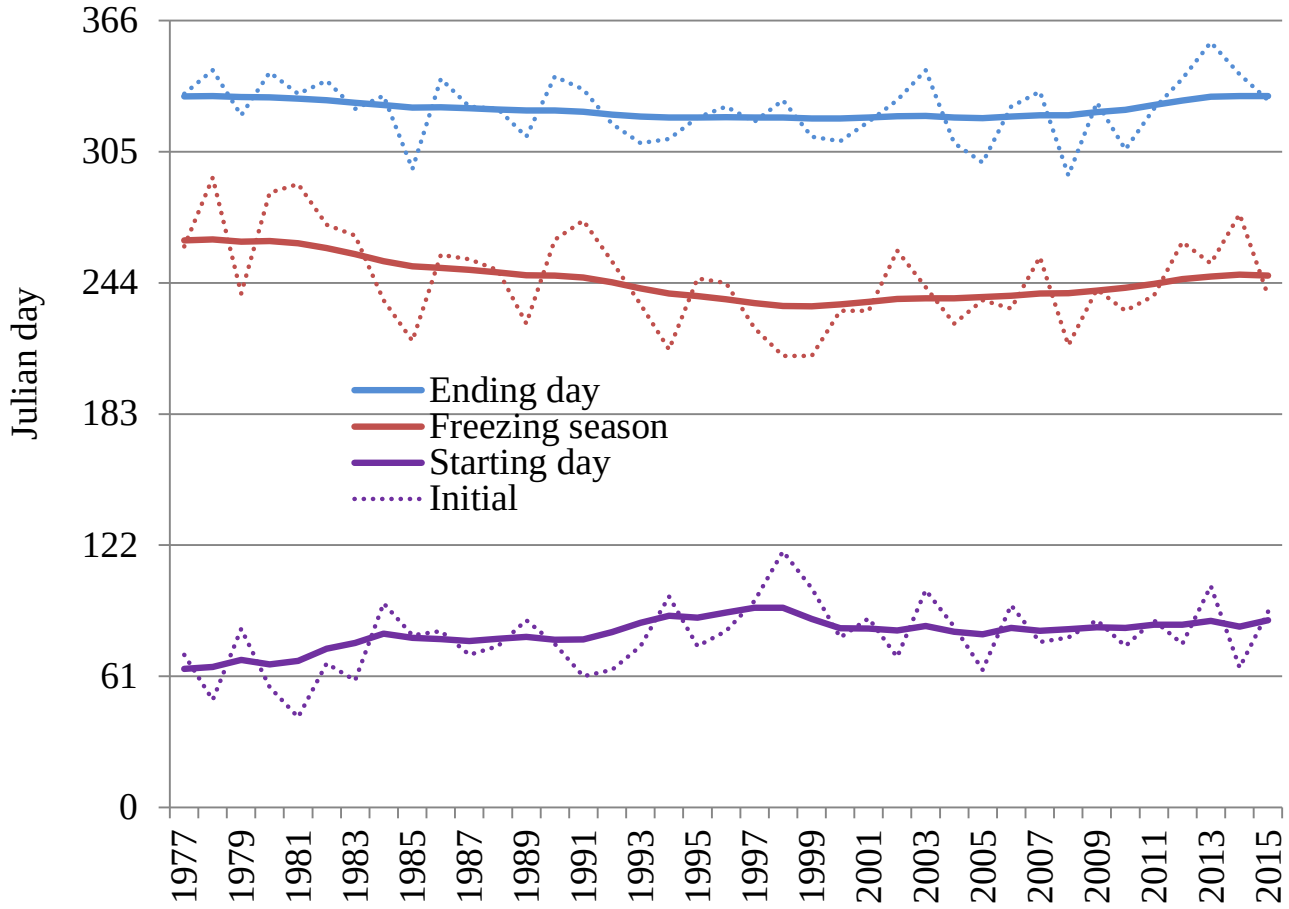
$$y_t = cx_t + (1-c)y_{t-1} \qquad t = 2,3,.....n \qquad (1)$$

$$\textit{and} \qquad z_t = cy_t + (1-c)z_{t+1} \qquad t = (n-1),(n-2),.....1 \qquad (2)$$

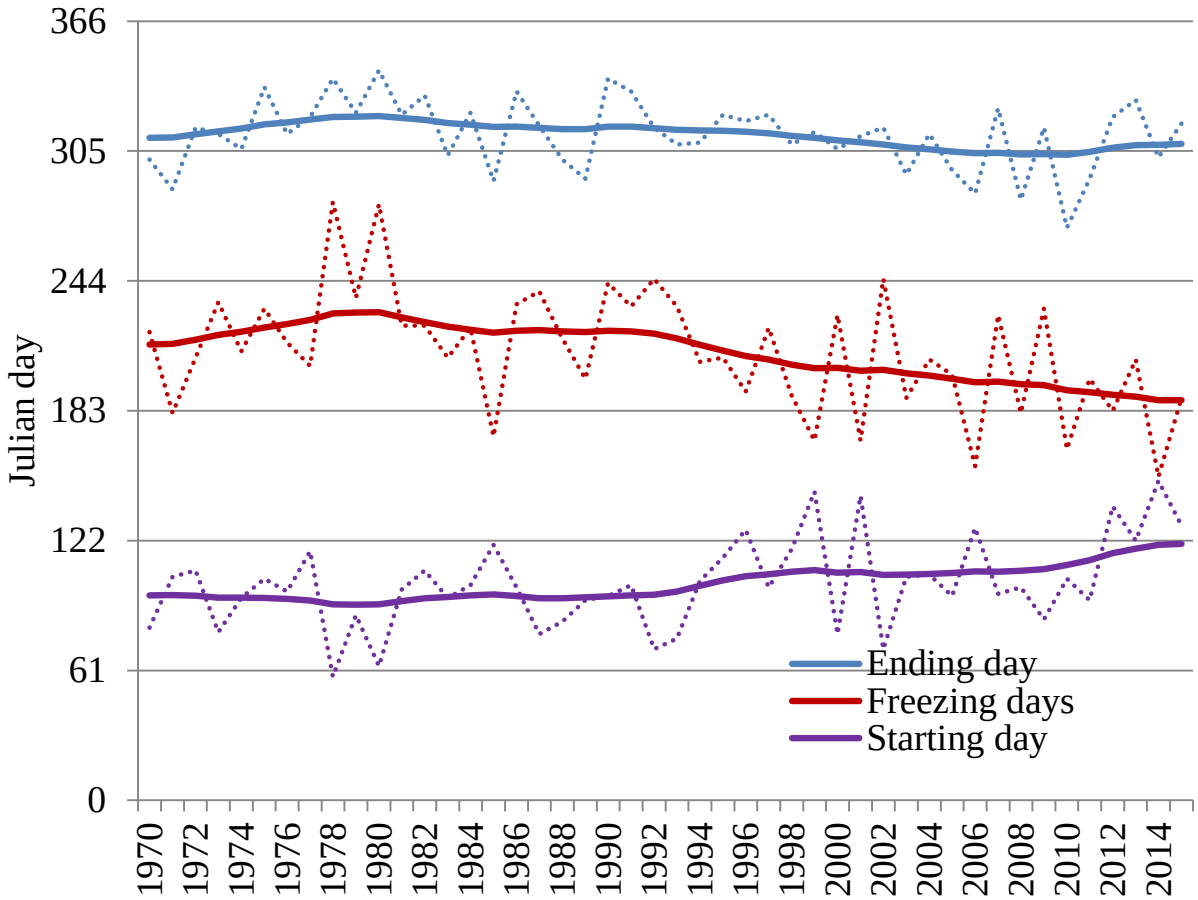




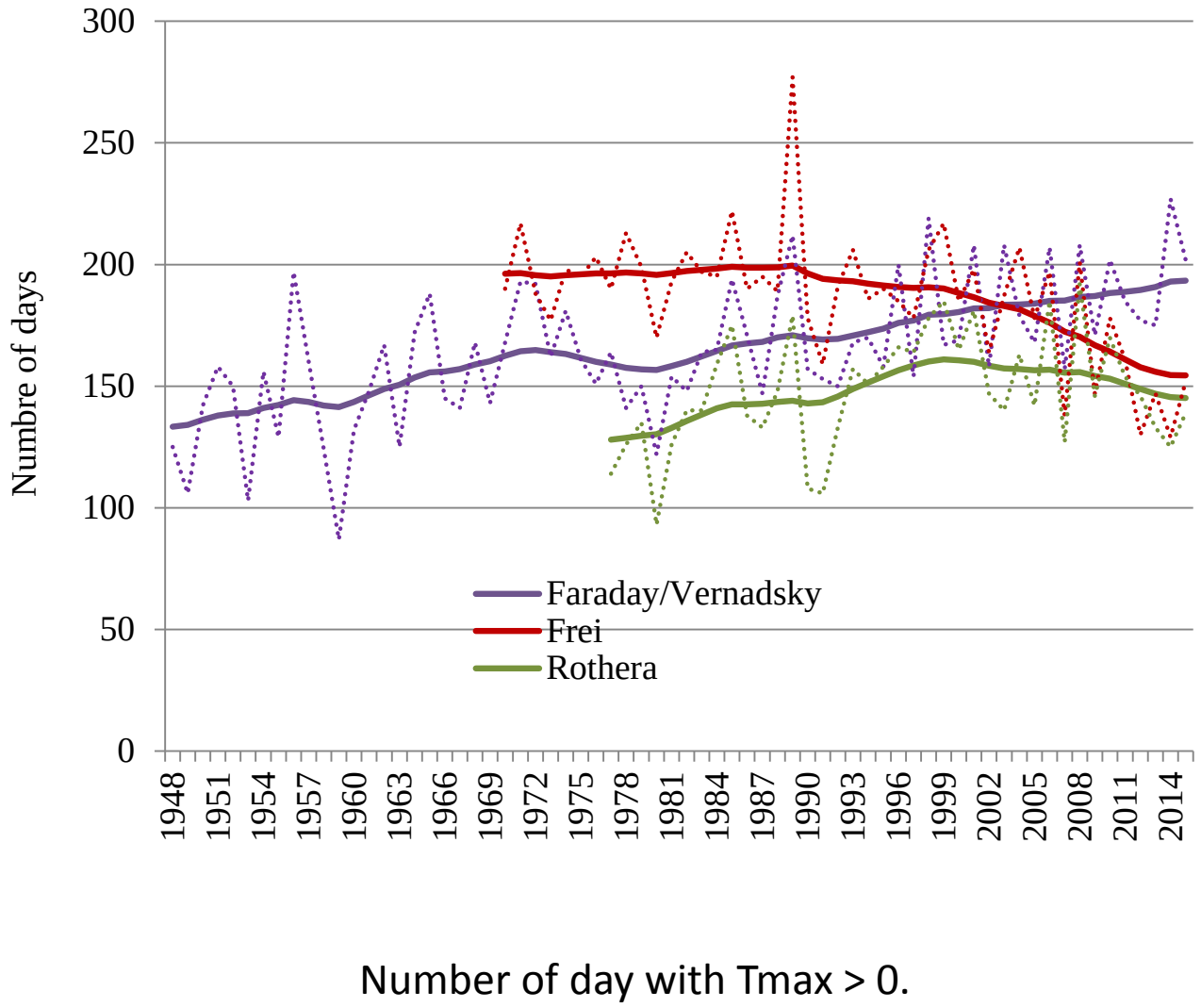
Annual duration of the freezing season and the starting and ending day at Frei station



Starting and ending day of the freezing season at Rothera station.



Starting and ending day of the freezing season at Faraday/Vernadsky station.



Number of day with Tmax > 0.

Conclusions

- The overall result at Frei station indicates a warming until 2000, meanly driving by the winter Tmin, and a slight cooling afterward.

- The duration of the freezing period has increased due to that the ending day has changed from the late October to late November during the 1970-2015 period.

- Rothera station only shows a slight increase of the freezing period after 2000, while Faraday/Vernadsky reveals a decrease over 1970-2015 period.

- Faraday/Vernadsky station is the only station that consistently shows a positive tendency in Tmax over the observed period (1948-2015), even during the last 15 years

This might suggest different north-south environmental and biophysical responds to the variability of the freezing season.

For example, Petlicki et al. (2017) indicates that the reduction of ice mass loss in Ecology Glacier at King George Island is probably related to the decreasing summer temperature. The increase of the freezing period at Frei also support the Petliki et al.'s conclusion.

Cook et al. (2014) found an increasing ice loss from north to south in the western side of the AP. This might concur with the fact that Faraday/Vernadsky and Rothera stations show an overall decrease of the freezing period, mainly at Faraday/Vernadsky.

Further analysis is needed on this different temperature behavior in the western AP and its impacts.

So…..

Thank you

very much

Akcknowledgements

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