



REPUBLIC OF ESTONIA
ENVIRONMENT AGENCY

Inhomogeneties in Estonian air temperature series with CLIMATOL and HOMER

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Outline

- ❑ Estonian stations /climate
- ❑ Dataset: 1925-2016; 1961-2016
- ❑ Methods: HOMER and CLIMATOL
- ❑ HOMER results (monthly)
- ❑ CLIMATOL results (daily)
- ❑ Discussion
- ❑ Conclusion

Estonian 22 meteorological stations



Dfb climate zone based on the Köppen-Geiger classification (Kottek *et al.*, 2006).
main climate – **snow (D)**, precipitation – **fully humid (f)**, temperature – **warm summers (b)**



Dataset: Estonian air temperature

22 data series
8 of these long-term data

1925

8 stations

2016

1961

22 stations



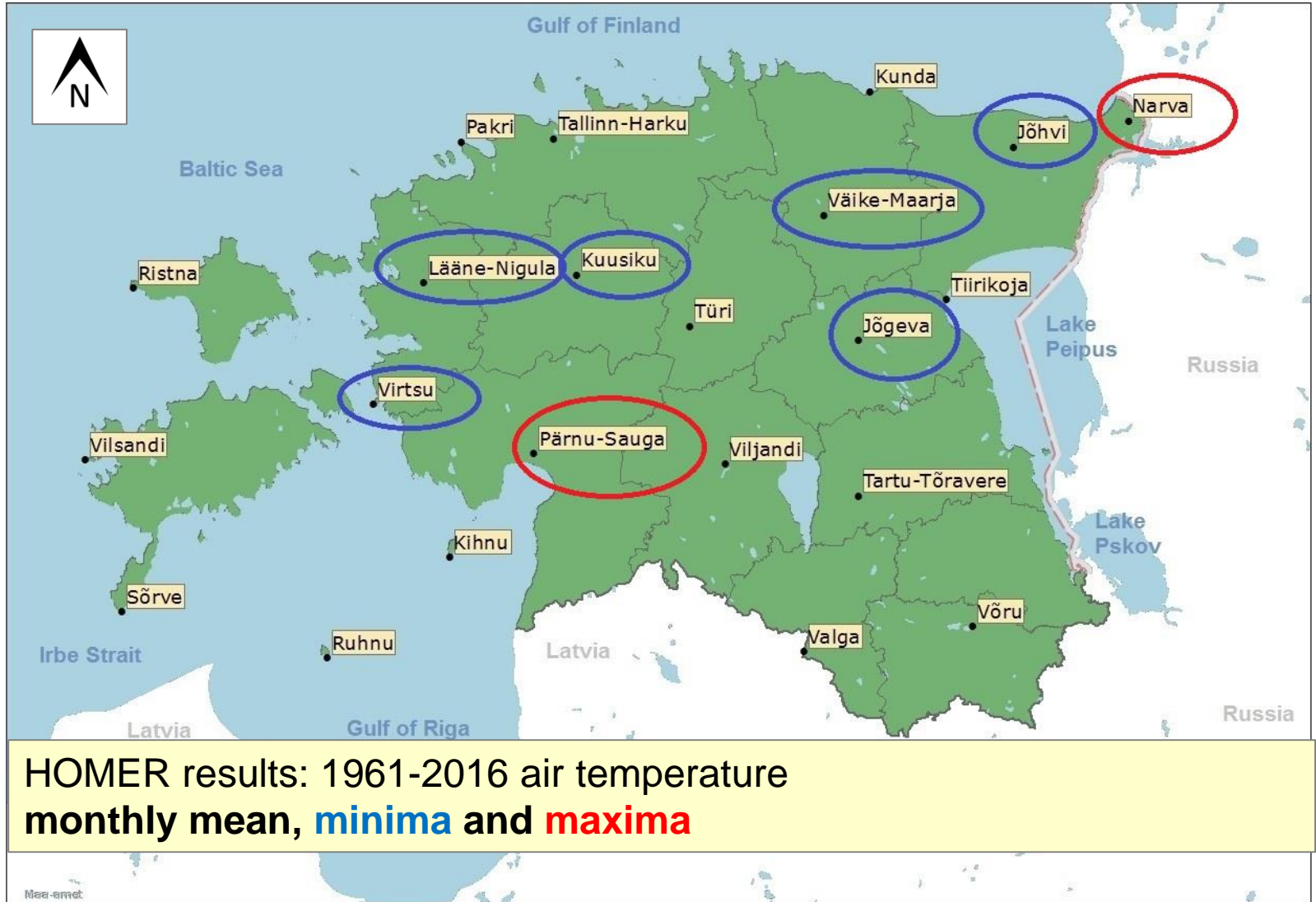
HOMER results: 6 stations considered as "no breaks" series 1961-2016



HOMER results: 1961-2016 air temperature
monthly mean, **minima** and **maxima**

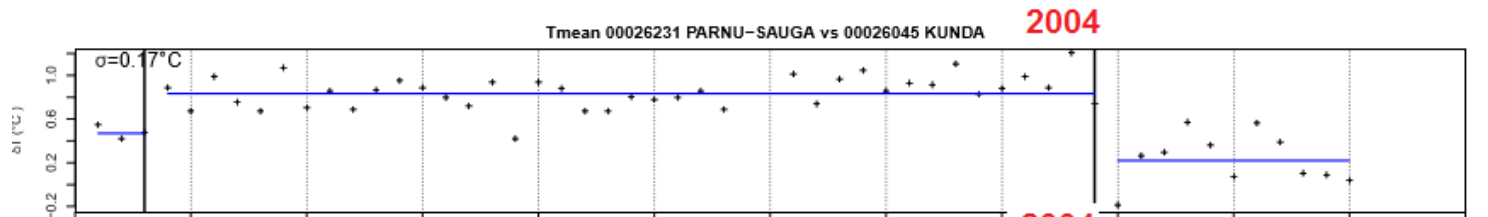
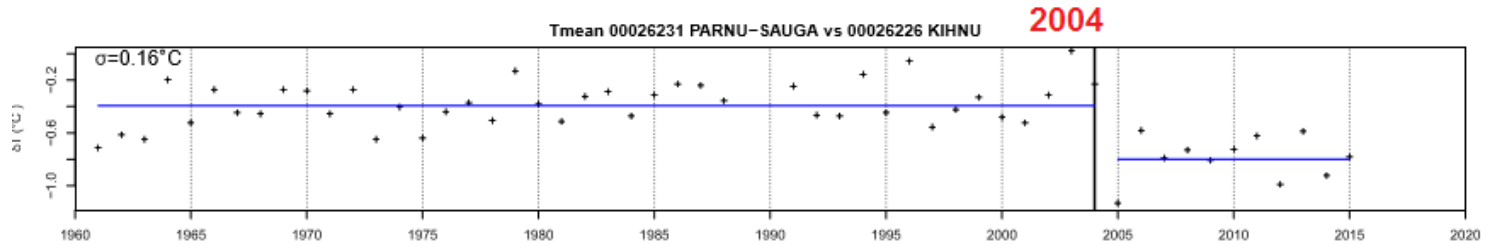
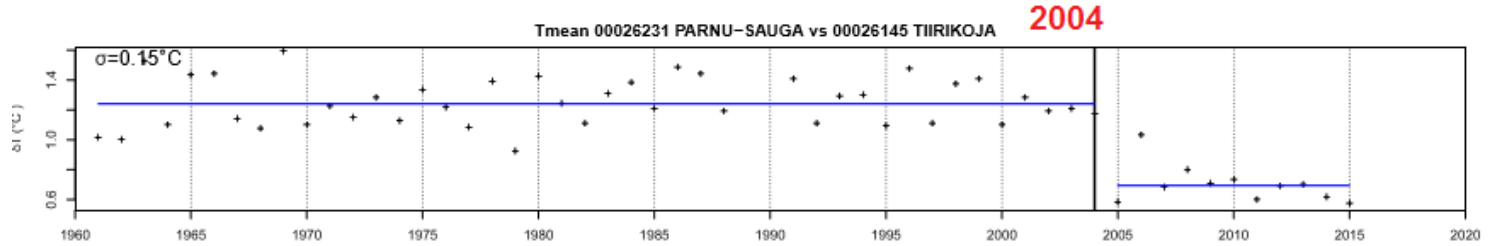
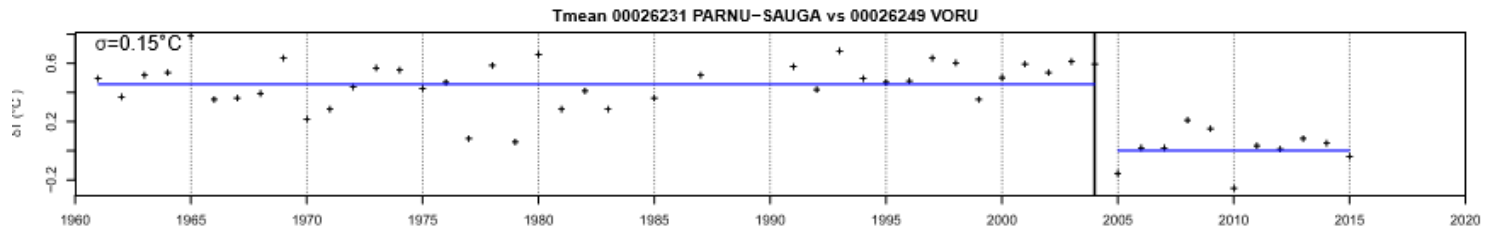
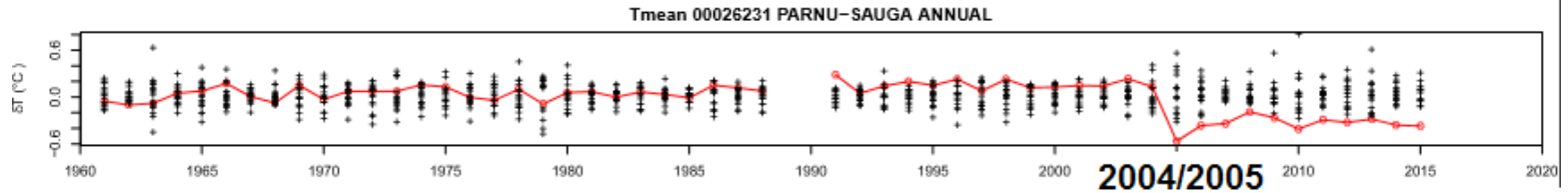


HOMER results: 2 stations very clear breaks





Pärnu-Sauga break 2004 – relocation from center of a town to the airport



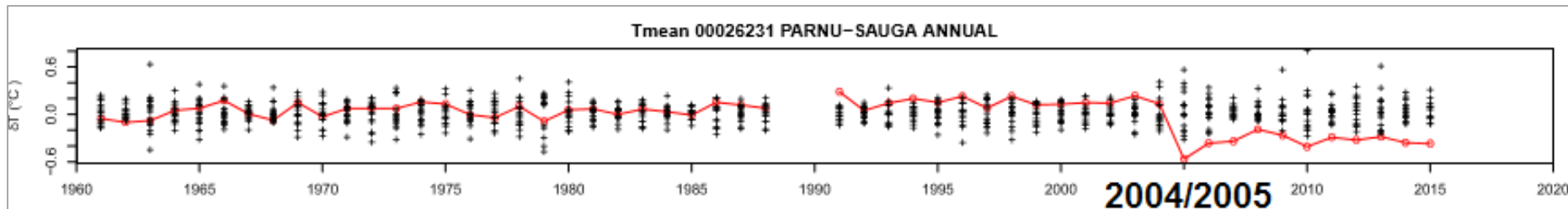


Pärnu-Sauga station break in december 2004

Relocation: from center of a town to the airport, the distance 10 km



Break 2004

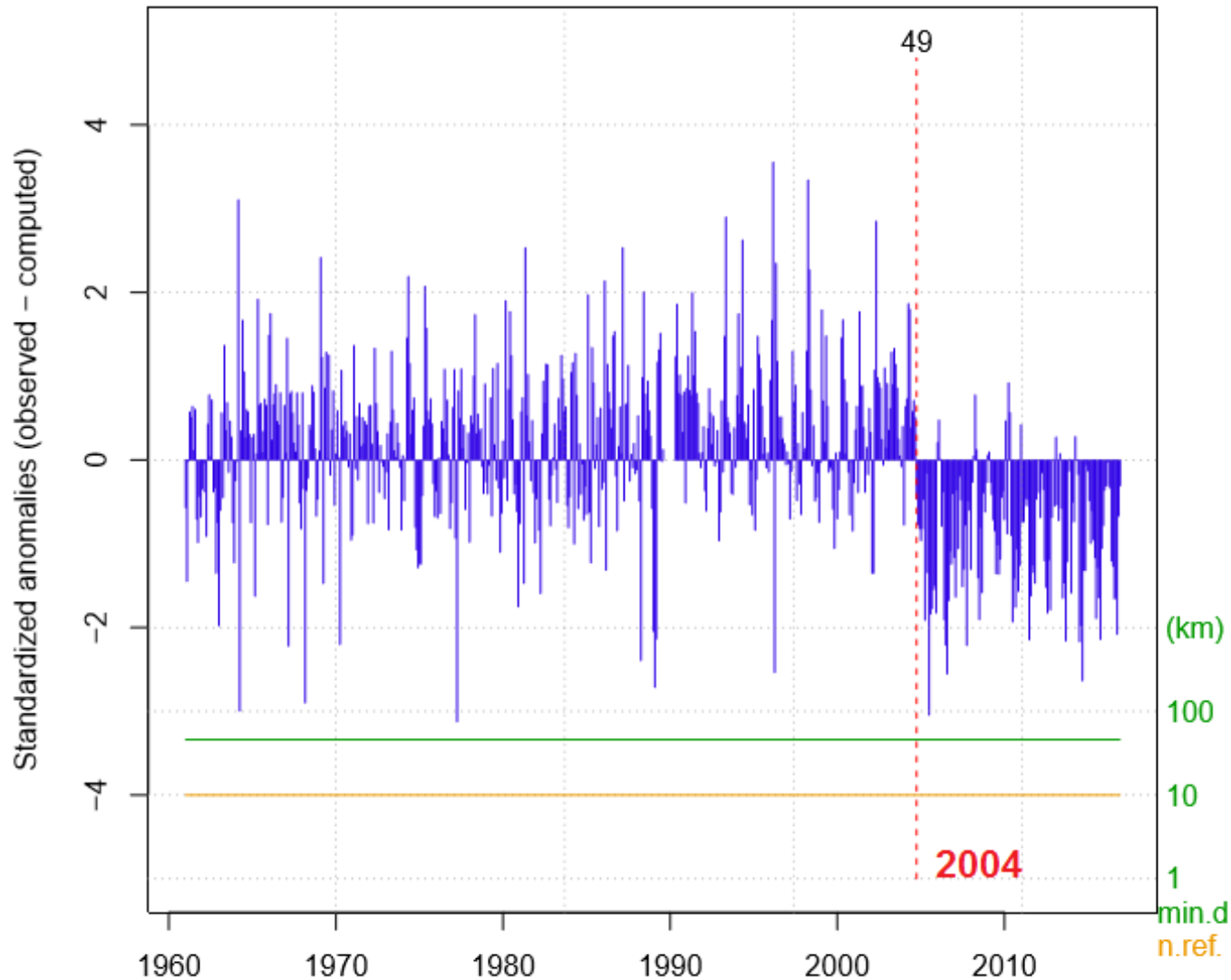


Annual correction -0,49 °C



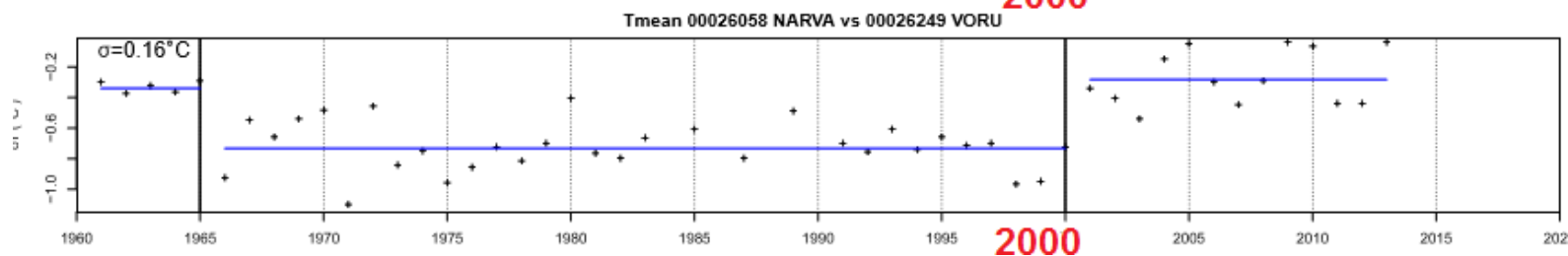
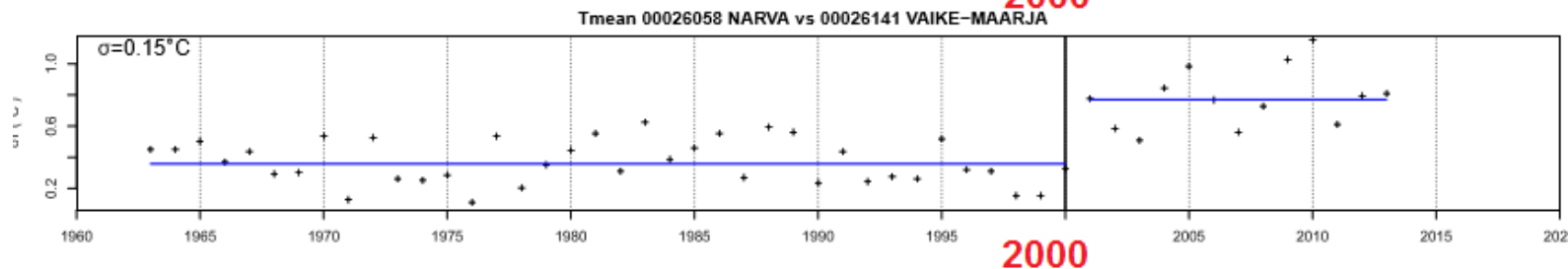
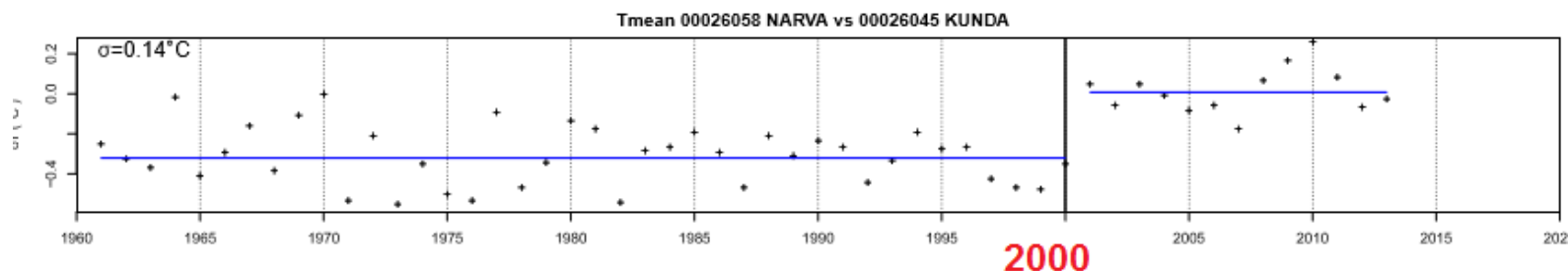
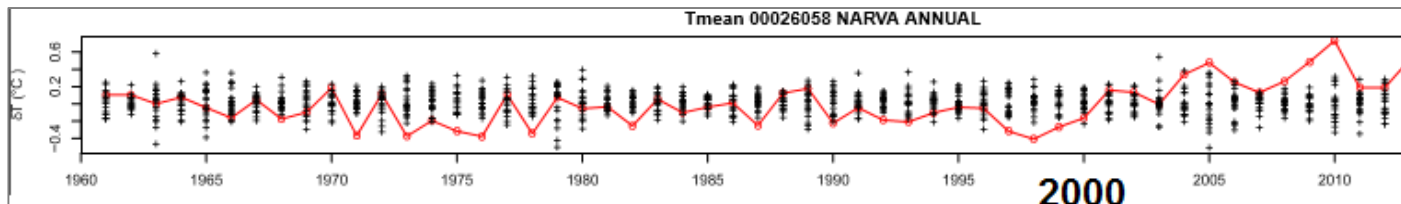
Climatol results: daily mean

tm-m at 00026231d(14), PARNU-SAUGA





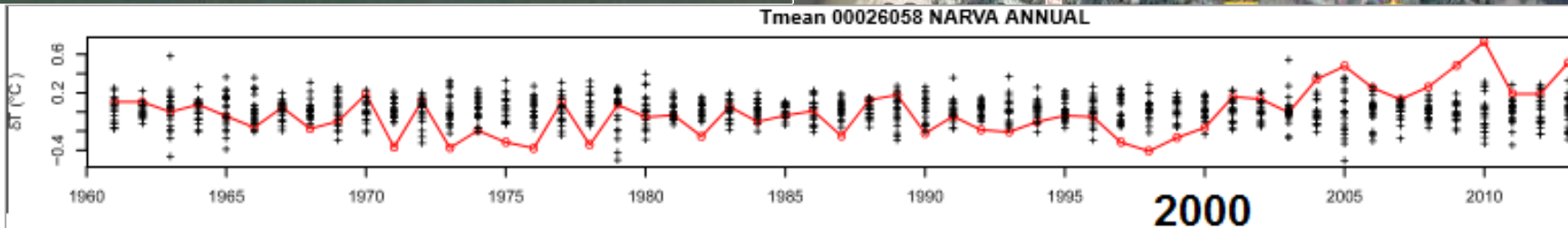
Narva station break in 2000 relocation: from the airport to the riverside the distance 20 km





Narva station break in 2000

Relocation: from the airport to the riverside the distance 20 km

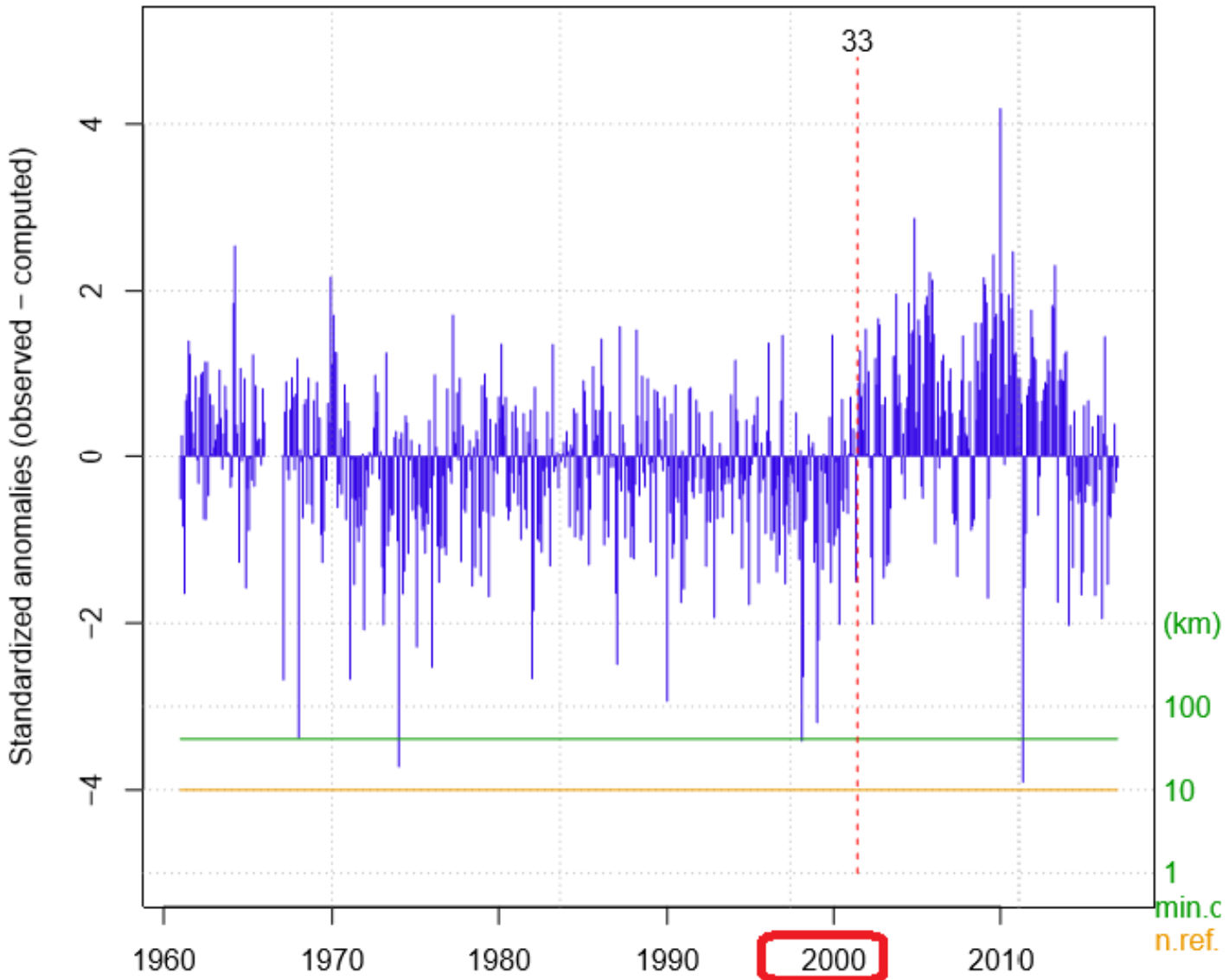


Annual correction +0,43 °C



Climatol results: daily mean

tm-m at 00026058d(5), NARVA





Breaks 2004 and 2000 not detected in maximum temperatures

series 1925-2016 and series 1961-2016	mean	min	max
Pärnu – Sauga station	Break 2004	Break 2004	No break
Narva station	Break 2000	Break 2000	No break



Confusing breaks???

Station	Size of the break 1965
Kunda	+0,23 °C
Ristna	-0,29 °C
Türi	+0,18 °C
Viljandi	+0,05 °C
Võru	+0,23 °C

For example: break1965
reveals in series

1961-2016 in many stations!

.....but not in long-term
series1925-2016?

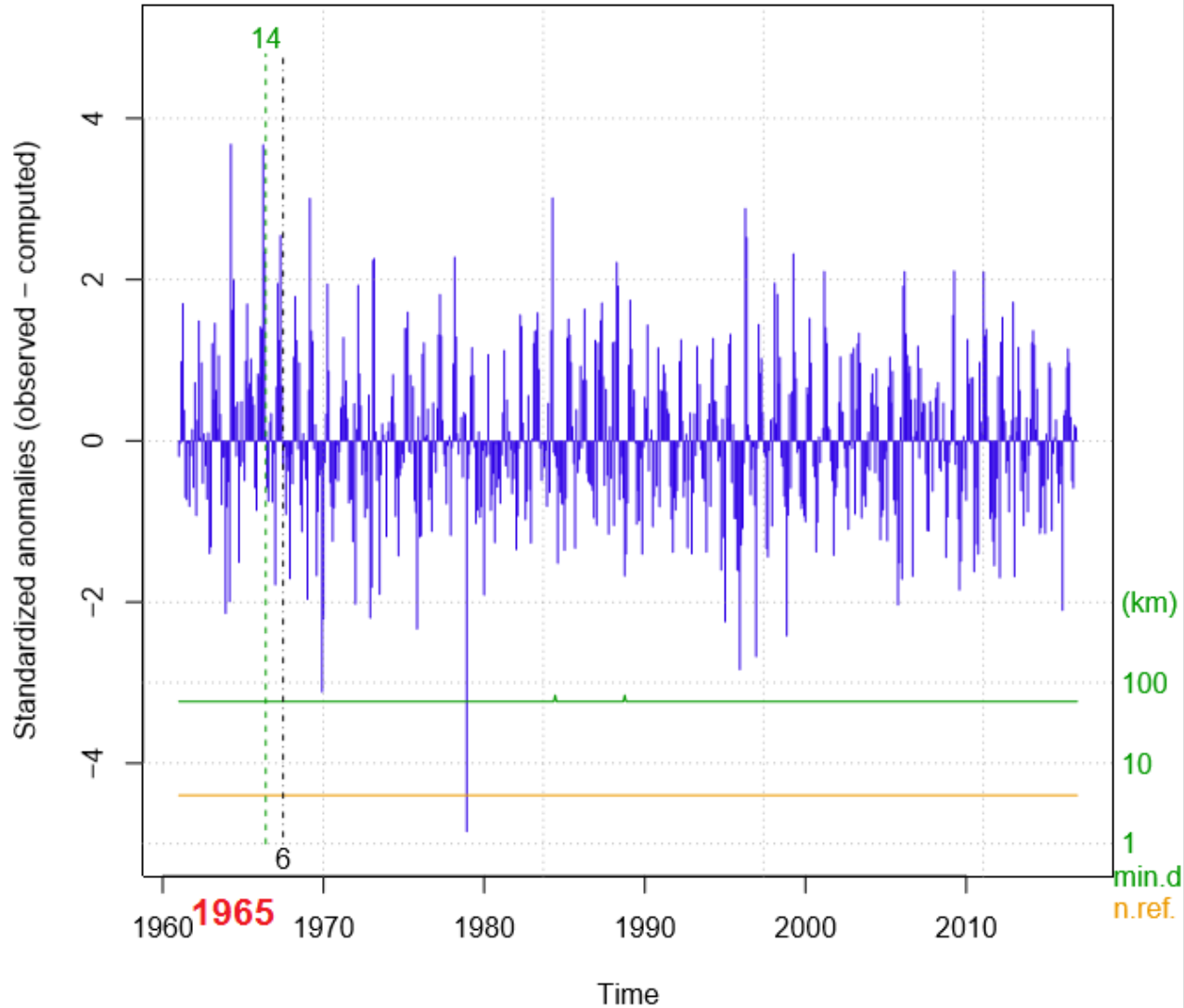
Break 1965 may be due to the
changes in the observation times
from 01,07,13,19 Local Time to 00,
03, 06, 09, 12, 15, 18, 21 GMT.

Is it break?



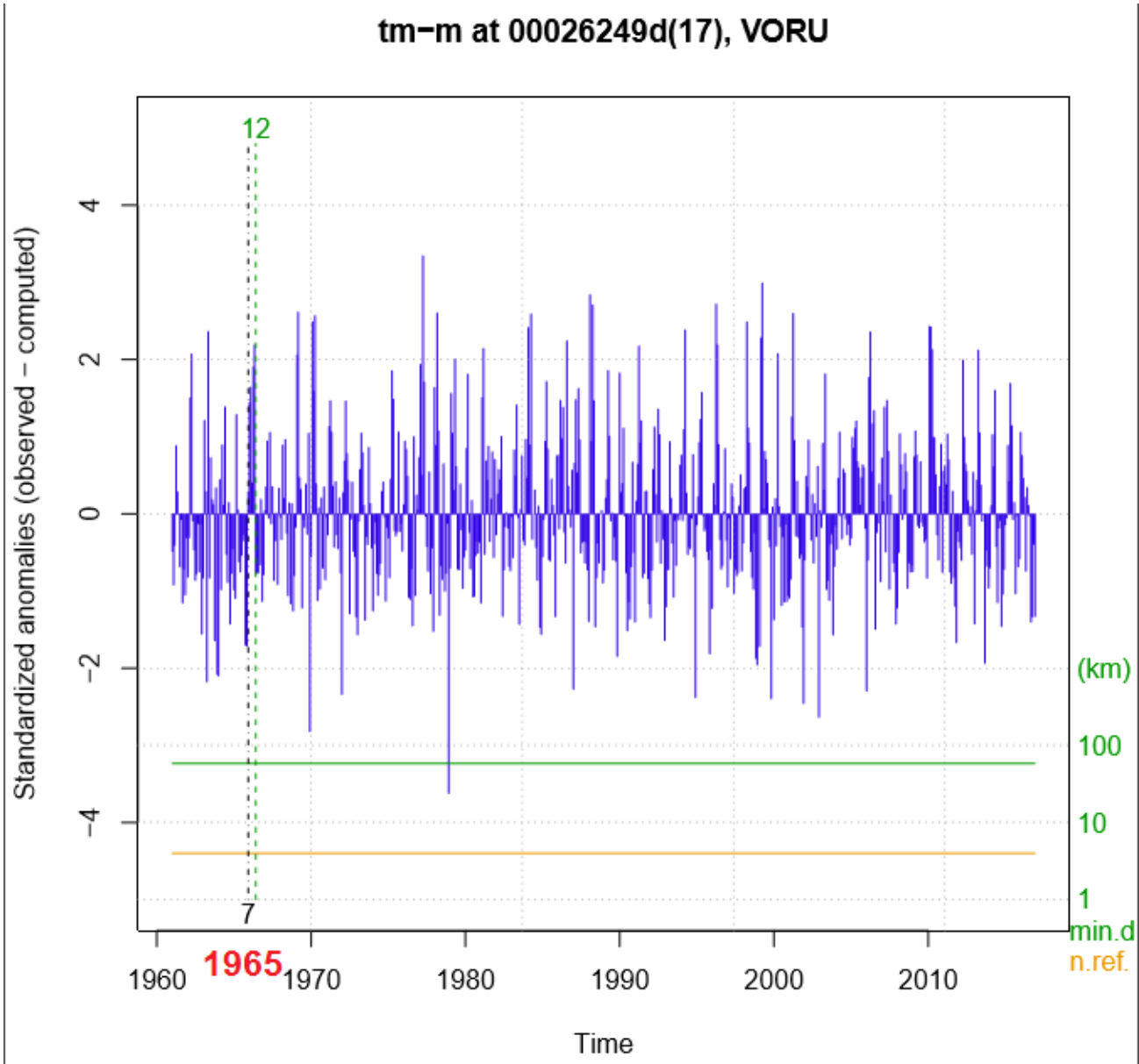
Climatol results: daily mean

tm-m at 00026247d(16), VALGA





Climatol results: daily mean





Very „small“ breaks?and only in 1961-2016 mean temperatures?

For example **break1982** Viljandi station in series
1961-2016, annual correction $-0,12^{\circ}\text{C}$

1982 not detected in min and max temperatures.

1982 not detected in long-time series 1925-2016

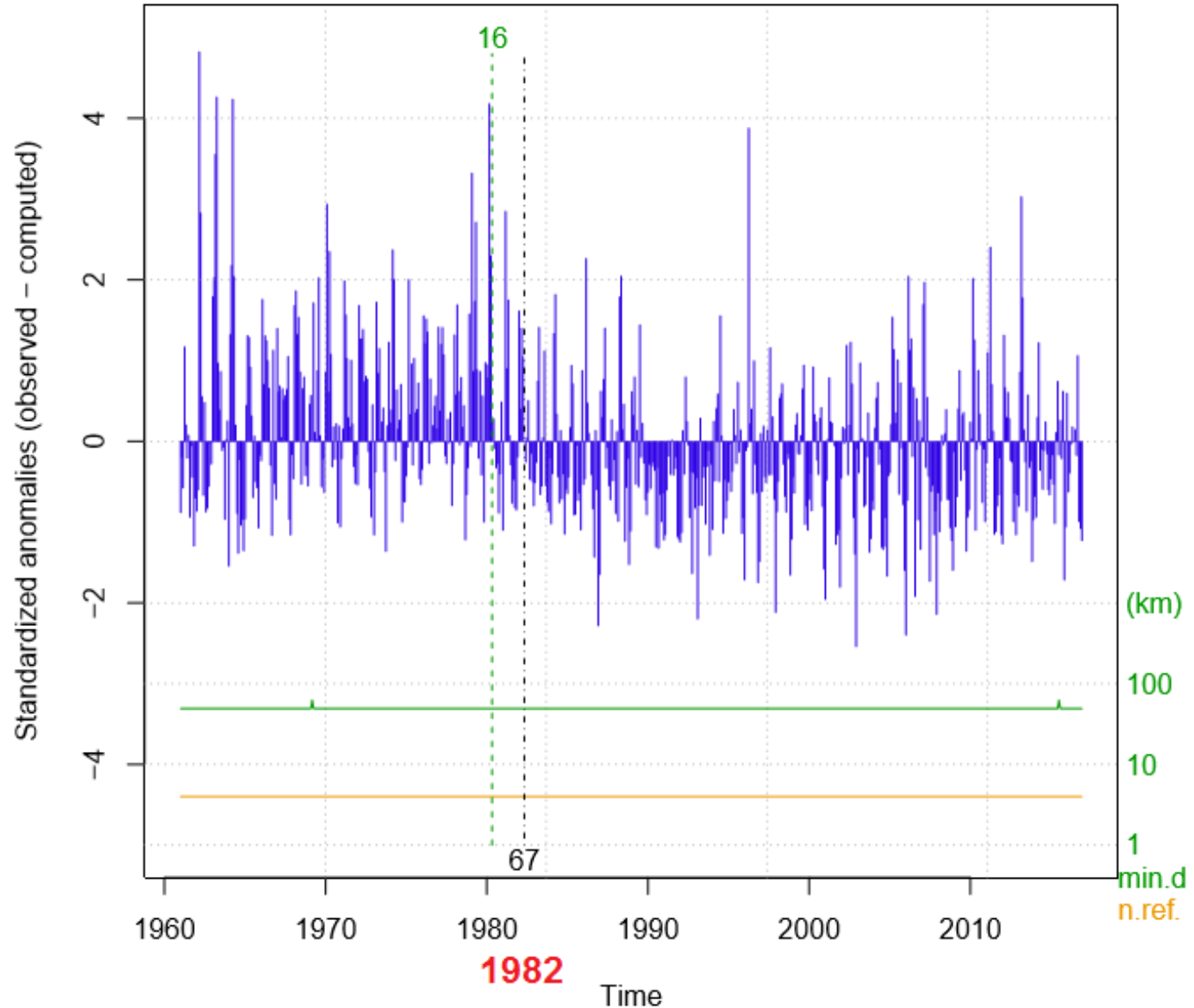
Mean 1961-2016	Min 1961-2016	Max 1961-2016
1982	No break	No break
Mean 1925-2016	Min 1925-2016	Max 1925-2016
No break	No break	No break

Metadata says that 1982: station relocation!



Climatol results: daily mean

tm-m at 00026233d(15), VILJANDI





Confusing breaks???

Break in 1987

in 9 station from the 22 stations, no metadata support,
but many scientific sources:

Keevallik 2011

Watanabe and Nitta 1998

Lehmann *et al.* 2011

Soomere *et al.* 2015

refers to changes in meteorological regime and should
not be referred as artificial ones.



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What's next?

SPLIDHOM

MASH

And more..

It is so small network that would be very easy to test as many methods as possible. Just for curiosity!

Or what would you recommend?



Conclusion and Discussion

Conclusion: The main finding of this study was that **station relocation almost always affects the temperature series.**

Discussion: is it true that „very small“ breaks does not reveal in long-term series???

Considering 1925-2016 as long-term series and 1961-2016 as not so long 😊



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Thank you!

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References

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Watanabe, M., Nitta, T., 1998. Decadal Changes in the Atmospheric Circulation and Associated Surface Climate Variations in the Northern Hemisphere Winter Centre for Climate System Research, University of Tokyo, Tokyo, Japan

Lehmann A., Getzlaff K., and Harlaß J. 2011. Detailed assessment of climate variability in the Baltic Sea area for the period 1958 to 2009. Clim. Res. 46, 165-196

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