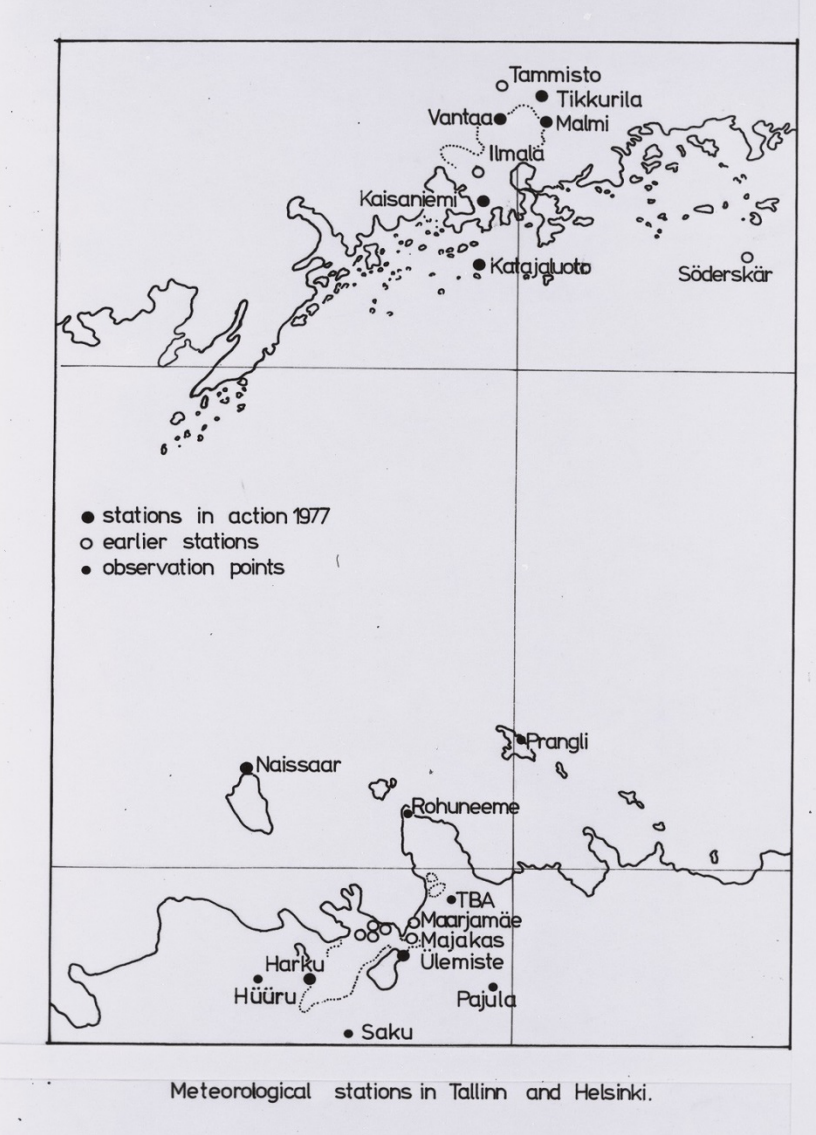
TWO REMARKS ABOUT CLIMATE TREND

Andres Tarand

Tallinn 24.Oct 2013

1. CLIMATE CHANGE in the Baltic Sea Region in 14th to 21st Century
2. Climate Change and local trends



Meteorological stations in Tallinn and Helsinki.

Tallinn - Helsinki

Distance = 80 km

Mean icebreak difference
17 days

Paldiski-Tallinn
D = 45 km
Icebreak 19 days

TALLINN SOURCES

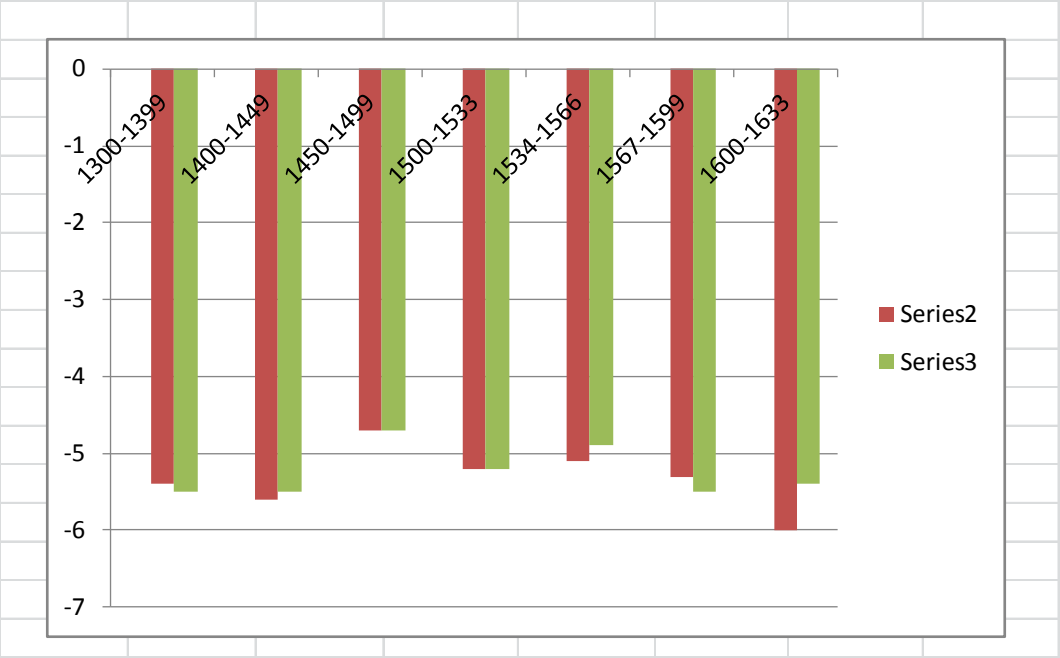
PORT JOURNALS, CUSTOM BOOKS 1339 –
TOWN COUNCIL MINUTES
CORRESPONDENCE
- TOWN COUNCIL
- CLAYHILLS´ DEPARTMENT STORE 1690 –
EARLY WEATHER OBSERVATIONS 1784 –
NEWSPAPERS (R.W.N. 1772 -; OTHERS 1821 -)
SYSTEMATIC ICE OBSERVATIONS (TALLINN STOCK EXCHANGE COMMITTEE 1858 -)
METEOROLOGICAL STATION 1903 –
OTHER SOURCES (E.G. 1918 WAR HISTORY)

CRITERIA FOR CORRESPONDENCE

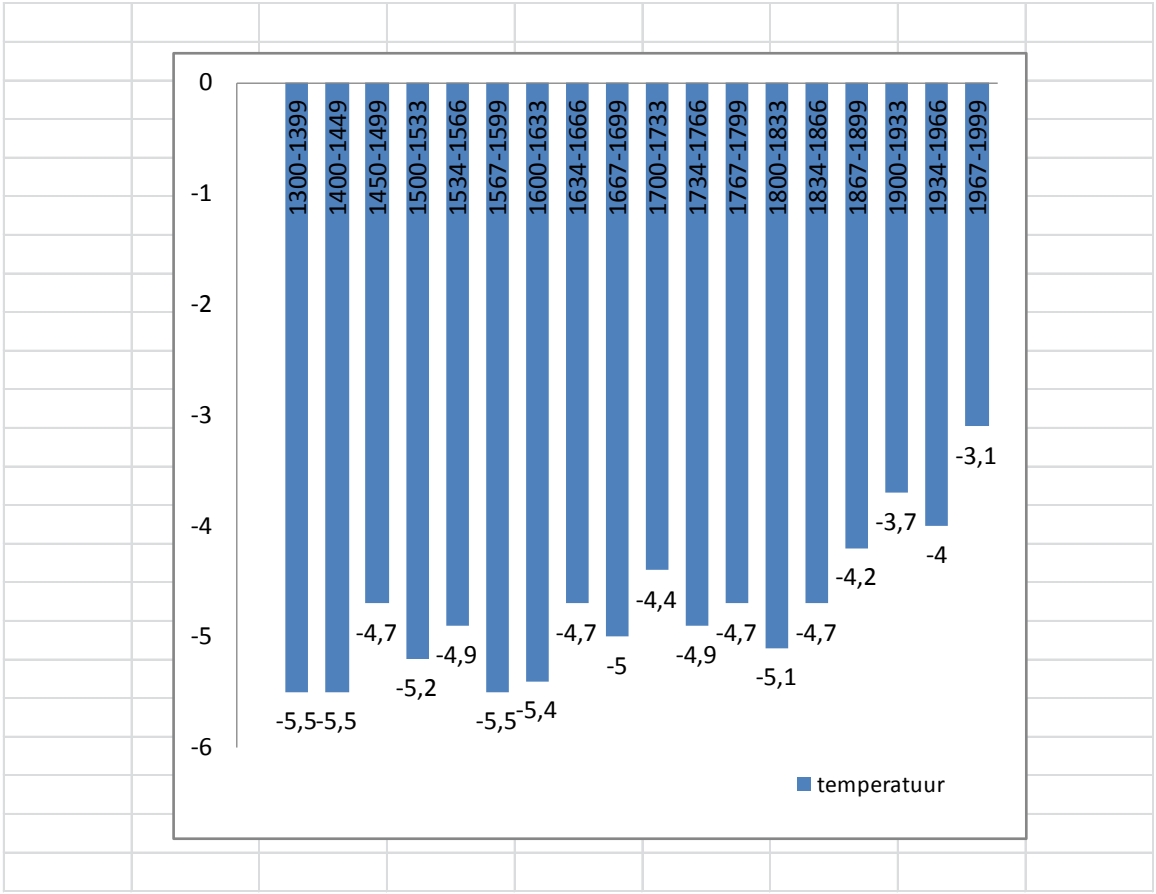
1. IF THE SPEED IS MORE THAN 60 KM/DAY THE LETTER WAS COMING FOR SURE BY SEA. SPECIAL CASES WITH CURRIERS OF HIGH OFFICIALS USUALLY HAD ALSO SPECIAL INFORMATION IN ADDITION

2. CORRESPONDENCE WITH THE SPEED OF 30-60 KM/DAY WAS MOST LIKELY COMING BY SEA UP TO THE SECOND HALF OF 17TH CENTURY. AFTER THAT TIME ADDITIONAL INFORMATION ABOUT LAND-ROADS IS NECESSARY

3. ONE CANNOT MAKE ANY DIFFERENCE BETWEEN CORRESPONDENCE COMING BY LAND OR SEA IF THE SPEED IS NOT MORE THAN 30 KM/DAY



DIFFERENCE BETWEEN ALL AND CORRECTED RESULTS



MEAN AIR TEMPERATURE IN TALLINN BY PERIODS OF 33-34 YEARS

		Jääminekute korrelatsioon Läänemere piirkonnas											
Veekogu	1	2	3	4	5	6	7	8	9	10	11	12	
1.Daugava	#	0,72	0,78	0,55	0,83	0,74	0,82	0,59				0,54	
2.Neeva, Peterburg		#	0,76	0,58	0,34	0,28	0,8					0,27	
3.Pärnu j., Pärnu			#	0,65						0,66		0,45	
4.Emajõgi, Tartu				#								0,5	
5.Aura j., Turu					#	0,96	0,74					0,35	
6.Kokemäe j.						#						0,27	
7. Võsu j., Palmse							#					0,32	
8.Tallinna laht								#	0,43	0,52	0,76	**0,84**	
9.Viiburi laht									#	0,29	0,43	0,37	
10.Pärnu laht										#	0,49	0,53	
11.Paldiski laht											#	0,6	
12 Läänemere max jää pindala												#	

CORRELATION BETWEEN ICEBREAKS ON THA EASTERN COAST OF THE BALTIC SEA

CORRELATION BTW. MAX. AREA OF ICE:

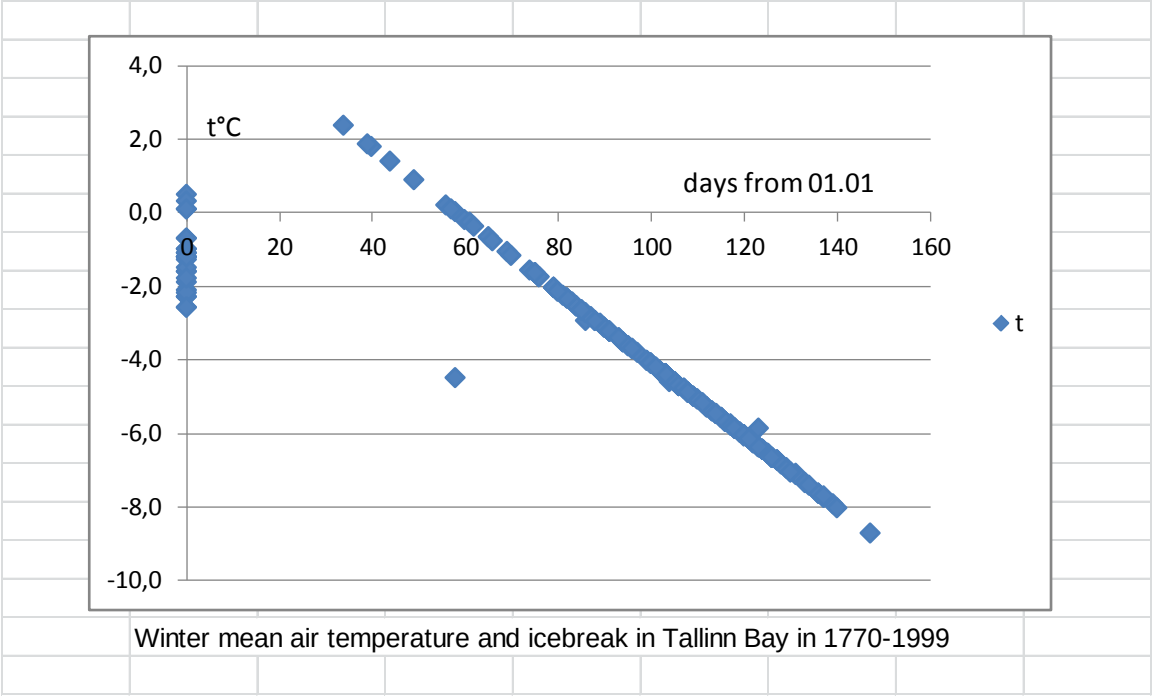
TALLINN 0.84 RIGA 0.54 PALDISKI 0.60 PÄRNU 0.45

VYBORG 0.53 (STOCKHOLM ?)

WINTER OR SPRING?

DAUGAVA WINTER (DEC – MARCH) **0.54** SPRING (MARCH-APR.) **0.69**

C.I.H. Speerschneider, 1915 Denmarks History Cold and very cold winters
R. Jurva 1939; M.Leppäranta ja A.Seinä, 1985 Maximum area of ice
S. Jevrejeva, 2001 Severity of winters (should be winters and springs)
A.Moberg, 2009 Stockholm winters temperature

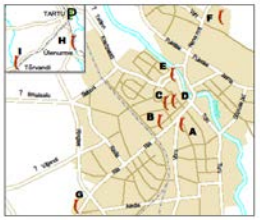


WINTER MEAN AIR TEMPERATURE AND ICEBREAK ON TALLINN BAY IN 1770 - 1999

St.Petersburg

Riga

Tallinn



Tartu

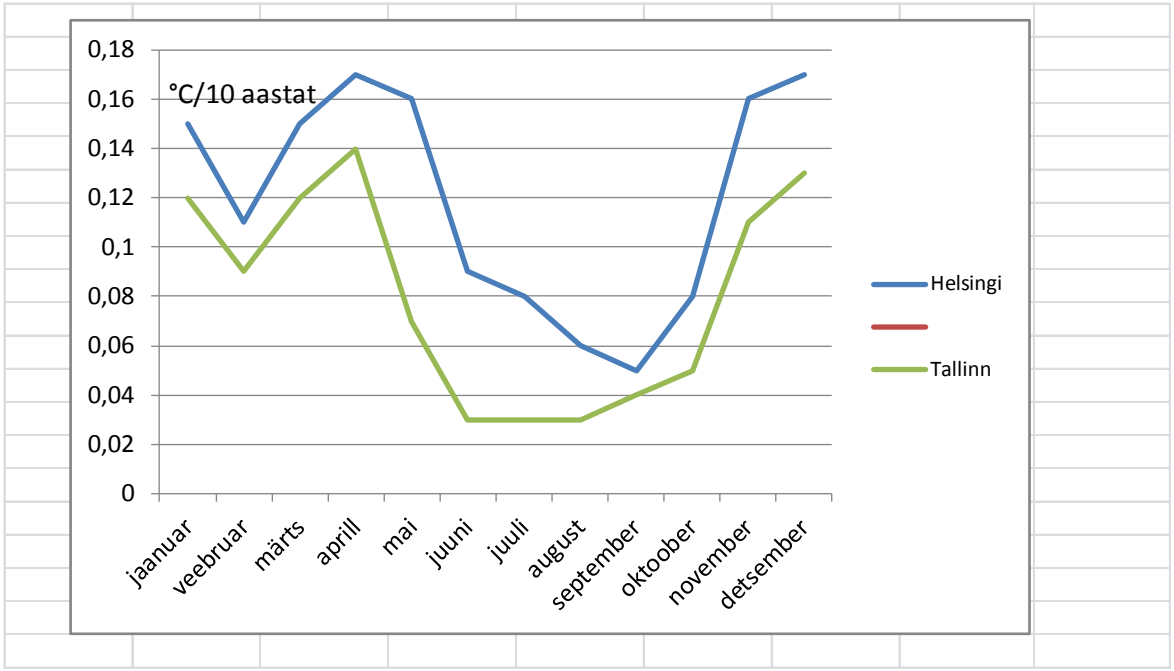
Stockholm

Helsinki

Mesoscale processes: 1. Impact of the sea 2. Urban impact (heat island)

Kuu keskmised temperatuurid Tallinna ja Helsingi meteojaamades 1961-1975 a (°C)

Meteojaam	kaugus keskm. rannajoonest km	kuud jaanuar	veebruar	märts	aprill	mai	juuni	juuli	august	september	oktoober	november	detsember	aasta
Naissaar	-17	-3,7	-4,4	-2,1	2,3	7,1	13,3	16,2	16,0	12,4	7,7	2,4	-0,8	5,6
Katajaluoto	-6	-4,8	-5,7	-3,1	1,6	7,0	13,4	15,8	15,3	11,8	7,1	2,1	-1,6	5,0
Kaisaniemi	0	-5,4	-5,4	-2,2	3	9,3	15,3	17,1	15,8	11,5	6,5	1,3	-2,4	5,4
Maarjamäe	4	-5,6	-5,3	-2,4	3,2	9,1	14,6	16,5	15,4	11,4	6,5	1,0	-2,5	5,2
Majakas	5	-6,1	-5,7	-2,9	3,1	9,4	14,8	16,4	15,3	11,1	6,2	0,7	-2,8	5,0
Malmi	6	-6,5	-6,5	-3,2	2,6	9,3	15,1	16,7	15,3	10,7	5,6	0,4	3,4	4,7
Ülemiste	8	-6,2	-5,8	-2,9	3,1	9,4	14,8	16,5	15,2	11,0	6,0	0,5	-2,8	5,0
Vantaa	8	-6,6	-6,5	-3,1	2,6	9,5	15,3	16,8	15,3	10,5	5,4	0,0	-3,7	4,7
8 jaama Δt max		2,9	2,1	1,1	1,6	2,5	2,0	1,3	0,8	1,9	2,3	2,4	2,9	0,9



Mean air temperature trend in Helsinki and Tallinn 1961-1975

Mean air temperature difference btw. Tartu Obsrvatory and ms. Raadi in 1929-1939 (°C)

Jan	Feb	March	April	May	June
0,5	0,7	0,8	0,6	0,6	0,5

July	Aug	Sept	Oct	Nov	Dec
0,4	0,3	0,5	0,4	0,4	0,4

Annual average 0,51°C

TARTU 50 000 inhabitants

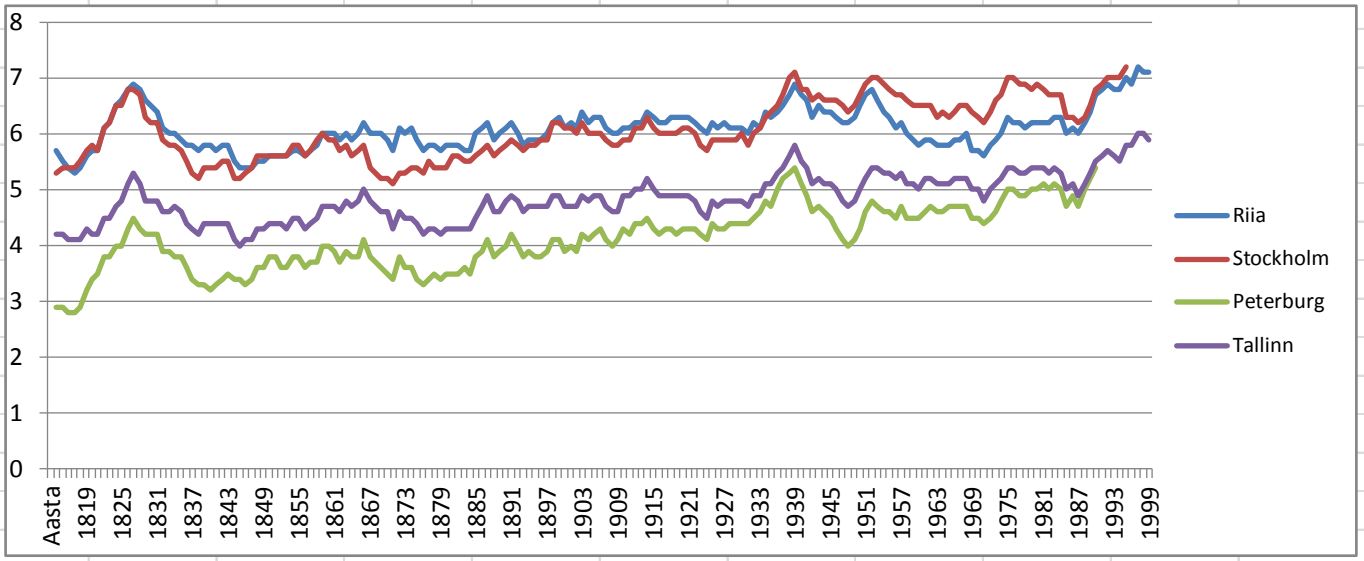
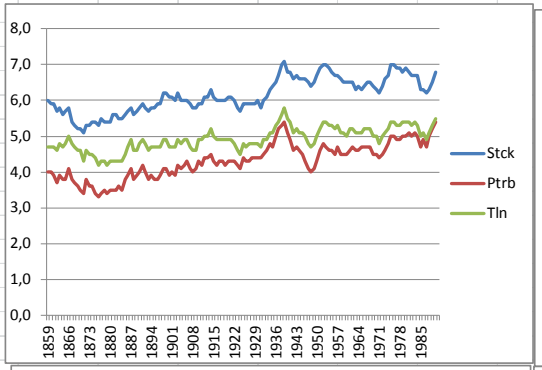
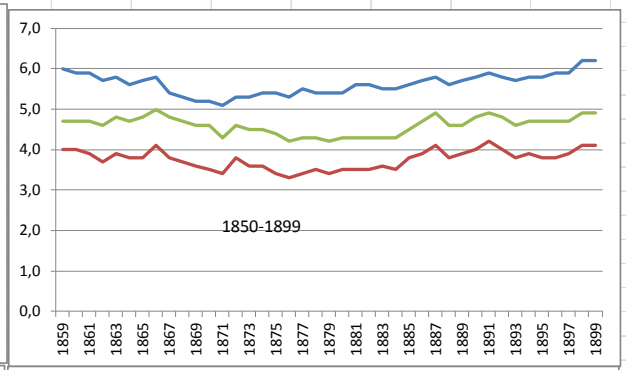
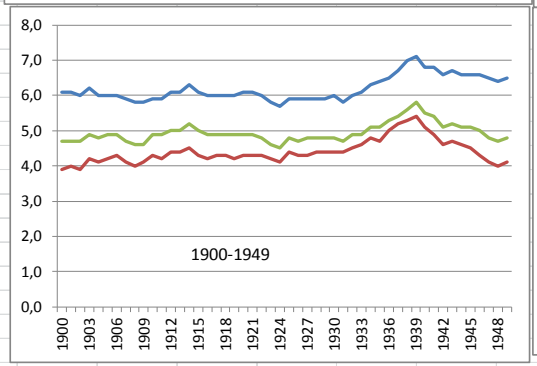


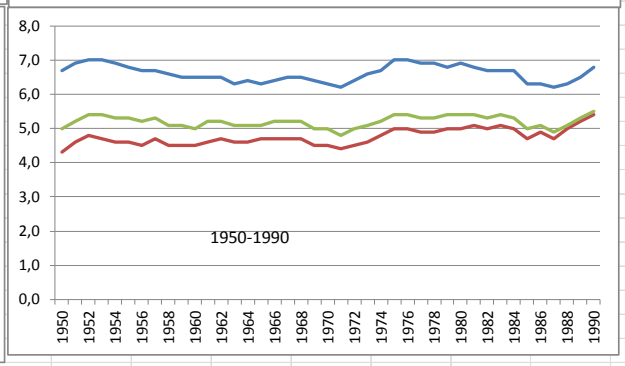
Fig.3. Average air temperature (10-years smoothed) in four Baltic Sea towns

AIR TEMPERATURE TRENDS IN STOCKHOLM, TALLINN AND PETERBURG 1850 - 1990 (10-years smoothed)









Periods of trend`s intense growth:

Stockholm 1871- 1900 3,0 centigrades/100 years

St Petersburg 1891-1920 1,7

1961- 1990 2,7

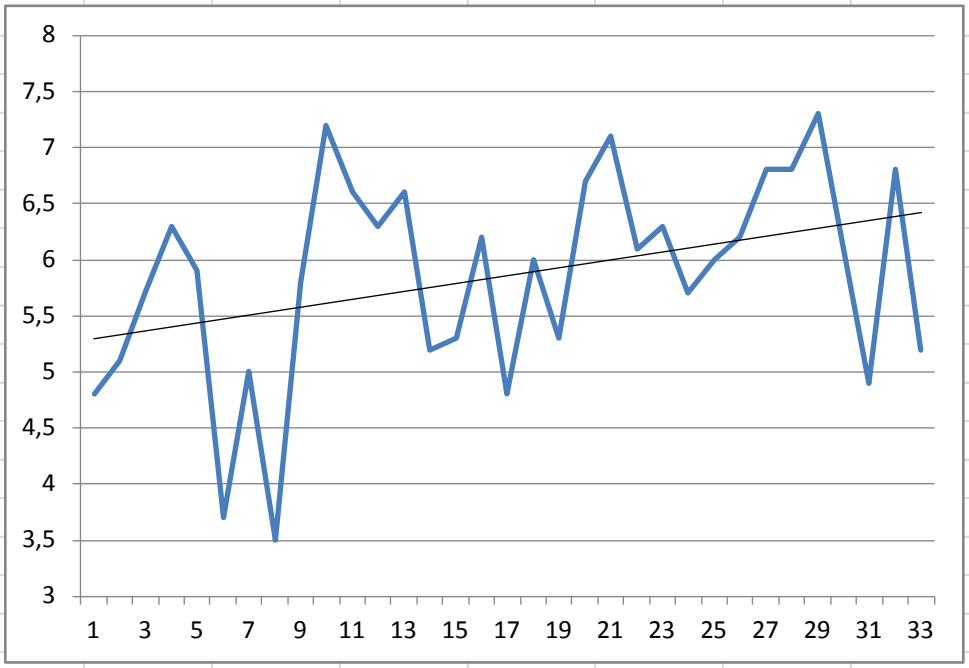
Tallinn 1980 – 2012 3,0 (also strong warming 1988-2008)

Difference of mean air temperature Stockholm-Helsinki:

1850 – 1890 1,6 centigrades/100 year

1891 - 1920 1,4

1940 - 1966 1,4



Õhutemperatuuri trend Tallinnas 1980-2012 (aasta keskmised)

Air temperature trend in Tallinn in1980-2012

Period 1850-1999 in our region global trend 1,2°C, local ˜0,6°C

Last 32 period (1980-2012) average climate warming 0,34 centigrades/10 years

If the same tempo continues in 2100 +3,0°C. **If ?**