



# Global Warming

## 1901 - 2018

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2019

Based on the Book:  
"Fundamentals of Global Warming"

# Presentation Slides about Global Warming

1. Global Warming 1901-2018
2. Influence of the Sun
3. CO2 Emissions and Concentration
4. Forecasting Global Warming
5. Seawater and Ice Conditions
6. Milankovich Cycles
7. Action Plans
8. Target Scenario 2050

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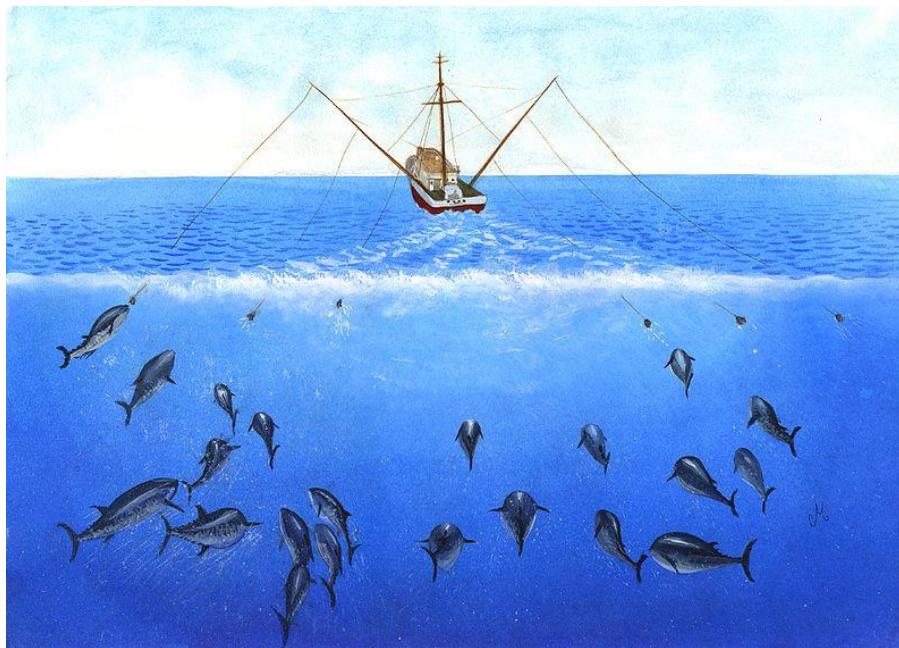
1. Introduction
2. Global warming
3. Warming in Finland



# **INTRODUCTION**

# Trolling and truth

- Disinformation to promote oil and coal industry
- Scandals to sell magazines and news
- Politics (Trump: Climate Change was Chinese...)
- Scientific paper to get a degree
- Also science, which is trying to find the truth

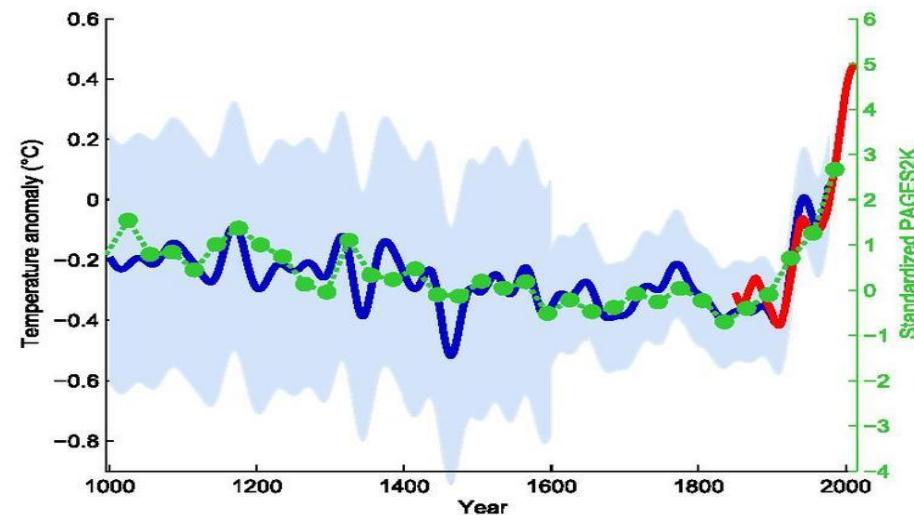
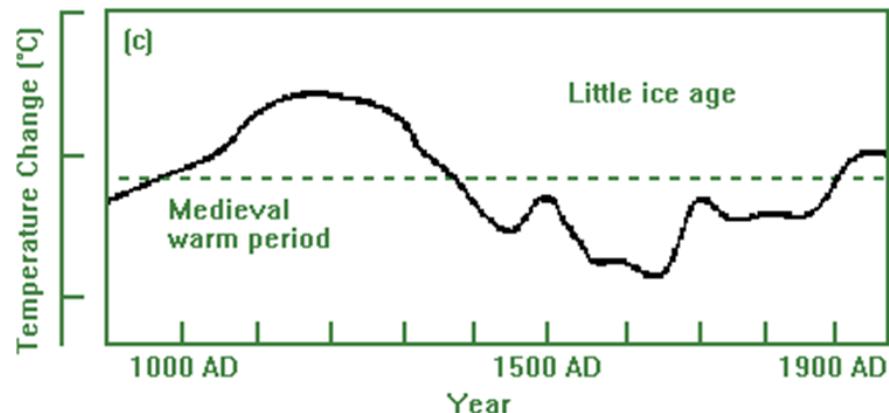


# Trolling stories

The first IPCC report  
in 1990

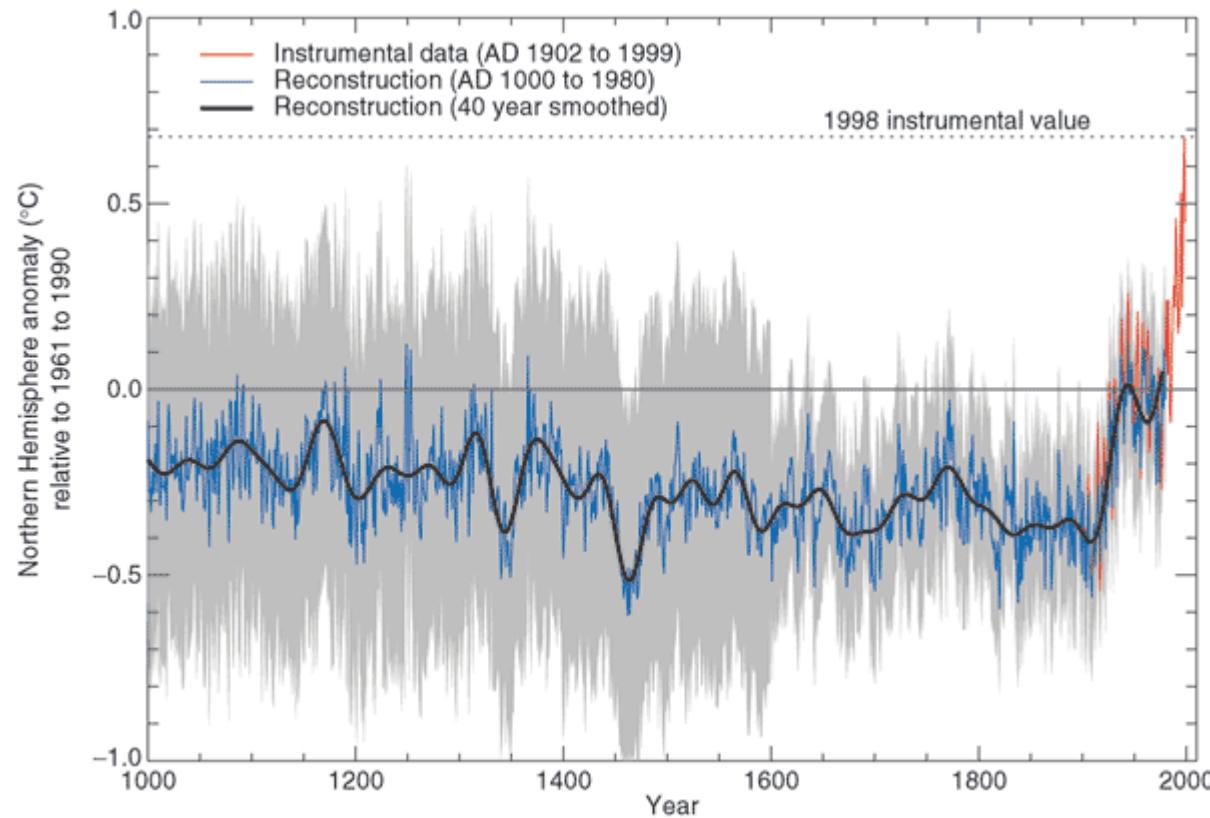
"The Hockey Stick"  
discovered by  
Michael E. Mann,  
Raymond S. Bradley  
Malcom G. Hughes  
In 1999

Creating temperature  
measurements by  
computer programs



# Trolling stories

Third IPCC report 2001 described hockey stick story and this picture:



# The truth is that it was very cold period from 1600 to 1700



*Frost fair on the river Thames in the winter 1683 – 1684*

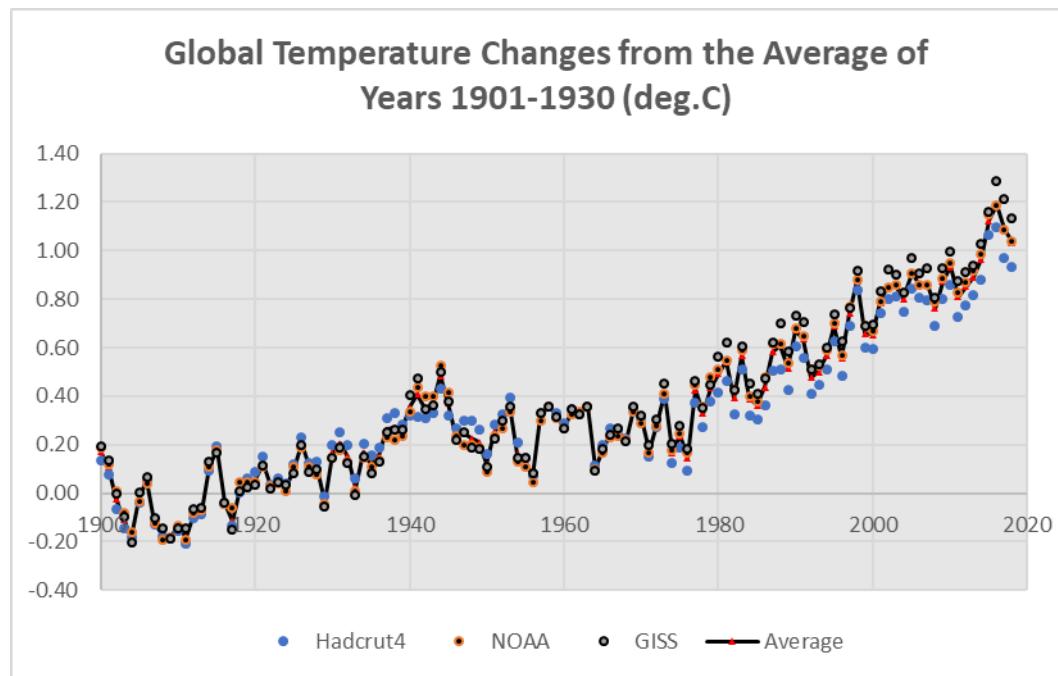


# **GLOBAL WARMING REAL FACTS**

# Data from three major providers

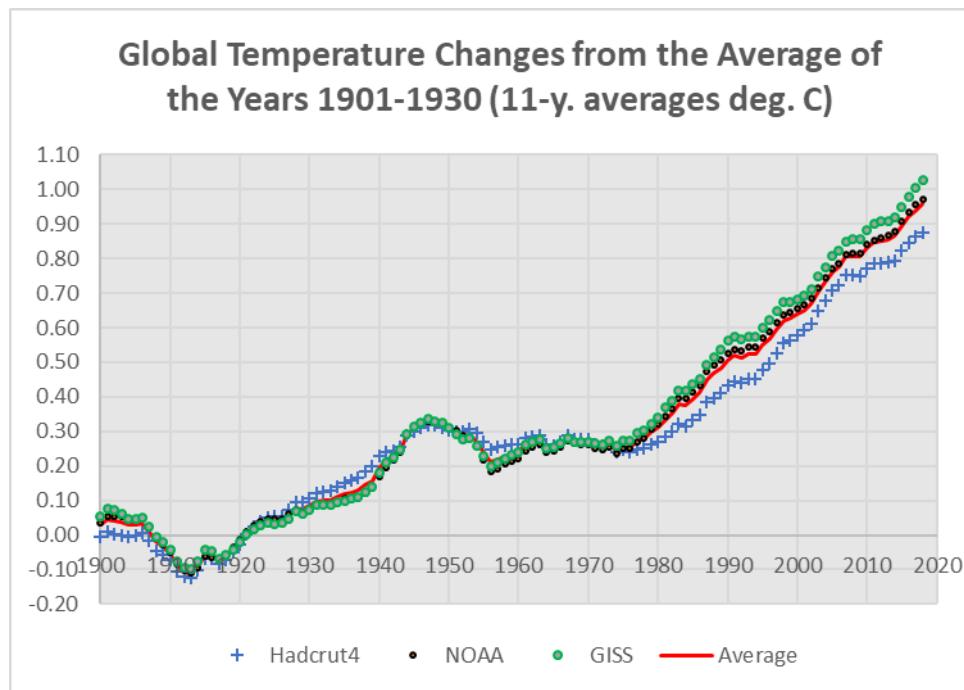
- **HadCRUT4, Climatic Research Unit (University of East Anglia)**
- **GISS, Goddard Institute for Space Studies (NASA)**
- **NOAA, National Oceanic and Atmospheric Administration (U.S. Department of Commerce)**
- **Average global temperatures from years 1880 - 2018**

# Temperature rise from average of years 1901-1930



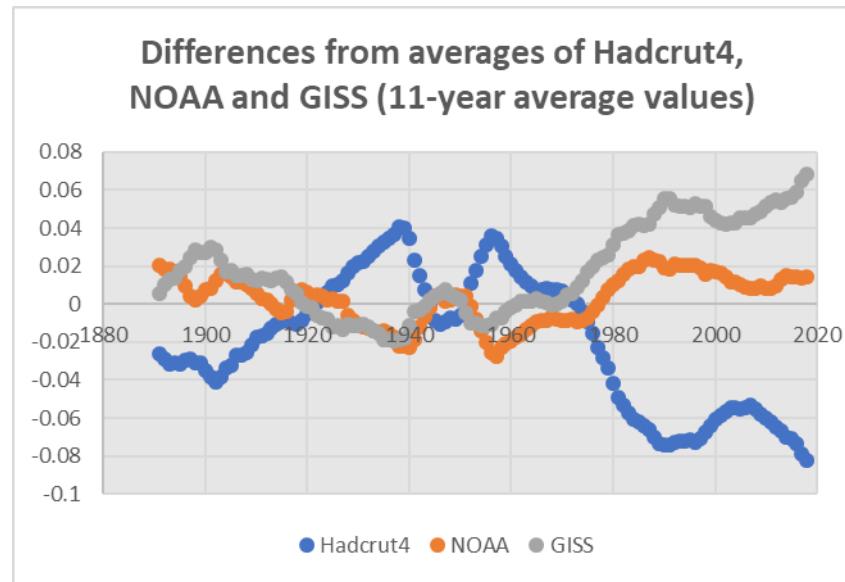
Annual global temperature was 1.04 deg. C higher in the year 2018 than average temperature during 1901 - 1930

# Temperature rise from average of years 1901-1930 (11-y. averages)



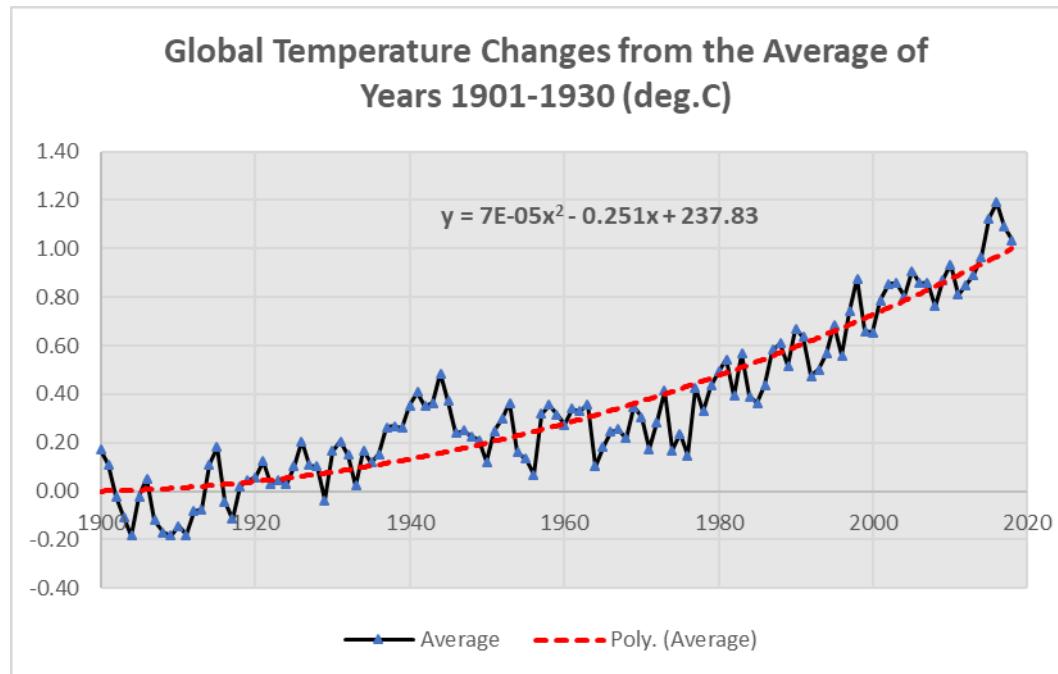
11-year average temperatures have risen 0.96 deg. C,  
The 11-year average temperature will eliminate 11-  
year cycle of solar spots

# Temperature differences from average (11-y. averages)



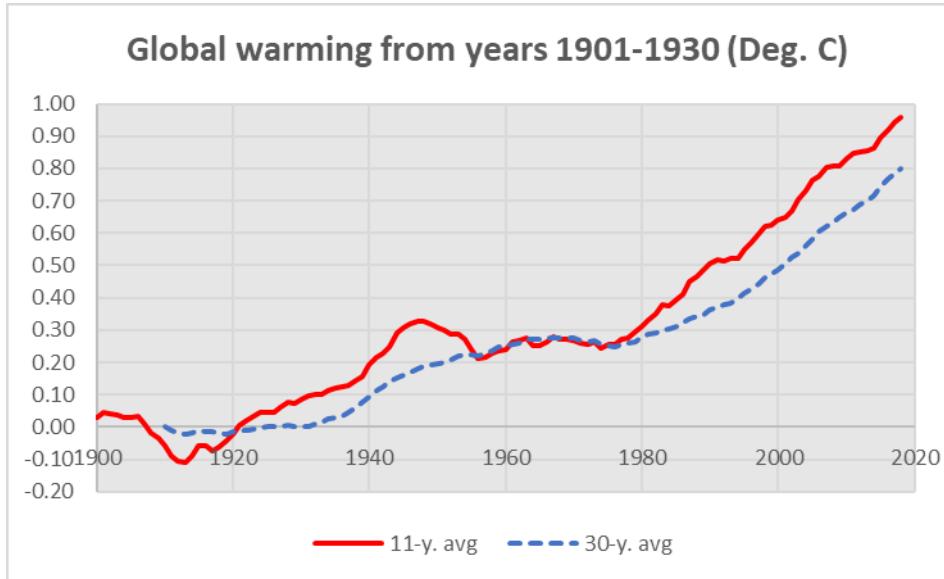
Standard deviation from the average are: NOAA 0.013, GISS 0,023 and Hadcrut4 0.035 deg.C

# Temperature rise from average of years 1901-1930



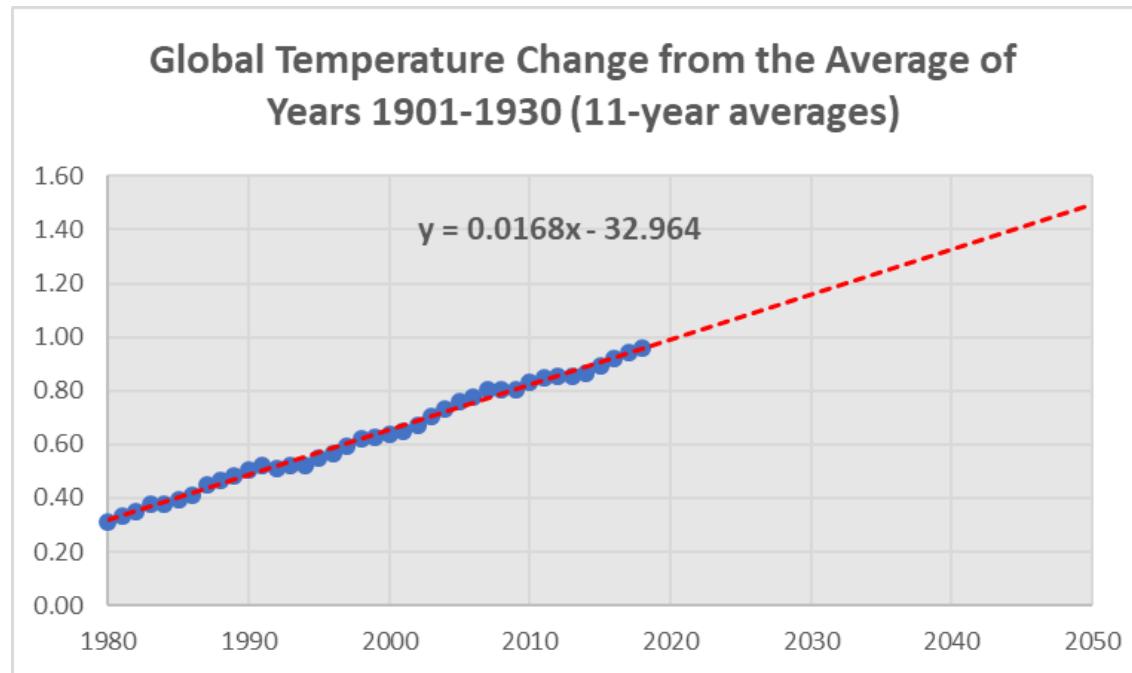
**Annual temperatures have risen by 1.0 deg. C  
Second degree polynom**

# Temperature rise from average of years 1901-1930



30-year average temperatures have risen 0.8 deg. C and 11-year average 0.96 deg. C

# Temperature rise trend from 1980 (11-y. averages)



Global temperature is rising 0.17 deg. C per decade. With this trend 1.5 deg. C limit will be exceeded in the year 2050



# **TEMPERATURES IN FINLAND**

# Temperature measurements in Finland

During years 1901 – 1930

3 times a day (7, 14, 21)

$$\text{average} = (7 + 14 + 2 \times 21)/4$$

During year 1950 -

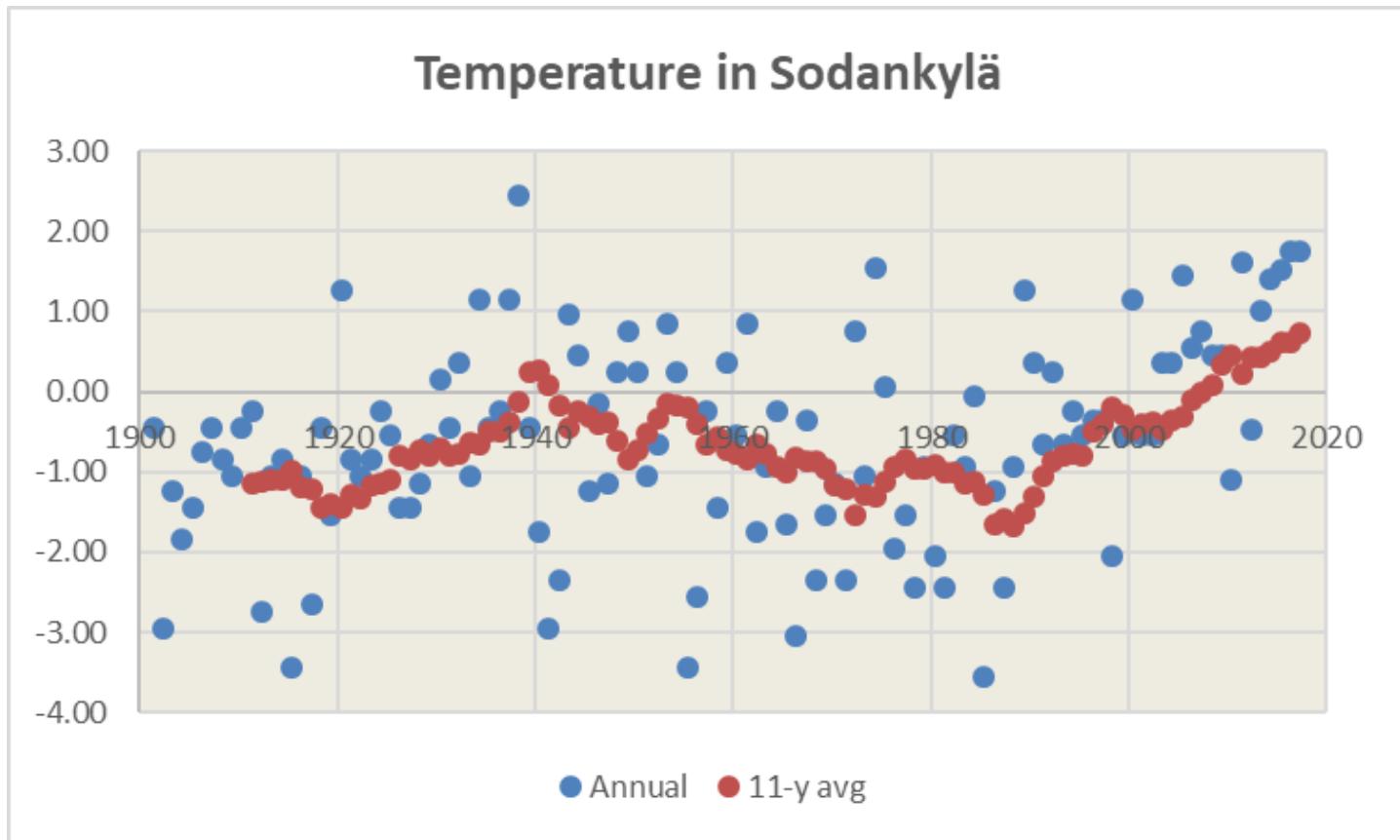
4 times a day (6, 12, 18, 24)

$$\text{average} = (6, 12, 18, 24)/4$$

Average for the day has slight difference, which can be eliminated by conversion of 4 measurements to 3 measurements per day

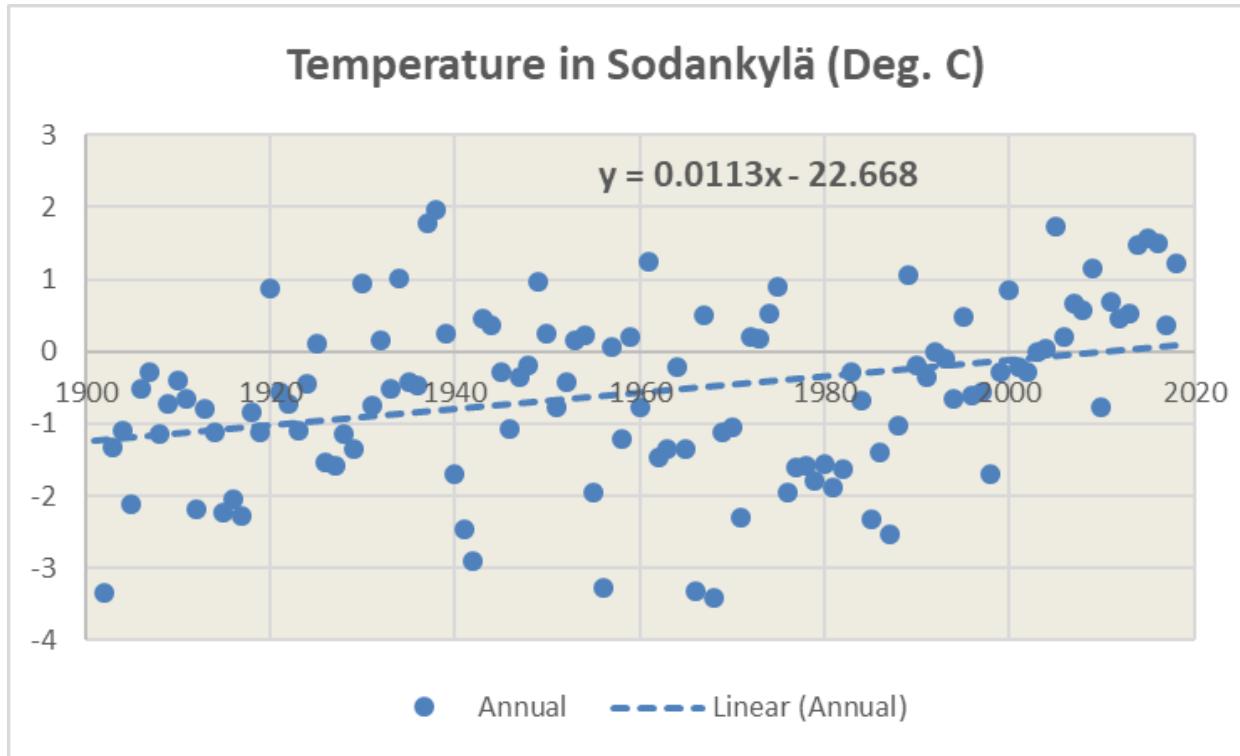
# Temperature in Sodankylä

( $67^{\circ} 22' N, 26^{\circ} 38' E, 180 m$ )



# Temperature in Sodankylä

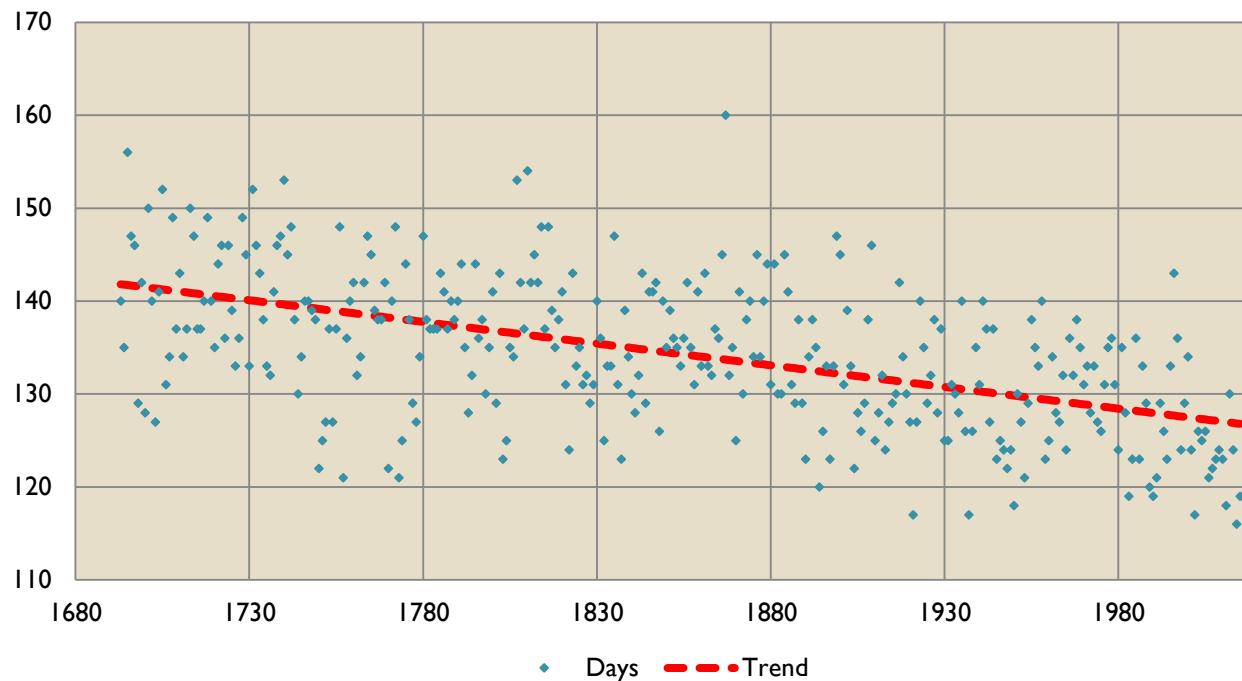
( $67^{\circ} 22' N, 26^{\circ} 38' E, 180 m$ , inside Polar Circle)



Temperature has risen with a trend 1.1 deg. C/100 years  
(annual trend 1901 – 2018)

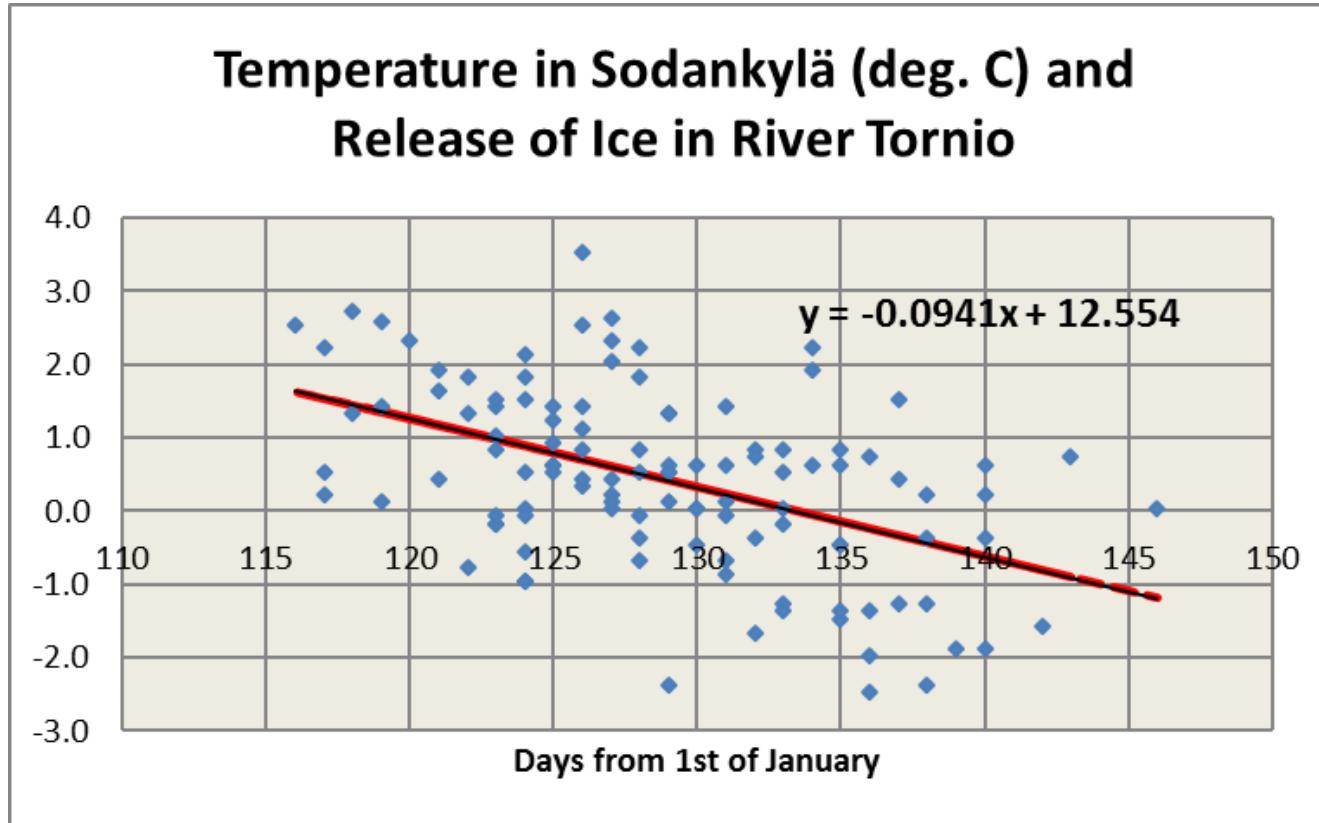
# Loss of Ice in Tornio River

**Loss of Ice in River Tornio  
(days from the First of January)**



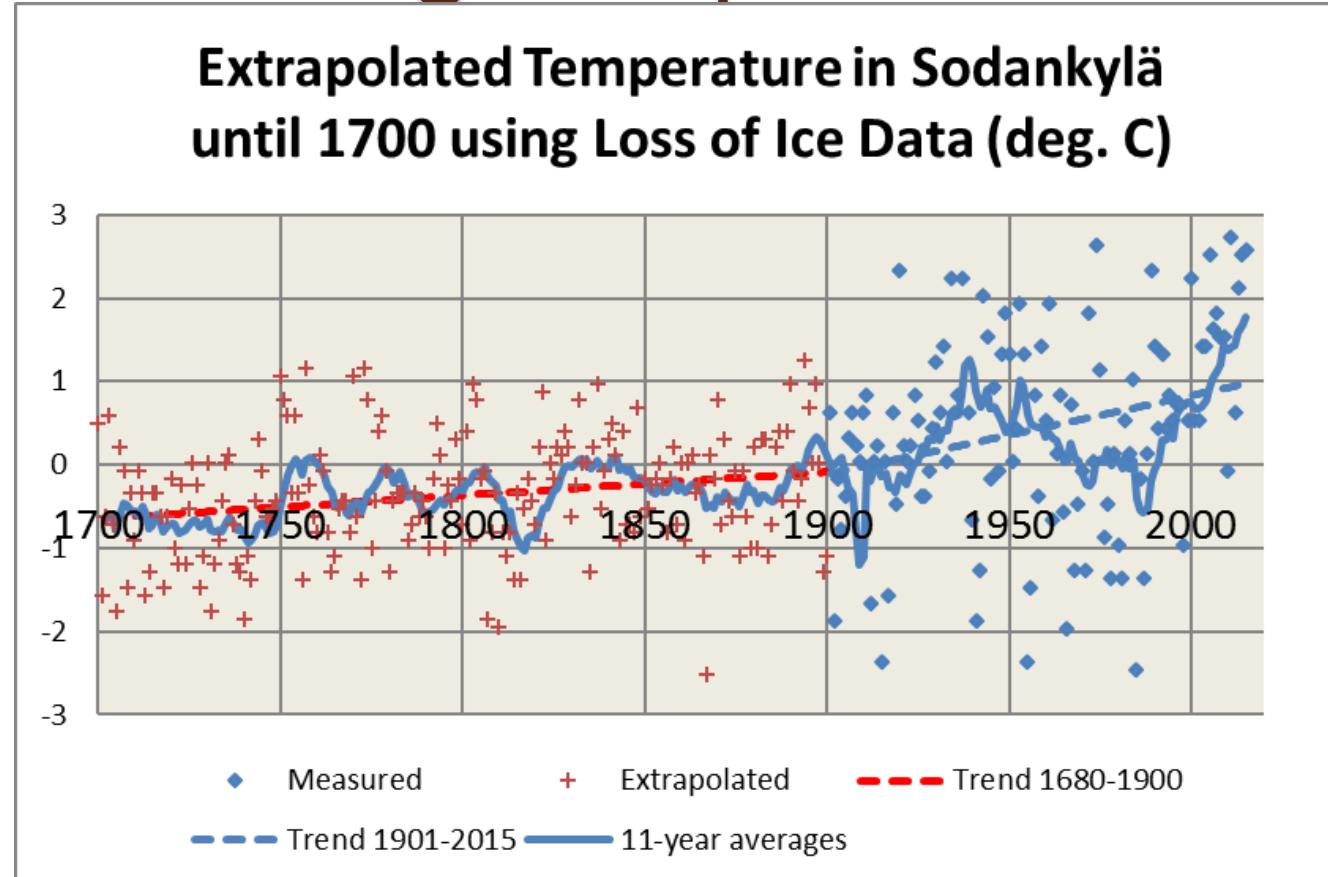
Longest time series, which is a practical measure of temperature

# Temperature and Release of Ice



Change of 30 days corresponds to 2.8 deg. C

# Temperature in Sodankylä 1700 – 1900 using extrapolated data



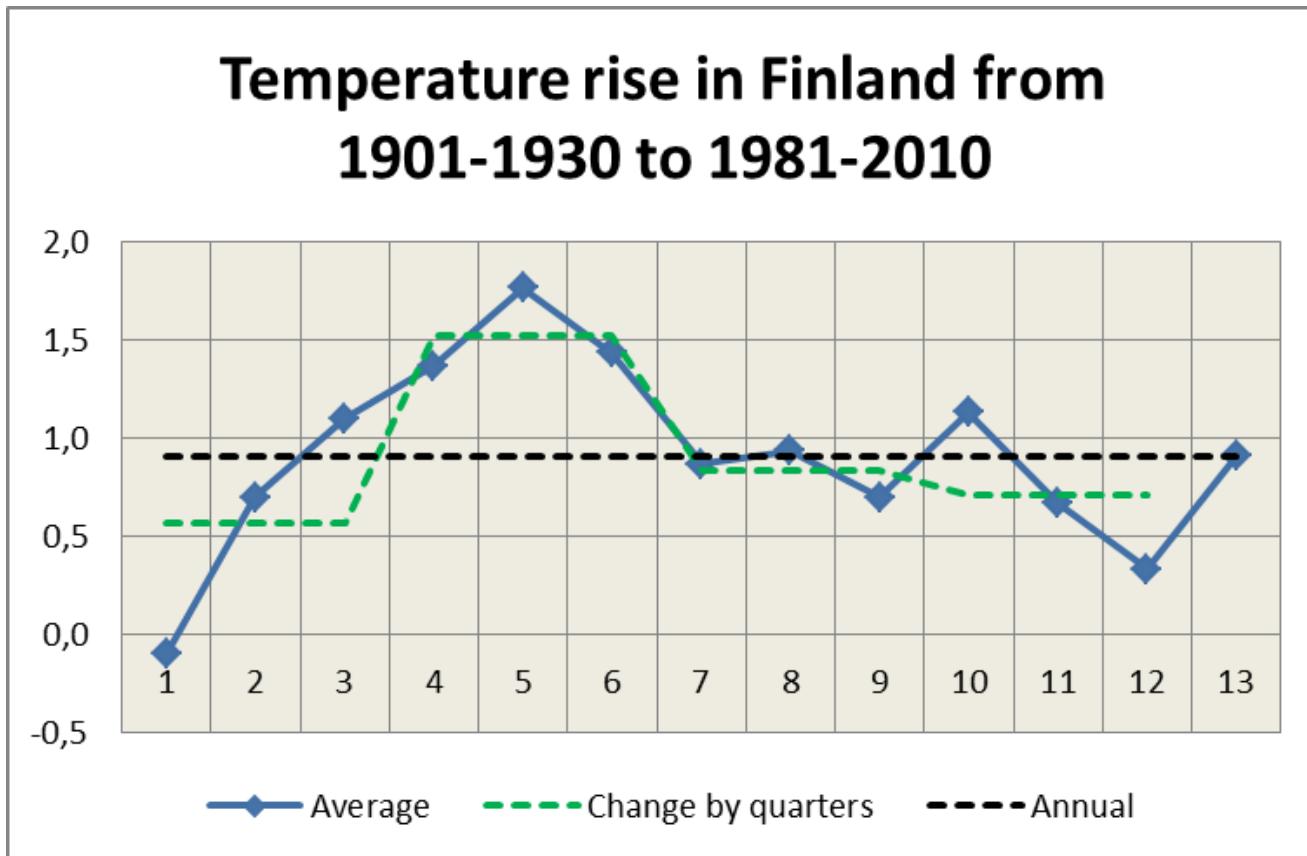
Temperature has been rising from the year 1700 continuously.  
Rising has been about 0.7 deg. C in 200 years from 1700 to 1900

# Temperature rise in Finland using 30-year average data has been 0.91

Years 1901-1930	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Helsinki	-5,5	-5,8	-2,7	2,2	8,2	13,0	16,8	15,0	10,6	5,3	0,5	-3,4	4,57
Tampere	-6,7	-7,2	-3,4	2,1	8,6	13,5	16,9	14,4	9,8	4,2	-0,9	-4,9	3,93
Maarianhamina	-2,4	-3,4	-1,6	2,2	7,0	11,7	15,6	14,8	10,5	6,1	2,0	-0,9	5,18
Oulu	-9,0	-10,0	-5,7	0,0	5,9	11,8	15,7	13,2	8,2	2,0	-3,3	-7,4	1,85
Sodankylä	-13,5	-13,8	-8,9	-2,5	4,0	10,6	13,8	10,8	5,7	-1,2	-8,0	-11,9	-1,18
Average	-8,3	-9,1	-5,4	-0,1	5,6	11,4	15,0	12,9	8,1	2,3	-3,1	-6,7	1,95
Years 1981-2010	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Helsinki	-3,9	-4,7	-1,3	3,9	10,2	14,6	17,8	16,3	11,5	6,6	1,6	-2,0	5,94
Tampere	-6,4	-6,9	-2,8	3,3	9,7	14,1	16,9	15,0	9,8	4,6	-0,6	-4,5	4,41
Maarianhamina	-2,1	-3,1	-0,6	3,7	9,1	13,3	16,7	15,8	11,4	6,9	2,6	-0,4	6,16
Oulu	-9,6	-9,3	-4,8	1,4	7,8	13,5	16,5	14,1	8,9	3,3	-2,8	-7,1	2,72
Sodankylä	-13,5	-12,7	-7,5	-1,3	5,3	11,6	14,5	11,7	6,2	0,1	-7,1	-11,7	-0,30
Average	-8,4	-8,4	-4,3	1,3	7,4	12,8	15,9	13,9	8,8	3,4	-2,4	-6,4	2,86
Rise to 1981-2010	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Helsinki	1,6	1,1	1,4	1,7	2,0	1,6	1,0	1,3	0,9	1,3	1,1	1,4	1,37
Tampere	0,3	0,3	0,6	1,2	1,1	0,6	0,0	0,6	0,0	0,4	0,3	0,4	0,48
Maarianhamina	0,3	0,3	1,0	1,5	2,1	1,6	1,1	1,0	0,9	0,8	0,6	0,5	0,98
Oulu	-0,6	0,7	0,9	1,4	1,9	1,7	0,8	0,9	0,7	1,3	0,5	0,3	0,87
Sodankylä	0,0	1,1	1,4	1,2	1,3	1,0	0,7	0,9	0,5	1,3	0,9	0,2	0,87
Average	-0,1	0,7	1,1	1,4	1,8	1,4	0,9	0,9	0,7	1,1	0,7	0,3	0,91

Rise of 0.91 deg. C from years 1901-1930 to 1981-2010

# Temperature rise in Finland using 30-year average data



+ 0.91 deg. C from years 1901-1930 to 1981-2010

+ 0.5 deg. C during the first quarter, 1.5 deg. C in the second quarter

# Summary

- **GLOBAL WARMING HAS BEEN MEASURED FROM AVERAGE TEMPERATURES OF YEARS 1901 – 1930**
- **GLOBAL WARMING HAS BEEN 0.96 DEG. C IN 11-YEAR AVERAGE TEMPERATURSES**
- **AND 0.80 DEG. C IN 30-YEAR AVERAGE TEMPERATURES TO YEARS 1998-2017**
- **WARMING IN FINLAND HAS BEEN 0.91 DEG. C IN 30-Y. AVERAGE TEMPERATURES FROM 1901 - 1930 TO 1981 - 2010**

# Reference

**The book**

**“Fundamentals of Global Warming”  
can be downloaded from**

**[www.ekoenergo.fi](http://www.ekoenergo.fi)**