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# Temperature on Utö Lighthouse Island in 1883-2025, City Effect and Tree-Ring Widths – The temperature at Utö rose by 0.1°C from 1883 to 1983

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## Introduction

This article/letter to the Editors presents an alternative view to some opinions in [1]. To avoid the “city effect” [2], this study examines temperature on the Finnish lighthouse island of Utö, located far from the mainland.

## Materials and Methods

Temperature data were obtained from the Finnish Meteorological Institute (FMI) [3]. The Utö (“Parainen Utö”) series contains missing data for 9/1917–4/1918 and 1/1919–12/1920. To fill these gaps, all Utö data for 1917–1920 were replaced with adjusted “Helsinki Kaisaniemi” (“Hki”) data. First, the mean temperatures for Utö and Hki were calculated for 1911–1916 and 1921–1926, and the difference between them was determined. The Hki data were then increased by 0.839, and these adjusted values were used to replace the missing Utö data for 1917–1920 (Figure 1). Figure 1 shows Utö temperature data as 5-year means (T.5ym) with a polynomial trendline, based on data collected in 1883–2025 and analyzed for 1885–2023.

### Analysis of Figure 1

Excel gives Equation for T.5ym. (trendline). (1885-2023) = $-1{,}523E\text{-}11x^6 + 4{,}298E\text{-}09x^5 - 2{,}501E\text{-}07x^4 - 2{,}105E\text{-}05x^3 + 2{,}460E\text{-}03x^2 - 6{,}422E\text{-}02^x + 6{,}038E{+}00$. For the 1885–1960 period, the polynomial trendline shows a valley in 1902 and a peak in 1939, although both were exceeded by the values in 1885–1886. For 1961–2023, the trendline shows a valley in 1969 and a peak in 2023. In 1885–2023 trendline valley was in 1902, peak in 2023. Values of 1885–86 and all the values after 1983 exceeded the top value of 1939. The T.5ym trendline values after 2023 (2024–2025) were lower to their value in 2025. (Original T.5ym values in 2021–23 and annual T values in 2021–25 were lower than respective values in 2020). Figure 2 shows annual temperature variation on Utö island from 1883 to 1983, with linear and polynomial trendlines displayed directly in Excel and calculated from the corresponding Excel equations. According to Excel, the linear trendline equation for annual temperature from 1883 to 1983 is 0.00095x + 5.704. This indicates that the temperature rose by 0.1°C during the 100-year period, from mid-1883 to mid-1983, based on monthly data.

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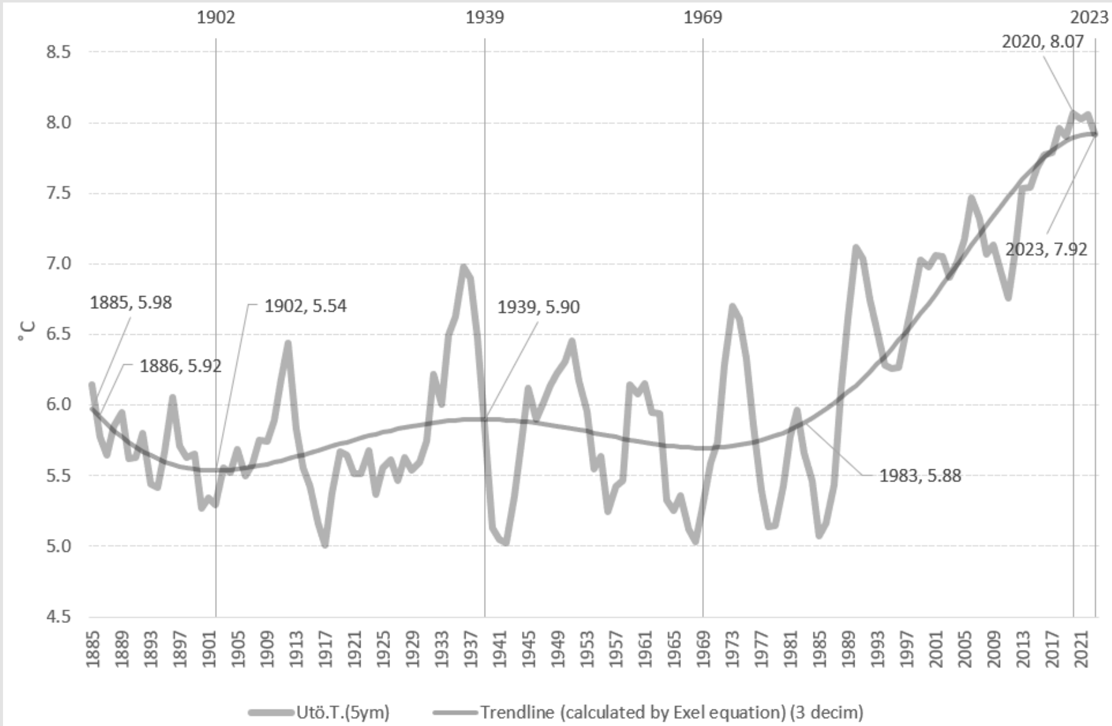


**Figure 1:** Temperature on Utö (lighthouse island) in 1885-2023, by 5-year means, with polynomic trendline, its equation, valleys and tops.

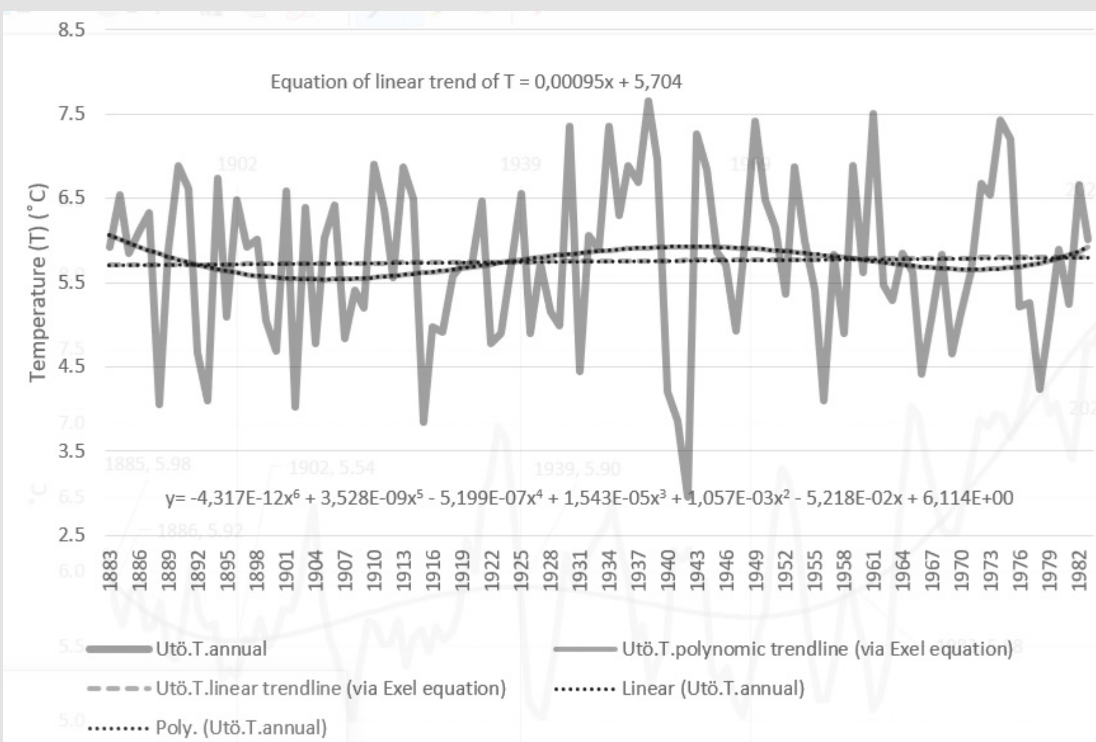


**Figure 2:** Annual Temperature in Utö (a ligthhouse island) in 1883-1983, with linear et polynomic trendlines and equations.

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### Equation for Polynomic Trendline

Figure 2 shows annual data for 1883–1983, along with linear and polynomial trendlines and their equations. Figure 3 shows these trendlines separately, with labels. The polynomial trendline equation is -4.317E- $12x^6$ + 3,528E-09x5 - 5,199E-$07x^4$ + 1,543E-$05x^3$ + 1,057E-$03x^2$ - 5,218E-02x + 6.114 and the linear trendline equation is 0.00095x + 5.704. The polynomial trendline formed valleys in 1905 (1902, Figure 1) and 1971 (1969, Figure 1), a peak in 1942 (1939, Figure 1). Values of 1863–65 and after 1983 exceeded the peak value of 1942. The pulsation (wave-like behavior) of temperature by waves of +0.27 – -0.53 degrees (C) per 22 – 37 years, are remarkably higher to the increasing linear trend of 0.1 degrees (C) per one hundred years (Table 1).

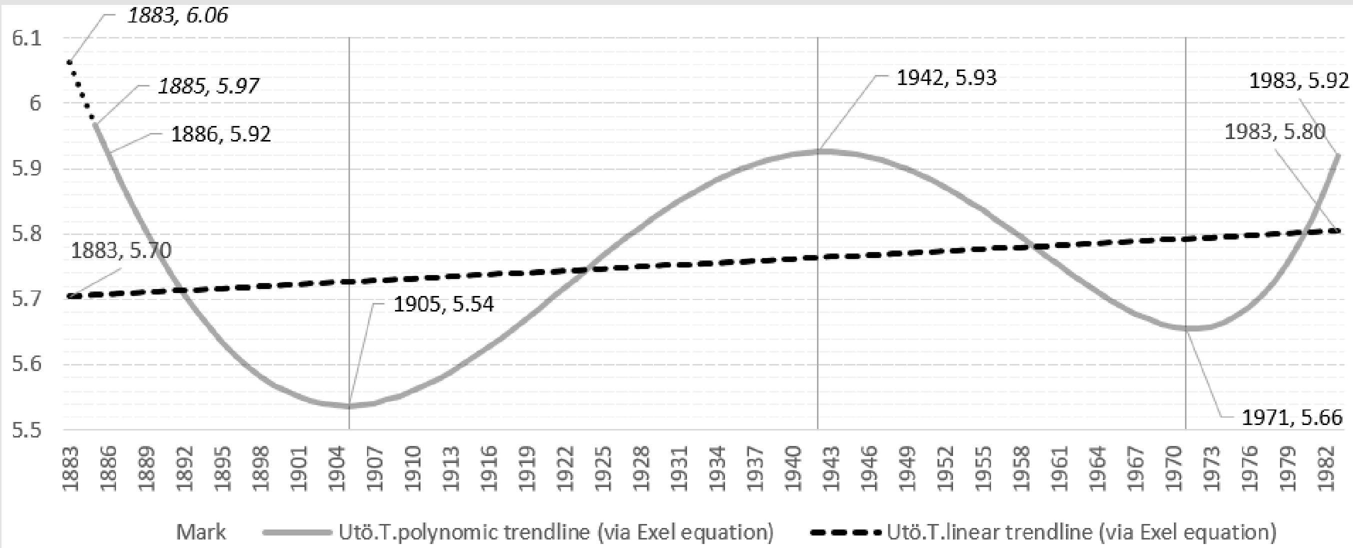


**Figure 3:** Linear and polynomic trendlines and equations of annual temperature in Utö, (1883-1983).

**Table 1:** Changes in the development of the polynomic trendline of temperature in Utö, (1883–1983).

| | | | | | | Difference (Δ) | | |
|---|---|---|---|---|---|---|---|---|
| Period | | | | | | 1883-1905 | 1905-42 | 1942-71 |
| | Peak | Valley | Peak | Valley | Direction | down | up | down |
| | 1883 | 1905 | 1942 | 1971 | | 22 | 37 | 29 |
| Temperature (C) | 6,06 | 5,54 | 5,93 | 5,66 | | -0,53 | 0,39 | -0,27 |
| | | | | | Δ per 100 yrs (C) | -2,4 | 1,0 | -0,9 |

### Temperature at "Helsinki Kaisaniemi" with the Approximated "City Effect" Reduced

In 1883-1983 the annual temperature of "Helsinki Kaisaniemi" (Hki) increased according to linear equation of Excel (0,01025x + 4,45406) 1.025% annually, slightly more than one degree (C) in hundred years. The difference between Helsinki and Utö is demonstrated by reducing annual temperature values of Helsinki by their difference in linear coefficients: 0,01025x – 0,00095x = 0,0093x. The result was labeled by [Hki.T.adj.polyn] (Figure 4). Determination (, definition) and reduction of the observed city effect on temperature in Figure 4, need much discussion (and other examples). Especially the cooling effect (phenomenon) in 1942–71 (Figure 3) cannot be explained by $CO_2$ ("excessive insulation" of the globe) nor by "city effect" (excessive production of energy or excessive transformation of radiation energy to warmth) but can be seen as a harmonious natural part of the FTPC (Finnish timberline pine chronology) rhythm [4,5], as represented in figures 7 & 8 of [4].

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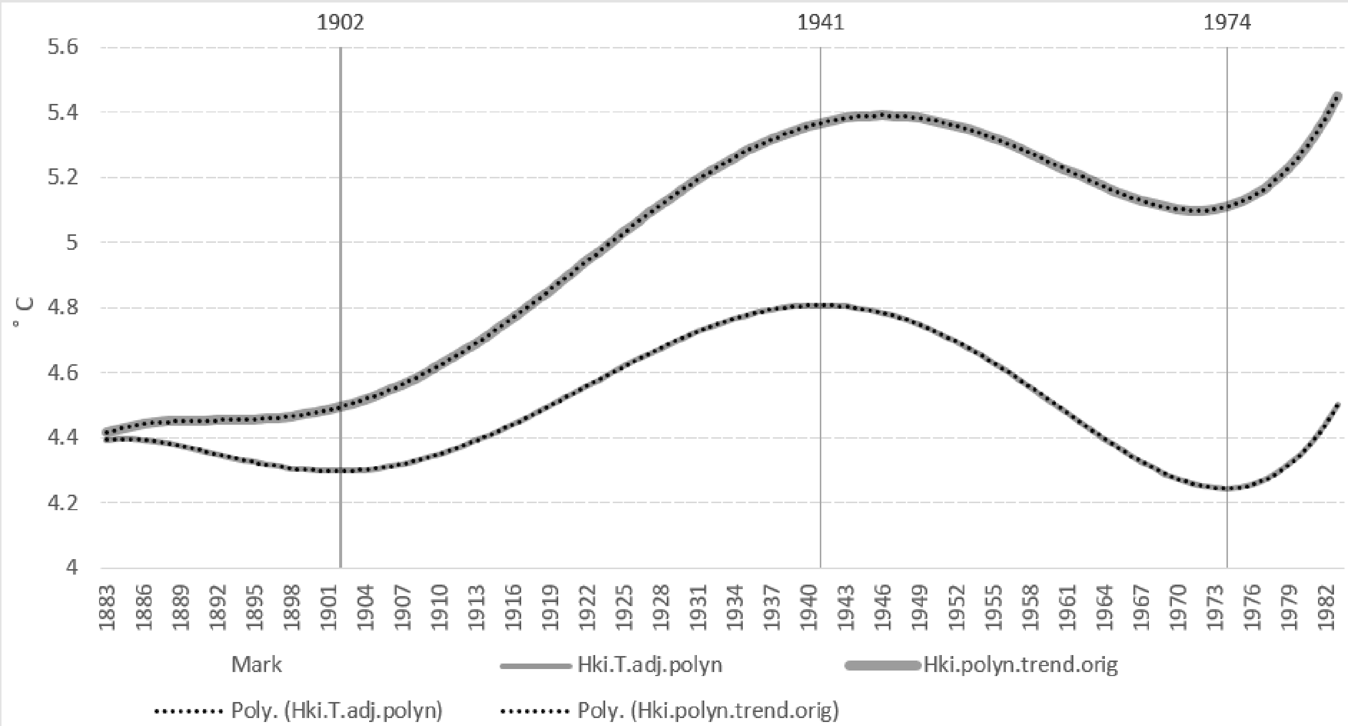


**Figure 4:** Variation of trendlines of annual Temperature of Helsinki, original and reduced by estimated city effect in 1883 – 1983.

## Results Condensed

1) Figure 3 shows an estimate of the basic speed of global warming in Utö (1883-1983), without the city effects [2] (0.1 degrees (C) per 100 years) and without the factors, which cause the oscillation (wave-like) phenomena on temperature.
2) The wave-like variation of temperature (seen in polynomic trendlines) is best seen during 1883–1983. The waves exclude remarkable influence of cumulative factors (e.g. CO2) [1].
3) The temperature variation in Figures 1-4 is in accordance with the variation of tree-ring in figures 7 and 8 of [4]. These suggest similarly on the beginning of a new natural cooling period.
4) The cyclicity of temperature is associated partially with the function of the sun [4].
5) The polynomic models of the development of temperature (Figures 1-4) suggest that the last warming period began at about 1970 (earlier than approximated by linear models).

## Conclusion

Neither atmospheric insulation nor excessive (appropriate or inconspicuous) heating can account for the wave-like fluctuations in global temperature. These fluctuations resemble seasonal cycles. The warming effect of atmospheric insulation seems to be minor compared to heating. U-235 is not recyclable. A combination of local solutions may help moderate these global temperature variations. This wave theory may be confirmed within the next few years.

## References

1. https://www.ipcc.ch/synthesis-report/.
2. (2022) European Commission. Joint Research Centre > Home, JRC news and updates, Cities are often 10-15 °C hotter than their rural surroundings, News article.
3. Finnish Meteorological Institute > Statistics > Download observations > Choose parameters > Weather observations > Momentary observations > Monthly observations > Monthly mean temperature > Chose time period > (e.g. 01/01/1883 – 09/04/2026) > Select observation station > ("Parainen Utö)" and separately ("Helsinki Kaisaniemi").
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