

IPCC 2021 – Comparing Arctic and Global temperatures – using Excel

According to the IPCC report for Policymakers “*It is very likely that the Arctic has warmed at more than twice the global rate over the past 50 years*”¹.

You are going to test this statement to see if it is true.

Resources

Arctic and global temperatures data < <https://www.metlink.org/wp-content/uploads/2022/01/Arctic-and-global-temperatures-data.xlsx>> spreadsheet

Tutorial: **Using Formula in Excel** < <https://youtu.be/45rtoi4SspQ>>

Tutorial: **Creating Line Graphs in Excel** < <https://youtu.be/iNvr8A2pJbY>>

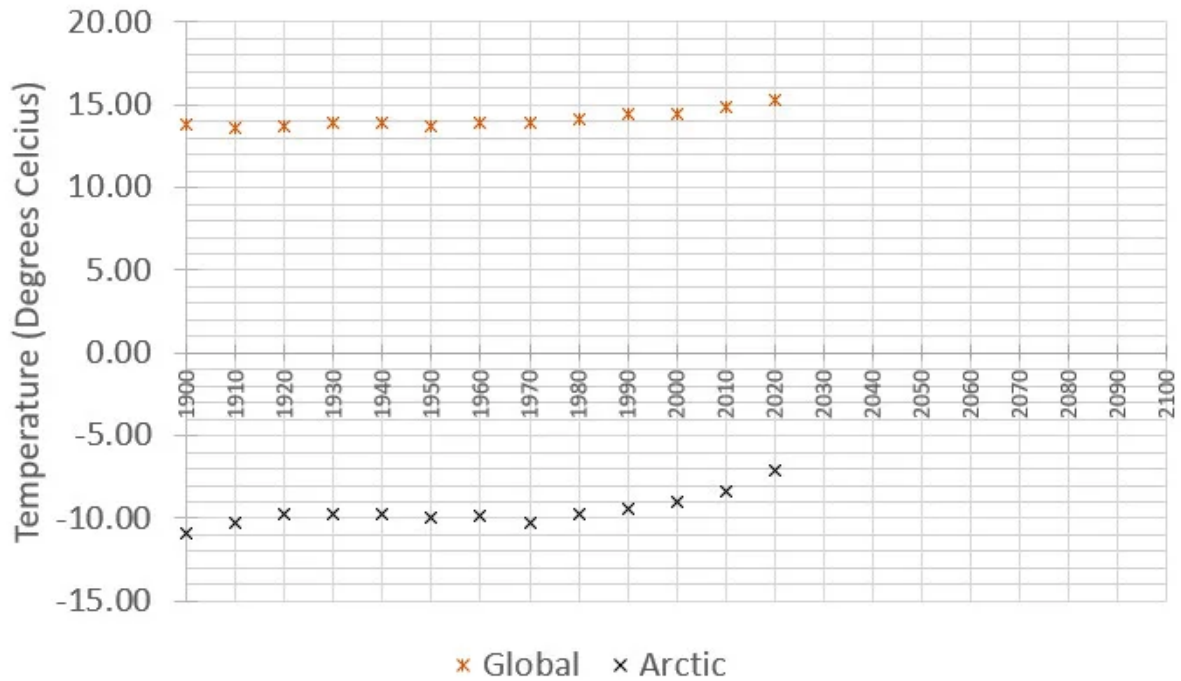
Calendar Year	Global	Arctic
1900-09	13.60	-10.56
1910-19	13.63	-10.59
1920-29	13.75	-9.94
1930-39	13.89	-9.55
1940-49	13.93	-9.63
1950-59	13.86	-9.92
1960-69	13.87	-10.16
1970-79	13.88	-10.14
1980-89	14.14	-9.72
1990-99	14.39	-9.38
2000-10	14.71	-8.70
2010-20	14.98	-8.02
Mean (all values added together/number of values)		
Median (the middle value when the values are placed in rank order)		
Mode (the most commonly recurring value)		
Maximum (the biggest value)		
Minimum (the smallest value)		
Change over time (Last value (2010 -20) – first value(1900-09))		

Data Source: Global and Arctic temperature time series ³

1. Contrast the results of your averages and the range for global air temperatures and those in the Arctic _____

2. Using the Change over time value in your table consider oif the statement “*It is very likely that the Arctic has warmed at more than twice the global rate over the past 50 years*” is true. _____

TITLE:



3. Complete the graph above which shows data on Global and Arctic temperature change from 1900 to 2020;

- Add a title to the graph
- Draw a curved line of best fit between the data shown for the start of each decade for the Global data
- Draw a curved line of best fit between the data shown for the start of each decade for the Arctic data
- Try to predict the future! Continue your line of best fit for both Global and Arctic lines on until 2100. To do so follow the recent tend and try to project that into the future.
- What could change the future? Think about government policies relating to climate change and the future. __

Why is the Arctic warming faster that the rest of the globe?

Place the following information into a logical sequence to explain why the Arctic is warming faster that the global average:

	Sequence point (1 to 7)
When ice melts, less sunlight is reflected (the albedo lowers) and the surface temperature increases.	
There is greater warming in the winter than in the summer and that is caused by energy transport. The seasonality of the polar warming is largely a result of energy in the atmosphere that is being transported to the poles by large weather systems and the oceans.	
Other atmospheric and oceanic processes are also at work other than albedo and positive feedback loops.	
As more ice melts, less sunlight is reflected and more absorbed, increasing temperatures further. This is known as a positive feedback loop.	
The main reason for greater polar warming can be caused by melting ice, lowering surface albedo.	
One of these other atmospheric processes is summertime changes in clouds – these reflect a lot of the Sun's light, offsetting the low surface albedo, and so it must be something else that determines the amount of warming.	
Albedo is the amount of Sun's light and heat that is reflected by the Earth's surface and back into space, rather than absorbed. The more reflective the surface – such as ice – the more energy is reflected and the cooler the temperature.	

Adapted from - [NASA - What's causing the poles to warm faster than the rest of Earth?](#)²

Sources

1. IPCC, 2021: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press. In Press. P.3461. Accessed 28th November 2021 at [Sixth Assessment Report \(ipcc.ch\)](#) < <https://www.ipcc.ch/report/ar6/wg1/>>
2. Ecochard, K., 2021. NASA – *What's causing the poles to warm faster than the rest of Earth?*. [online] Nasa.gov. Available at: <https://www.nasa.gov/topics/earth/features/warmingpoles.html> < <https://www.nasa.gov/topics/earth/features/warmingpoles.html>> Accessed 29 November 2021.
3. The annual mean global and Arctic temperature time series are provided by Dr. Muyin Wang. Values are the weighted average of all the non-missing, grid-box anomalies plus the absolute temperature. They are based on the monthly global gridded data (5×5 grid box) and the absolute temperature, that has been developed by the Climatic Research Unit ([University of East Anglia](#) < <https://gbr01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.uea.ac.uk%2F&data=04%7C01%7Csylvia.knight%40mets.org%7C601e1ee0a63>

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and NCAS < <https://gbr01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.ncas.ac.uk%2F&data=04%7C01%7Csylvia.knight%40rmets.org%7C601e1ee0a6334b35a84708d9925a460a%7C53399f52835347a4af2f041021685dde%7C0%7C0%7C637701738706980060%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzliLCJBTiI6IkhWwiLCJXVCi6Mn0%3D%7C1000&sdata=jGHGqo%2FC9p3rra%2FUU%2BTV2TEDGXbxzalIMG5wSR5HtCU%3D&reserved=0>>
) jointly with the Hadley Centre (UK Met Office < <https://gbr01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.metoffice.gov.uk%2F&data=04%7C01%7Csylvia.knight%40rmets.org%7C601e1ee0a6334b35a84708d9925a460a%7C53399f52835347a4af2f041021685dde%7C0%7C0%7C637701738706990019%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzliLCJBTiI6IkhWwiLCJXVCi6Mn0%3D%7C1000&sdata=EOubO9SOBhBtKki9uQMO2hmYb4YzLFV7MxzRGr8cWDc%3D&reserved=0>>
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Other resources based on the 2021 IPCC report
< <https://www.metlink.org/ipcc-2021-resources/>>