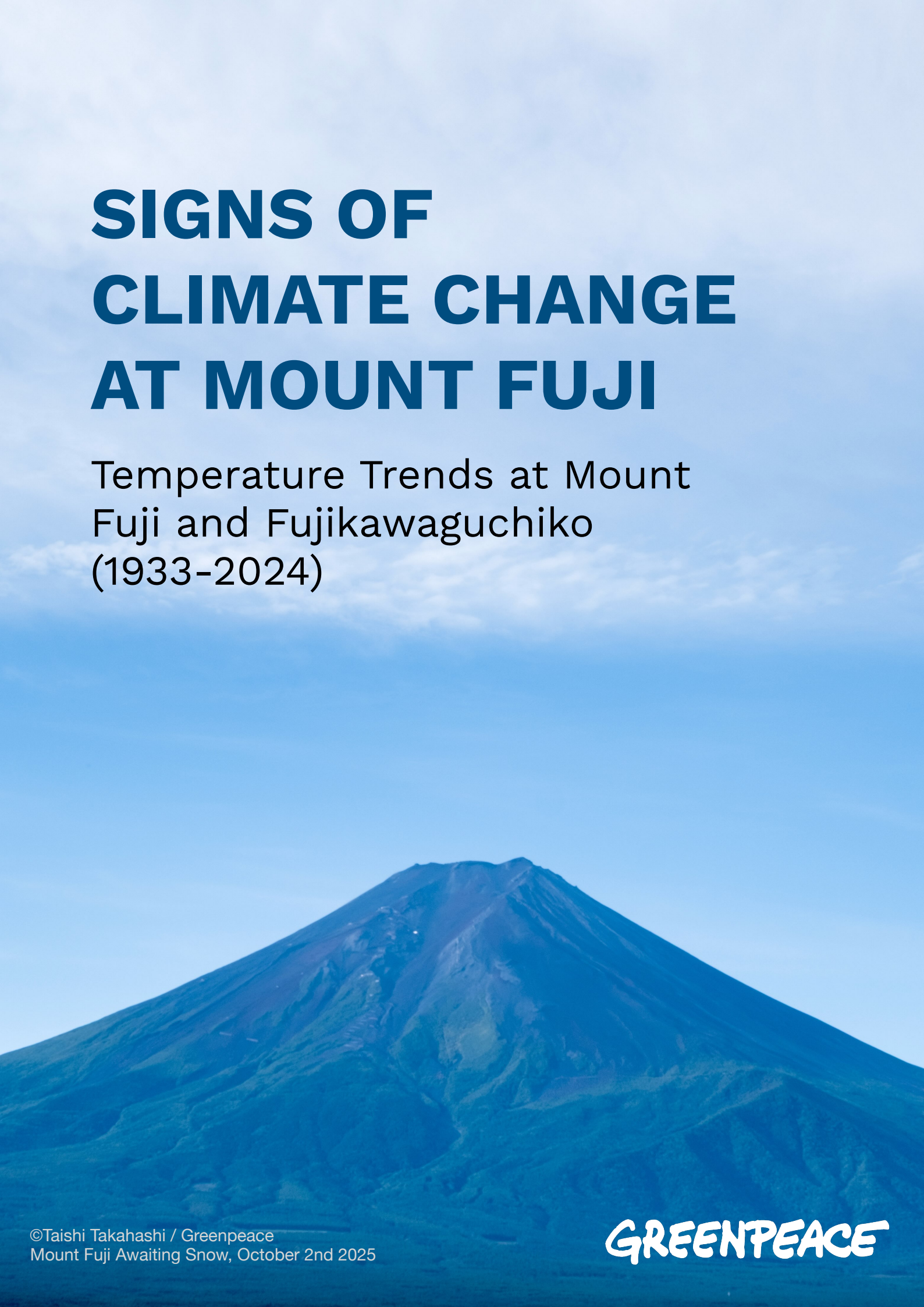
SIGNS OF CLIMATE CHANGE AT MOUNT FUJI

Temperature Trends at Mount Fuji and Fujikawaguchiko (1933-2024)



Mount Fuji Awaiting Snow, October 2nd 2025

GREENPEACE

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Executive Summary

In 2024, Mount Fuji recorded its 'first snowcap day' on November 7th, the latest date for it to be recorded since observations began in 1894[1]. According to the Kofu Regional Meteorological Observatory, the average date of the first snowcap is October 2nd[2]. This 36-day delay marks the latest appearance of Mount Fuji's snow cover in 130 years, suggesting unprecedented changes in the climate patterns around the mountain. In October of the same year, Fujikawaguchiko, a town situated at the foot of Mount Fuji, recorded its highest average temperature on record[3]. The delayed snowcap cannot be explained by rising temperatures alone, and further research is needed to clarify its link to climate change. However, it is clear that the effects of global warming are increasingly evident, even on Japan's highest peak.

Against this backdrop, this briefing paper analyses temperature trends at Mount Fuji's summit using publicly available data from the Japan Meteorological Agency (JMA) since 1933. We conclude that there is significant warming occurring at Mount Fuji's summit. The annual mean temperature is rising by 1.47°C per century, and the annual number of subzero days is decreasing by 15 days per century. Winters at the summit are warming more rapidly, with an increase of 1.70°C per century, particularly during January and February.

To provide a comparative, lower-elevation perspective, this paper also examined trends in Fujikawaguchiko, a town at the base of Mount Fuji surrounding Lake Kawaguchiko. Here, warming is even more pronounced; the annual mean temperature at Fujikawaguchiko is increasing 2.64°C per century, with a decrease of 27 subzero days per century. Notably, 2024 was the warmest year on record at both locations.

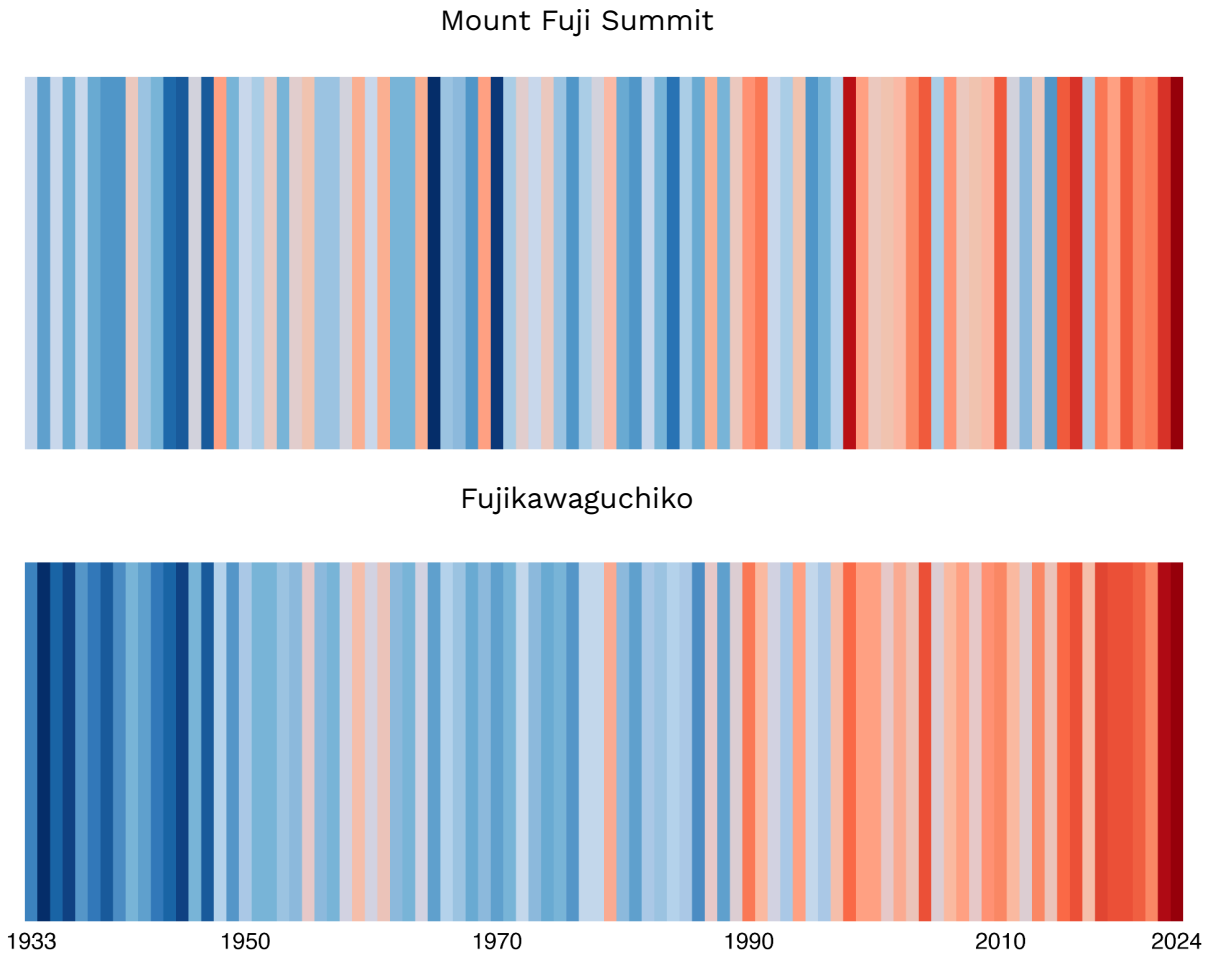
With Japan already warming faster than the global average (1.4°C per century),[4] the observed rate at Mount Fuji, approximately 1.5°C per century, is highly concerning. This accelerated warming, observed at both the summit and the base, risks (1) stressing local ecosystems, (2) disrupting downstream meltwater flows, and (3) shifting seasonal patterns.

[1] Japan Meteorological Agency (JMA), "甲府から観測した 富士山の初冠雪のお知らせ", November 8, 2024, https://www.data.jma.go.jp/kofu/image/2024/20241107_fujihatukansetu.pdf
[2] Japan Meteorological Agency (JMA), "気候・気象観測統計", Accessed September 2025, https://www.jma-net.go.jp/kofu/shosai/chousa.html
[3] Calculated from JMA "Past Weather" data (see Methodology)
[4] Ministry of Education, Culture, Sports, Science and Technology (MEXT), Climate Change in Japan 2025, March 2025: P9, https://www.data.jma.go.jp/cpdinfo/ccj/2025/pdf/cc2025_gaiyo_en.pdf

Warming stripes inspired by the original developed by Ed Hawkins[5] show mean annual temperatures spanning 92 years (1933-2024). For each year, a temperature anomaly was calculated as the difference between the annual mean temperature and the mean temperature of 1961-1990, the World Meteorological Organisation's standard reference period for long-term assessments. The intensity of each stripe's colour represents how much cooler (blue) or warmer (red) the temperature anomalies are relative to the historical baseline.

Warming Stripes for Mount Fuji's Summit and Fujikawaguchiko (1933-2024)

Annual Temperature Anomalies Relative to 1961-1990 Mean Temperature



[5] Ed Hawkins, "*#ShowYourStripes – Visualizing global warming trends*", University of Reading. Accessed September 2025 https://showyourstripes.info

Methodology

Data Sources

All data presented in this report are retrieved from the Japan Meteorological Agency (JMA) 'Past Weather' public database from 1933-2024: https://www.data.jma.go.jp/stats/etrn/index.php

Mount Fuji Weather Observatory (3775.1m above sea level; 35°21'6'' N 138°43'6" E)[6]
Fujikawaguchiko Weather observatory (859.6m above sea level; 35°30'0'' N 138°45'6" E)[7]

Data analysis

The mean annual temperatures for both locations were analysed. A centred 10-year moving average was applied, and a simple linear regression model was fitted to estimate long-term trends. The linear model was used to estimate the rate of temperature change per century, extrapolating from the available data (1933-2024), in line with JMA's description of similar data.[8]

To understand in particular how winters have changed over time, mean winter temperatures were analysed for the period 1933-2025. The results for each 'winter year' are averaged from December (of the previous year), January, and February to capture a continuous winter season; for example, the winter year 2025 includes December 2024, January 2025, and February 2025. The centred 10-year moving average and trend line were also graphed.

The mean decadal temperature for meteorological winter months (December, January, February) were also calculated using the same winter-year framework from monthly averages over successive ten-year periods, beginning with 1935–1944.

In addition, the annual number of subzero days was analysed for both locations. Days between 1933 and 2024 with a recorded minimum temperature below 0°C were classified as "subzero days." Years in which minimum temperature data were missing (1970, 2014 and 2019 for Mount Fuji) were excluded, resulting in gaps in the graph. Leap years (i.e. 1 extra winter day every 4 years) were not accounted for. As with the above data, a centred 10-year moving average and trend line were graphed.

[6] Japan Meteorological Agency (JMA), 富士山, 過去の気象データ検索, https://www.data.jma.go.jp/stats/etrn/index.php?prec_no=50&block_no=47639&year=&month=&day=&view=p1
[7] Japan Meteorological Agency (JMA), 河口湖, 過去の気象データ検索, https://www.data.jma.go.jp/stats/etrn/index.php?prec_no=49&block_no=47640&year=&month=&day=&view=p1
[8] Japan Meteorological Agency (JMA) Tokyo Regional Headquarters, 富士山の気候変化, Accessed September 2025, https://www.jma-net.go.jp/tokyo/shosai/chiiki/kikouhenka/html/fujisaweren.html

Results

1. Mount Fuji

1.1 Annual Mean Temperature

There is a long-term increase in annual mean temperature at the Mount Fuji summit. This result is consistent with warming trends seen in Japan: according to a 2023 report, JMA determined that annual mean surface temperature across the country has risen at a rate of 1.35°C per century (99% confidence level)[9]. Similarly, on the Mount Fuji summit, the rate of annual mean temperature rise is approximately 1.47°C.

Compared to the mean temperature across 1933-2024, which is -6.37°C, recent years show a trend of abnormally warm annual temperatures, illustrated by the years 2020-2024 highlighted in red. In 2024, the annual average temperature reached a record high of -4.2°C.

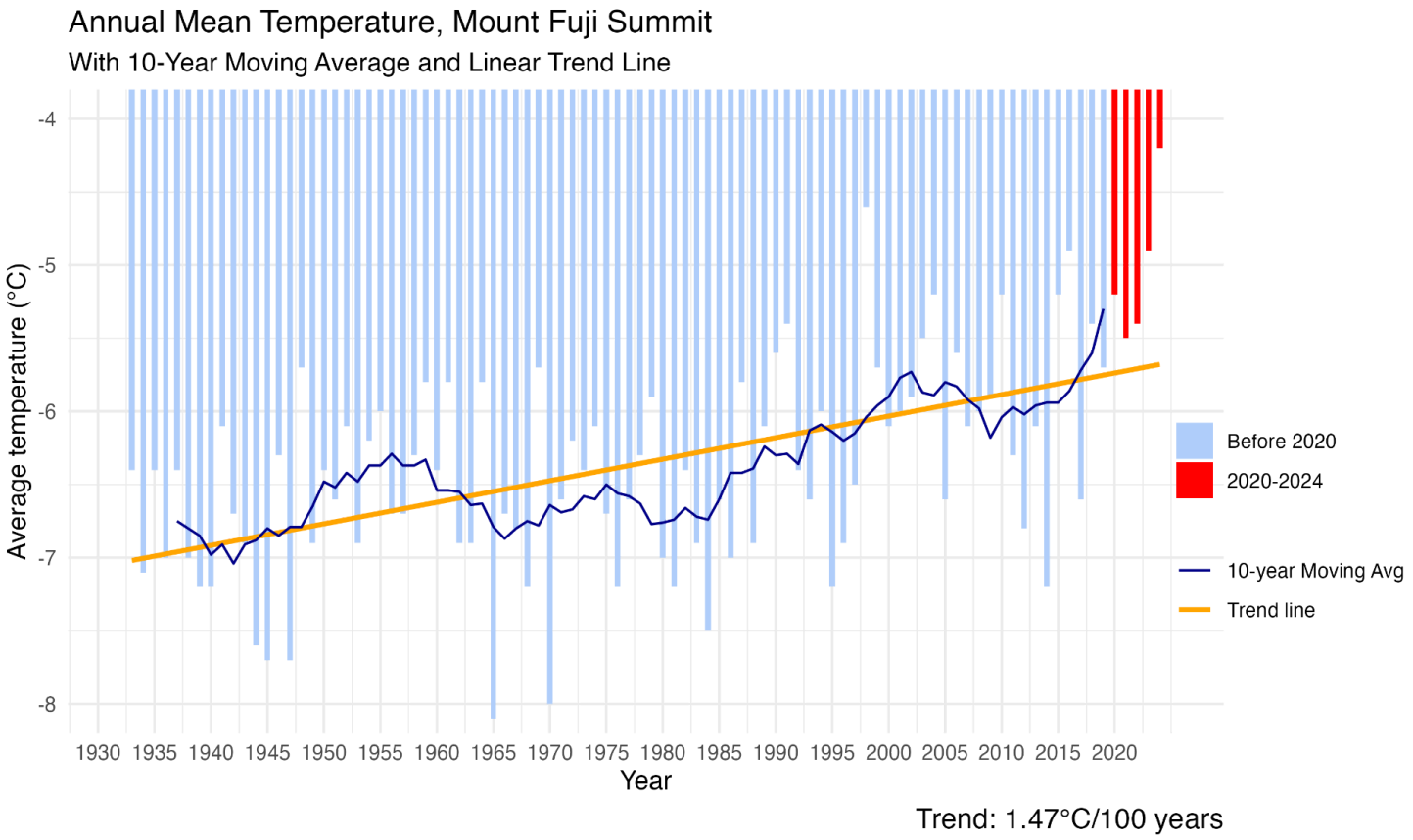


Figure 1. Annual Mean Temperature at the Mount Fuji Summit, 1933-2024

[9] Japan Meteorological Agency (JMA), Climate Change Monitoring Report 2023, June 2024: P60, https://www.jma.go.jp/jma/en/NMHS/ccmr/ccmr2023.pdf

1.2 Mean Temperature over the Winter Months

The long-term mean winter temperature at the Mount Fuji summit has been rising by 1.70°C per century (not graphed). Meanwhile, JMA published a seasonal warming rate for winter across Japan as 1.19°C per century (99% confidence level).[10]

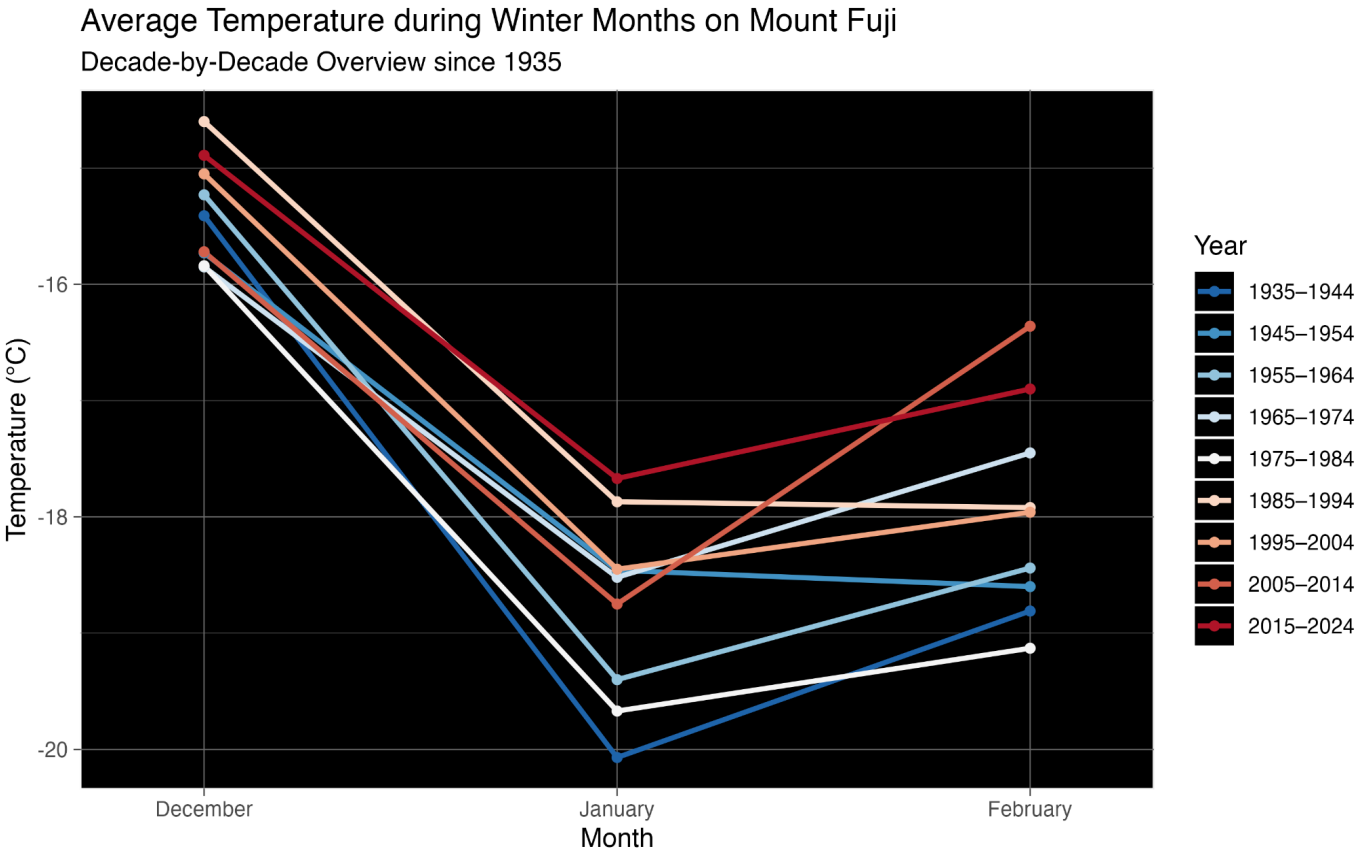


Figure 2. Mean temperatures at the Mount Fuji Summit for December, January and February, grouped by decades spanning 1935-2024

Figure 2 shows that the warming trend is most pronounced in February, followed by January. In contrast, temperatures in December remain relatively stable, with significant overlap between decades and a narrower overall range in mean decadal temperature. Over the initial ten-year period (1935-1944) and the most recent ten-year period (2015-2024), temperature increases of 2.40°C in January and 1.91°C in February were observed.

[10] Japan Meteorological Agency (JMA), Climate Change Monitoring Report 2023, June 2024: P60, https://www.jma.go.jp/jma/en/NMHS/ccmr/ccmr2023.pdf

1.3 Subzero days

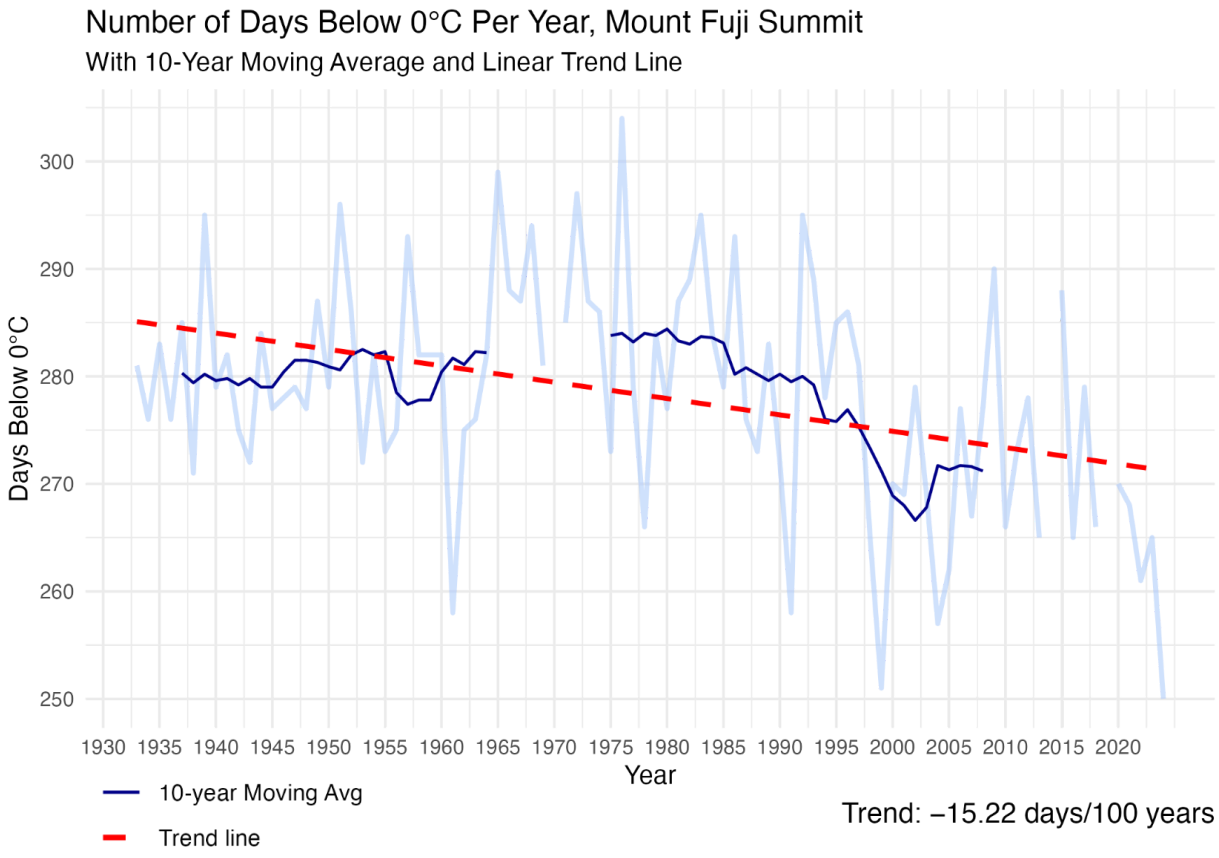


Figure 3. Number of days per year with subzero temperatures at the Mount Fuji Summit, 1933-2024

The above graph describes how many days reached temperatures below 0°C each year at the Mount Fuji summit. Despite year-to-year fluctuations, fewer days are reaching subzero temperatures, echoing graphs published by JMA[11].

In particular, 2024 stands out with the lowest count of subzero days on record (250 days). This is consistent with it being a historically warm year, as illustrated in Figure 1, with a record-high annual temperature of -4.2°C. In addition, 2024 set monthly records for the highest temperature ever observed in both September and October.

The summit experiences consistently subzero (minimum) temperatures from November through April, leaving little variation in winter conditions during these months. Year-to-year changes in the number of subzero days are most apparent during the transitional periods—particularly the onset and end of summer. Over time, there has been a noticeable decline in the number of subzero days in June, September, and October. 1999 and 2024 also shared an abnormally low number of subzero days in September (0 and 1 days, respectively).

[11] Japan Meteorological Agency (JMA) Tokyo Regional Headquarters, 富士山の気候変化, Accessed September 2025, https://www.jma-net.go.jp/tokyo/shosai/chiiki/kikouhenka/html/fujisan.html

2. Fujikawaguchiko

2.1 Annual Mean Temperature

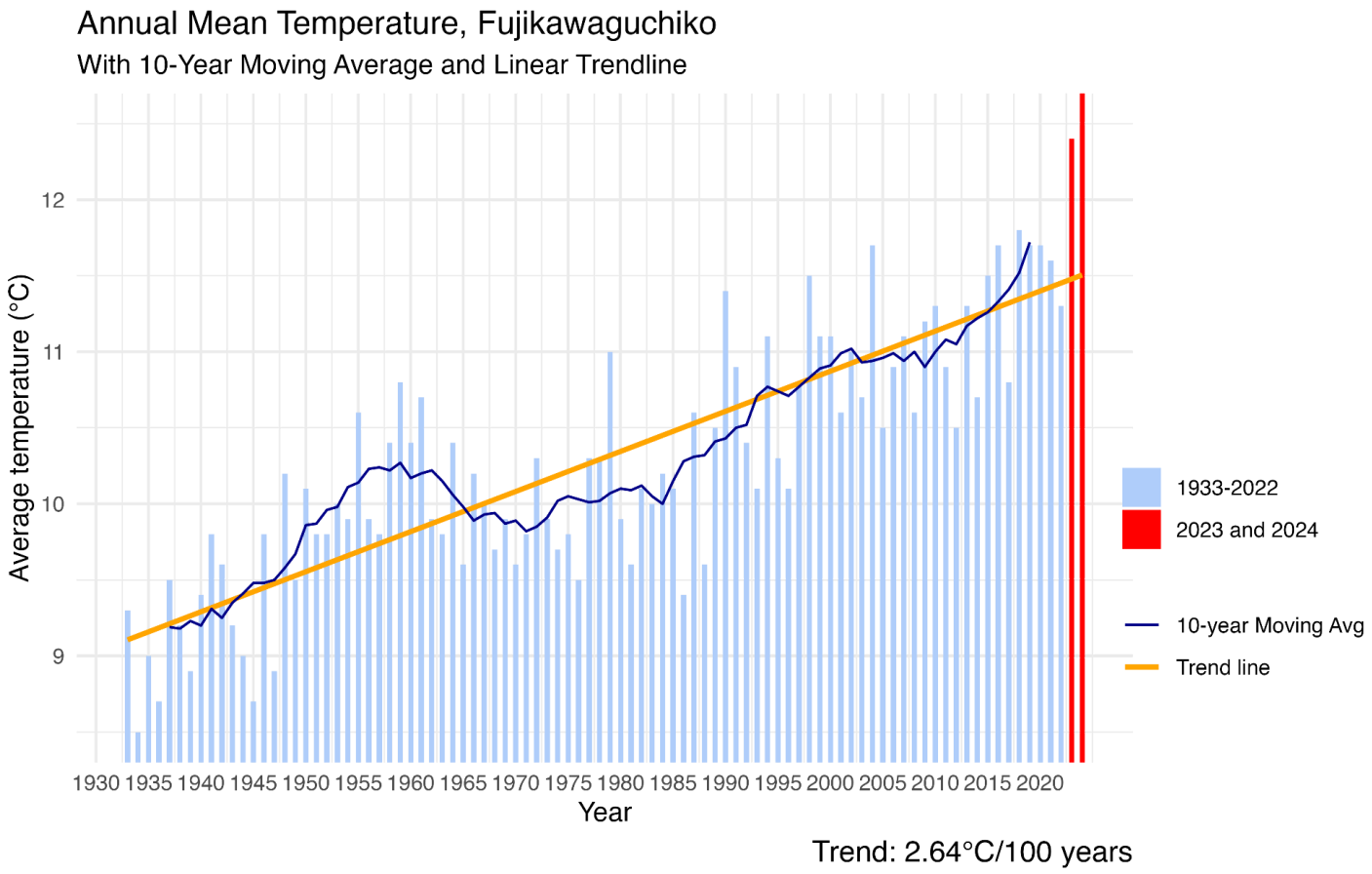


Figure 4. Annual Mean Temperature at Fujikawaguchiko Town, 1933-2024

Figure 4 shows that a warming trend is apparent at Fujikawaguchiko, with a rate of 2.64°C per century. 2023 and 2024 (indicated in red) record dramatic temperature increases of 1°C more than any preceding annual mean temperature.

While not graphed, the number of subzero days at Fujikawaguchiko was also analysed. Compared to the summit of Mount Fuji, where temperatures fall below 0°C for more than two-thirds of the year, Fujikawaguchiko experiences subzero temperatures less frequently, averaging 124 subzero days annually. However, the rate decline in subzero days is much more rapid, with nearly one month (26.74 days) lost per century.

2.2 Mean Temperature over Winter Months

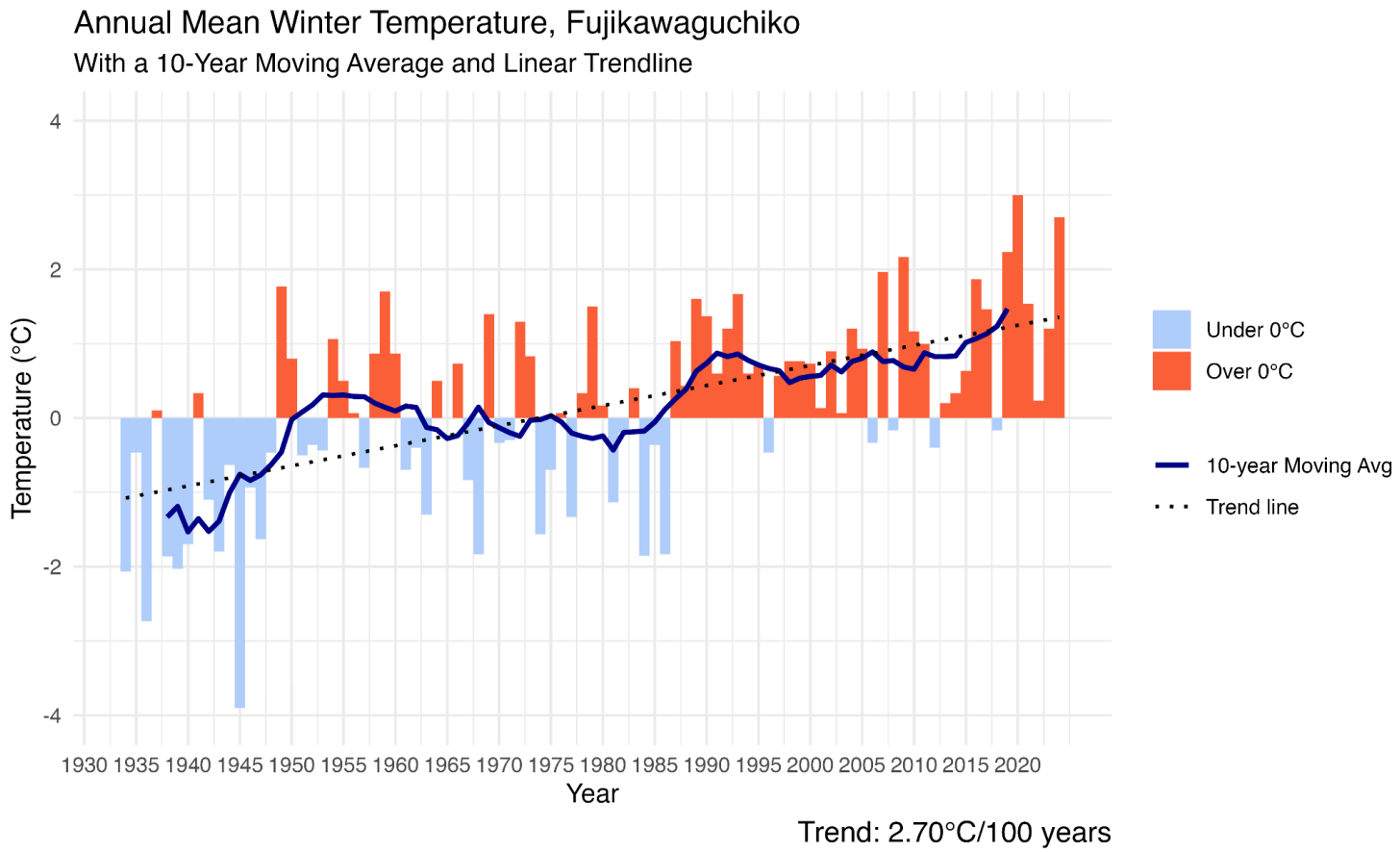


Figure 5. Annual Mean Winter Temperature at Fujikawaguchiko Town, 1933-2024

A closer look at Fujikawaguchiko in Figure 5 over winter months shows a shift to above-zero mean temperatures. While winters during 1933-1953 were predominantly characterised by mean temperatures below 0°C, winters between 1987-2024 have been almost predominantly (except for 5 years) above 0°C. This result is also captured in decade-by-decade shifts (not graphed), where 2015-2024 is the first decade with mean temperatures above 0°C for all three months. The biggest change is seen in February, where the earliest (1935-1944) and latest (2015-2024) decades differ by almost 3.5°C.

Conclusion

To summarise, the annual mean temperature at the Mount Fuji summit and in Fujikawaguchiko is rising at rates of 1.47°C and 2.64°C per century, respectively. This trend is partially explained by warming winters, with mean winter temperatures rising at rates of 1.70°C at the summit and 2.70°C in Fujikawaguchiko. As illustrated in Figure 5, winter warming at Fujikawaguchiko marks a critical transition from historically freezing conditions to mean temperatures consistently above zero. The number of subzero days is declining at both locations. At the Mount Fuji summit, the frequency of subzero days is decreasing by 15.22 days per century, while in Fujikawaguchiko, the rate is nearly double (loss of 26.74 days per century).

In particular, 2024 was an exceptionally warm year, with both locations recording their highest annual mean temperatures on record. The record-low number of subzero days and record-high temperatures observed in 2024 may have contributed to the late first snowcap day that year. The relationship between climate change and snow is highly complex, with some attribution studies showing that global warming can increase extreme snowfall events in Japan[12]. A separate analysis (not included in this briefing paper) looked at long-term trends in first snowcap days sourced from JMA[13], indicating that Mount Fuji's first snowcap is arriving about 9.91 days later per century. However, substantial interannual variability produced a weak correlation (R = 0.07), limiting confidence in this trend.

Aside from snowfall trends, there is mounting evidence to suggest that Mount Fuji is showing other aspects of warming: studies have identified an upward shift in treeline[14] and a projected upward shift of the permafrost zone[15]. At Lake Kawaguchiko, which typically freezes between January and March,[16] ice cover may become increasingly rare.

The localised changes observed around Mount Fuji reflect broader patterns of warming across Japan. For example, Greenpeace Japan has reported delayed leaf colouration in maple and gingko trees[17]. The accelerating pace of climate change extends beyond warm winters to include an increase in intense summer heat, changes in the seasons and shifts in phenological events. If warming persists, the timing and appearance of the snow-capped Mount Fuji, a national symbol of Japan, may be affected. Climate change threatens to change the landscapes that have long defined Japan..

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[12] Ministry of Education, Culture, Sports, Science and Technology (MEXT), Climate Change in Japan 2025, March 2025: P14, https://www.data.jma.go.jp/cpdinfo/ccj/2025/pdf/cc2025_gaiyo_en.pdf

[13] Japan Meteorological Agency (JMA), "富士山・甲斐駒ヶ岳の初冠雪日", November 22, 2024, https://www.data.jma.go.jp/kofu/image/chousa/hatsukansetsu2024.pdf

[14] Hitoshi Sakio and Takehiro Masuzawa, "Advancing Timberline on Mt. Fuji between 1978 and 2018, " Plants 9, no. 11 (2020): 1537, doi: 10.3390/plants9111537

[15] Atsushi Ikeda, et al., "Permafrost distribution on Mt. Fuji: A discussion," Proceedings of the General Meeting of the Association of Japanese Geographers (2013): 265-, doi: 10.14866/ajg.2013s.0_265

[16] International Lake Environment Committee Foundation (ILEC), Kawaguchi-ko, World Lake Database, accessed September 2025, https://wldb.ilec.or.jp/Display/html/3542

[17] "紅葉時期にみる気候変動の影響について" Greenpeace Japan, September 27, 2023, https://www.greenpeace.org/japan/wp/wp-content/uploads/2024/08/b9ccd35355ad76caf4325d74a528b47a-1.pdf