

Unusual weather conditions in Japan during the first half of August 2017

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<http://ds.data.jma.go.jp/tcc/tcc/index.html>

Summary

- During the first half of August 2017, the Pacific side of northern Japan¹ experienced shorter-than-normal sunshine durations and cooler-than-normal² conditions, and the Pacific side of eastern Japan also experienced shorter-than-normal sunshine durations. These unseasonable weather conditions were caused by the Okhotsk High persisting from the end of July and bringing cool and wet northeasterly airflow to the Pacific side of northern and eastern Japan.
- During the same period, warmer-than-normal conditions persisted in Okinawa/Amami in association with the North Pacific Subtropical High shifting southward of its normal position, corresponding to the Pacific-Japan (PJ) pattern with suppressed convective activity over the Philippines.

1. Climatic characteristics (Figure 1, Table 1)

In the first half of August 2017, cloudy and rainy conditions were prominent on the Pacific side of northern and eastern Japan. This led to below-normal sunshine durations in these regions and below-normal temperatures, especially in northern Japan. During the period from 1 to 16 August, the ratio of the sunshine duration to the normal averaged over the Pacific side of northern Japan was 42% (lowest all-August figure since records began in 1946: 58% (1998)), representing a significant lack of sunshine in the region. In addition, the mean temperature anomaly was -1.9°C (lowest all-August monthly mean temperature anomaly since records began in 1946: -3.6°C (1980)).

Meanwhile, warmer-than-normal conditions persisted in the area from western Japan to Okinawa/Amami during the period. The mean temperature averaged over Okinawa/Amami was $+1.5^{\circ}\text{C}$, resulting in significantly hot conditions in the region for this period (highest all-August mean temperature anomaly since records began in 1946: $+1.2^{\circ}\text{C}$ (1998)).

¹ The region names appearing here (e.g., northern Japan) refer to the areas shown on the map of Japanese archipelago on page 5.

² Climatological normals are averages for the period from 1981 to 2010. Unless otherwise noted, anomalies are deviations from normals.

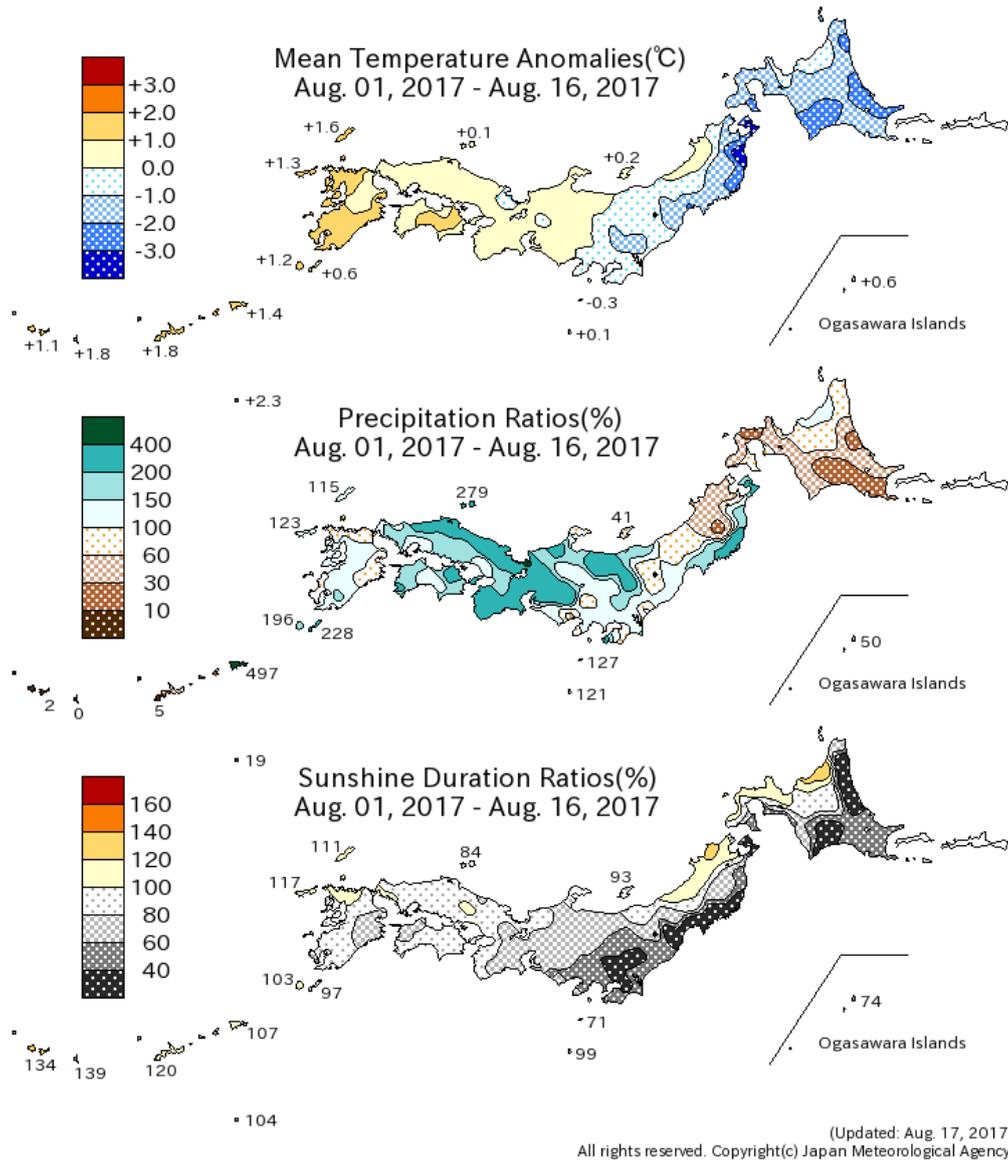


Figure 1 Mean temperature anomalies, precipitation ratios and sunshine duration ratios for the period from 1 to 16 August 2017

The base period for the normal is 1981 – 2010.

Table 1 Regional averages of mean temperature anomalies and sunshine duration ratios for the period from 1 to 16 August 2017

		Mean temperature anomaly (°C)	Sunshine duration ratio (%)
Northern Japan	Sea of Japan side	-0.8	97
	Pacific side	-1.9	42
Eastern Japan	Sea of Japan side	+0.1	84
	Pacific side	-0.2	57
Western Japan	Sea of Japan side	+0.8	91
	Pacific side	+0.8	88
Okinawa/Amami		+1.5	118

2. Characteristic atmospheric circulation causing Japan's weather conditions (Figures 2 and 3)

(1) Shorter-than-normal sunshine durations and cooler-than-normal conditions on the Pacific side of northern Japan and shorter-than-normal sunshine durations on the Pacific side of eastern Japan

The Okhotsk High, which occasionally emerges for several days near the surface over the Sea of Okhotsk (usually during summer) has persisted since the end of July, bringing cool wet northeasterly flows to the Pacific side of northern and eastern Japan. Typhoon Noru passed over and around the islands of Japan in early August, after which low-pressure systems passed repeatedly over mainland Japan in association with the southward shift of the westerly jet from its normal position and a weaker-than-normal northwestward extension of the North Pacific Subtropical High (NPSH). These atmospheric circulations increased the number of cloudy and rainy days on the Pacific side of northern and eastern Japan.

The persistence of the Okhotsk High is presumed to be mainly due to blocking-high development over the Sea of Okhotsk in association with the meandering westerly jet stream over northern Eurasia.

(2) Warmer-than-normal conditions in Okinawa/Amami

Throughout the first half of August, the NPSH did not extend to mainland Japan as usual and shifted southward of its normal position, corresponding to the Pacific-Japan (PJ) pattern (Nitta 1987; Kosaka and Nakamura 2010) with suppressed convective activity over and around the Philippines. This anomalous atmospheric circulation in the lower troposphere caused longer-than-normal sunshine durations, adiabatic heating associated with stronger-than-normal subsidence and westerly warm air inflow, thereby contributing to significantly warm conditions in Okinawa/Amami. The Tibetan High in the upper troposphere extended southward to cover Okinawa/Amami. This is also presumed to be related to the warm conditions over the area.

This NPSH enhancement is considered to have been caused by suppressed convective activity over and around the Philippines, which is likely to be associated with the intraseasonal variability of the tropical atmosphere.

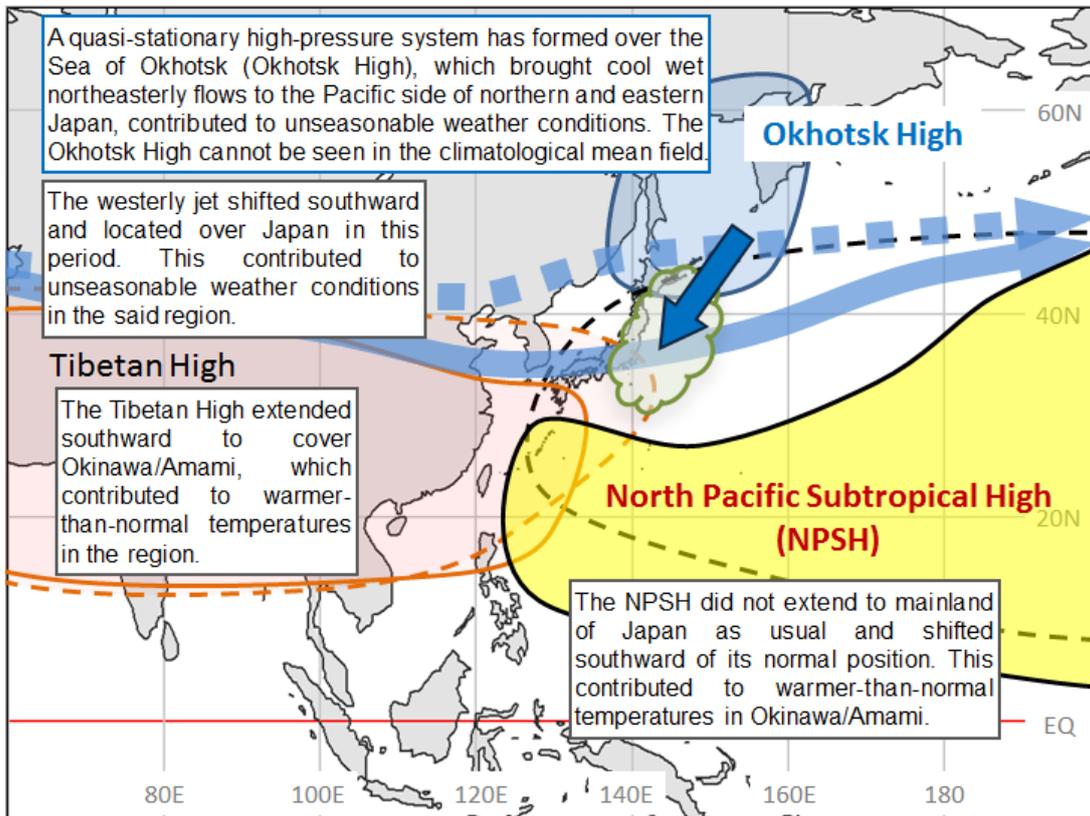


Figure 2 Primary factors contributing to the unseasonable weather conditions observed during the first half of August 2017

Solid lines show elements for 2017, and dashed lines show the normal.

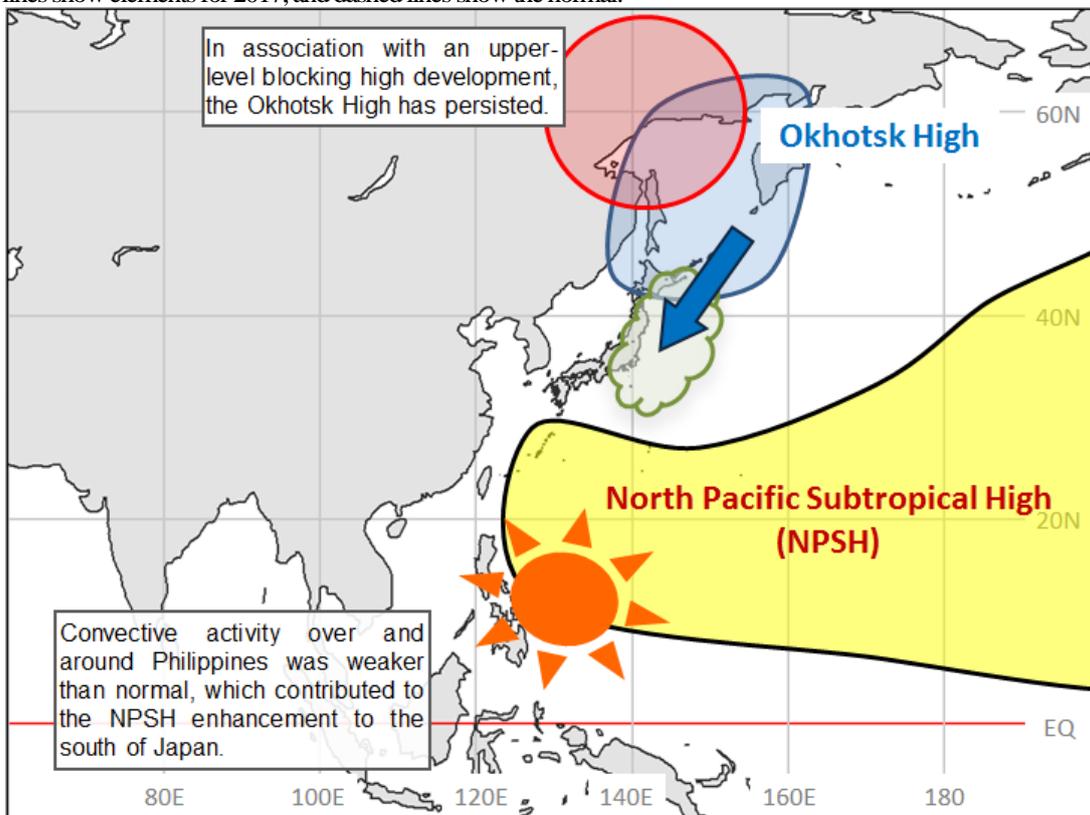


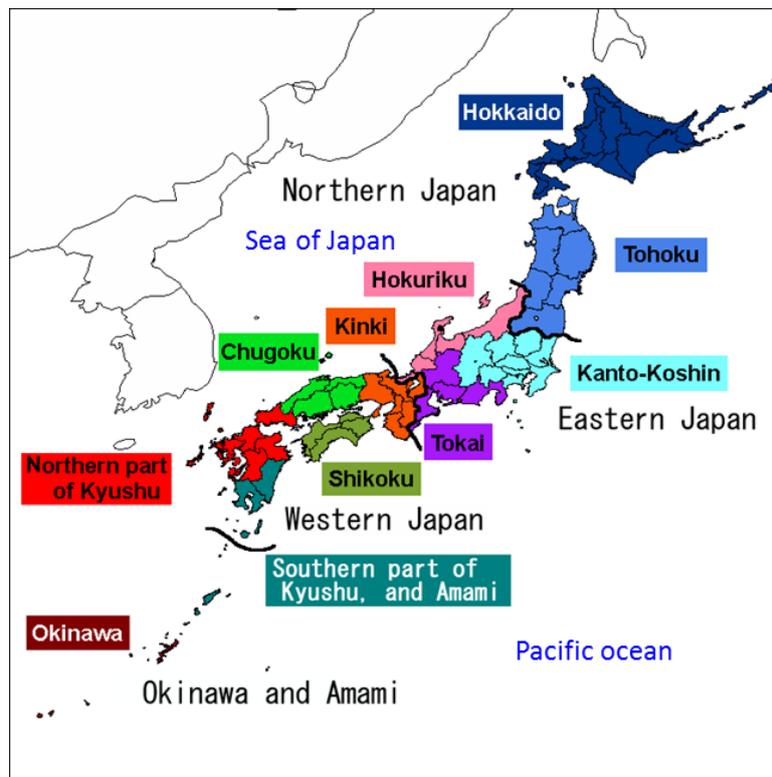
Figure 3 Primary factors contributing to the sustainment of the Okhotsk High and the strong expansion of the Pacific High to the south of Japan during the first half of August 2017

3. Outlook

Cloudy/rainy conditions are expected to persist on the Pacific side of northern and eastern Japan for the week from 17 August. Temperatures on the Pacific side of northern Japan are predicted to remain below normal during the week, though such conditions are expected to end by the last 5 days of August.

In Okinawa/Amami, sunny conditions will prevail during the week and temperatures are predicted to remain higher than normal throughout the month.

Check the latest weather forecasts and information for updates.



Climatological regions of Japan

The country has four divisions (northern, eastern, western Japan and Okinawa/Amami) and eleven subdivisions (Hokkaido, Tohoku, Kanto-koshin, Hokuriku, Tokai, Kinki, Chugoku, Shikoku, northern Kyushu, southern Kyushu and Okinawa).

References

Kosaka, Y., and H. Nakamura, 2010: Mechanisms of meridional teleconnection observed between a summer monsoon system and a subtropical anticyclone. Part I: The Pacific-Japan pattern, *J. Climate*, **23**, 5085 – 5108.

Nitta, T., 1987: Convective activities in the tropical western Pacific and their impact on the Northern Hemisphere summer circulation. *J. Meteor. Soc. Japan*, **65**, 373 – 390.