

Cold Spell in Japan from late January 2018

5 February 2017

Tokyo Climate Center, Japan Meteorological Agency
<http://ds.data.jma.go.jp/tcc/tcc/index.html>

Summary

- An extremely cold spell lasting several days hit Japan and surrounding areas around 23rd January. This was caused by the movement of a significantly cold lower-troposphere air mass over the country due to a stronger-than-normal northwesterly monsoon from eastern Siberia, where the extraordinary cold air mass accumulated in association with the meandering of the polar front jet stream over the area.
- A tendency for cold air to move over Japan and surrounding areas is expected over the next two weeks. Be sure to check the latest weather forecasts and information for updates.

1. Weather conditions

An extremely cold spell lasting several days hit Japan and surrounding areas around 23rd January. Cold air has prevailed throughout the country since then, especially in eastern and western parts. A record-low temperature of -9.8°C was observed in Saitama City just north of Tokyo.

2. Cause

The polar front jet stream over northern Eurasia exhibited clear meandering from mid-January onward (Figure 1 (a)) with southward meandering over eastern Siberia. These conditions caused extremely cold air to accumulate in the lower troposphere over eastern Siberia (Figure 2 (a)). Temperatures over this area are generally at their lowest at this time of year, but the air mass that accumulated there in January 2018 was much colder than usual. The area-averaged 850-hPa temperature over eastern Siberia in this event was significantly lower than the corresponding historical values (Figure 2 (a) and Table 1).

The mid-tropospheric trough over eastern Siberia subsequently shifted slightly eastward to cover Japan and again persisted (Figure 1 (b)). The northwesterly monsoon was enhanced (Figure 3 (b)) in association with upper-level jet meandering, which caused continuous flowing of the low-level cold air mass over Japan from eastern Siberia (Figure 2 (b)). The 850-hPa temperature over Wajima in Japan's Ishikawa Prefecture at 12 UTC on 24 January was the lowest on record for 12UTC-observation since April 1957.

3. Outlook

A tendency for cold air to move over Japan and surrounding areas is expected over the next two weeks. Heavy snow is expected along the Sea of the Japan side of the country. Be sure to check the latest weather forecasts and information for updates.

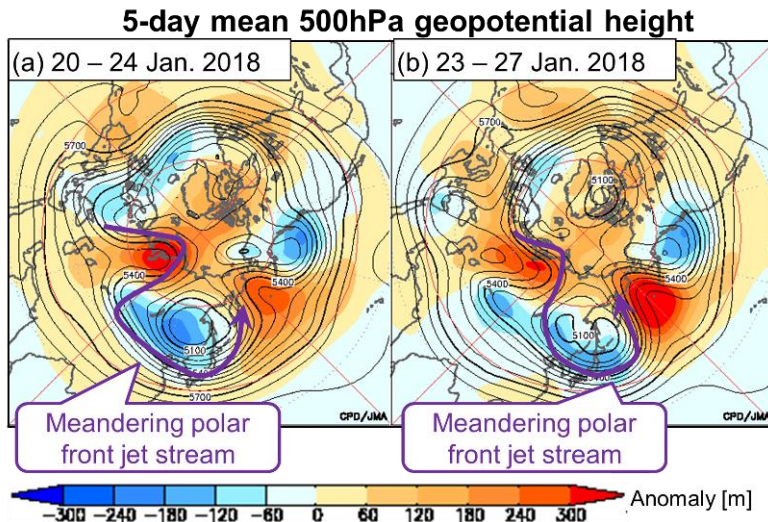


Figure 1. 5-day mean 500-hPa geopotential height [m] (contours) and anomaly (shading) ((a) 20 – 24 Jan. 2018, and (b) 23 – 27 Jan. 2018)

Contour and shading intervals are 60 m. Anomalies are deviations from the 1981 – 2010 average.

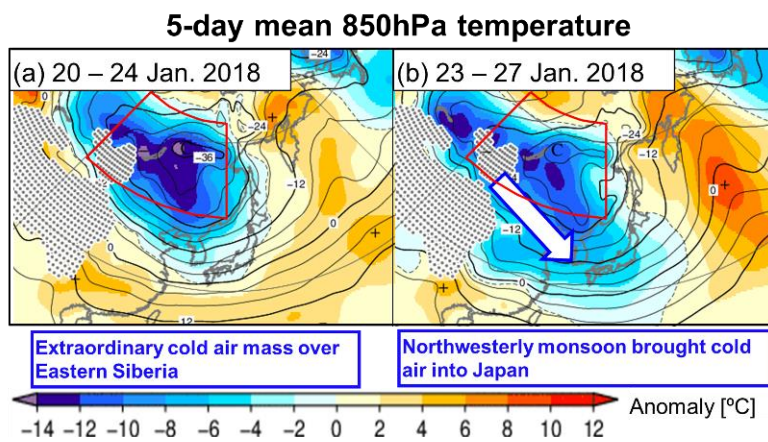


Figure 2. 5-day mean 850-hPa temperature [°C] (contours) and anomaly (shading) ((a) 20 – 24 Jan. 2018, and (b) 23 – 27 Jan. 2018)

Contour and shading intervals are 4 and 2°C, respectively. Anomalies are deviations from the 1981 – 2010 average. Red boxes indicate areas referred to in Table 1.

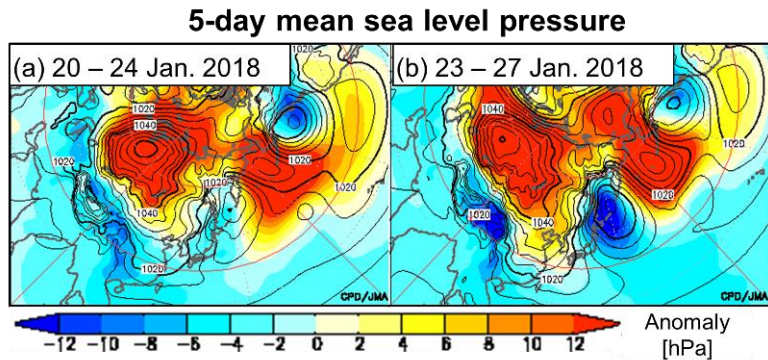
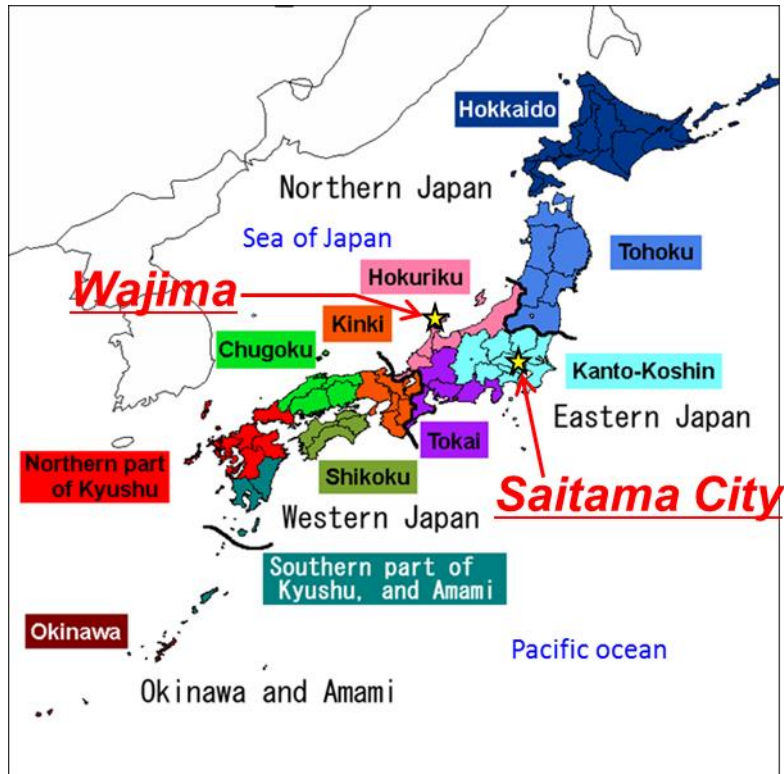


Figure 3. 5-day mean sea level pressure [hPa] (contours) and anomaly (shading) ((a) 20 – 24 Jan. 2018 and (b) 23 – 27 Jan. 2018)

Contour and shading intervals are 4 and 2 hPa, respectively. Anomalies are deviations from the 1981 – 2010 average.

Table 1. Top six coldest events of 5-day mean 850-hPa temperature averaged over eastern Siberia [45° – 65°N, 90° – 135°E] (red boxes in Figure 2). Data are based on based on JRA-55 (Kobayashi *et al.* 2015) from January 1958 onward. Anomalies are deviations from the 1981 – 2010 average.

| Rank | Period (5 days) | Mean temperature (°C) | Anomaly (°C) |
|----------|------------------------------------|-----------------------|--------------|
| 1 | 11 Feb. 1969 – 15 Feb. 1969 | -31.6 | -13.3 |
| 2 | 18 Jan. 1969 – 22 Jan. 1969 | -30.6 | -11.0 |
| 3 | 26 Jan. 1979 – 30 Jan. 1979 | -30.1 | -10.7 |
| 4 | 30 Dec. 1958 – 3 Jan. 1959 | -29.0 | -9.7 |
| 5 | 20 Jan. 2018 – 24 Jan. 2018 | -28.9 | -9.4 |
| 5 (tied) | 1 Feb. 2001 – 5 Feb. 2001 | -28.9 | -9.9 |



Locations of Wajima (Ishikawa Prefecture) and Saitama City (Saitama Prefecture) in Japan

Detailed information on regional division is provided on JMA's web site at

<http://www.data.jma.go.jp/gmd/cpd/longfct/en/tourist.html>.

References

Kobayashi, S., Y. Ota, Y. Harada, A. Ebita, M. Moriya, H. Onoda, K. Onogi, H. Kamahori, C. Kobayashi, H. Endo, K. Miyaoka and K.

Takahashi, 2015: The JRA-55 Reanalysis: General specifications and basic characteristics. *J. Meteor. Soc. Japan*, **93**, 5 – 48.

JMA website

Analysis Charts

5-day Mean Figures of Atmospheric Circulation: http://ds.data.jma.go.jp/gmd/tcc/tcc/products/clisys/figures/db_hist_pen_tcc.html

Animation Maps (Northern Hemisphere): http://ds.data.jma.go.jp/gmd/tcc/tcc/products/clisys/anim/anim_nh.html

Outlook

Monthly Outlook for Japan: http://www.jma.go.jp/en/longfct/000_1_00.html