Exercise

Analyzing past extreme climate events for your country and preparation for presentation

Analyzing procedure

Step 1 : Assess surface climate conditions and impacts.

Step 2 : Identify atmospheric circulation directly contributing to the targeted surface climate conditions.

Step 3 : Investigate the possible factors associated with the identified atmospheric circulation directly contributing to the targeted surface climate conditions.

Presentation slides

Make a presentation on findings from your exercise.

Contents:

1. Surface climate conditions
2. Characteristic atmospheric circulation
3. Factor analysis (if possible)

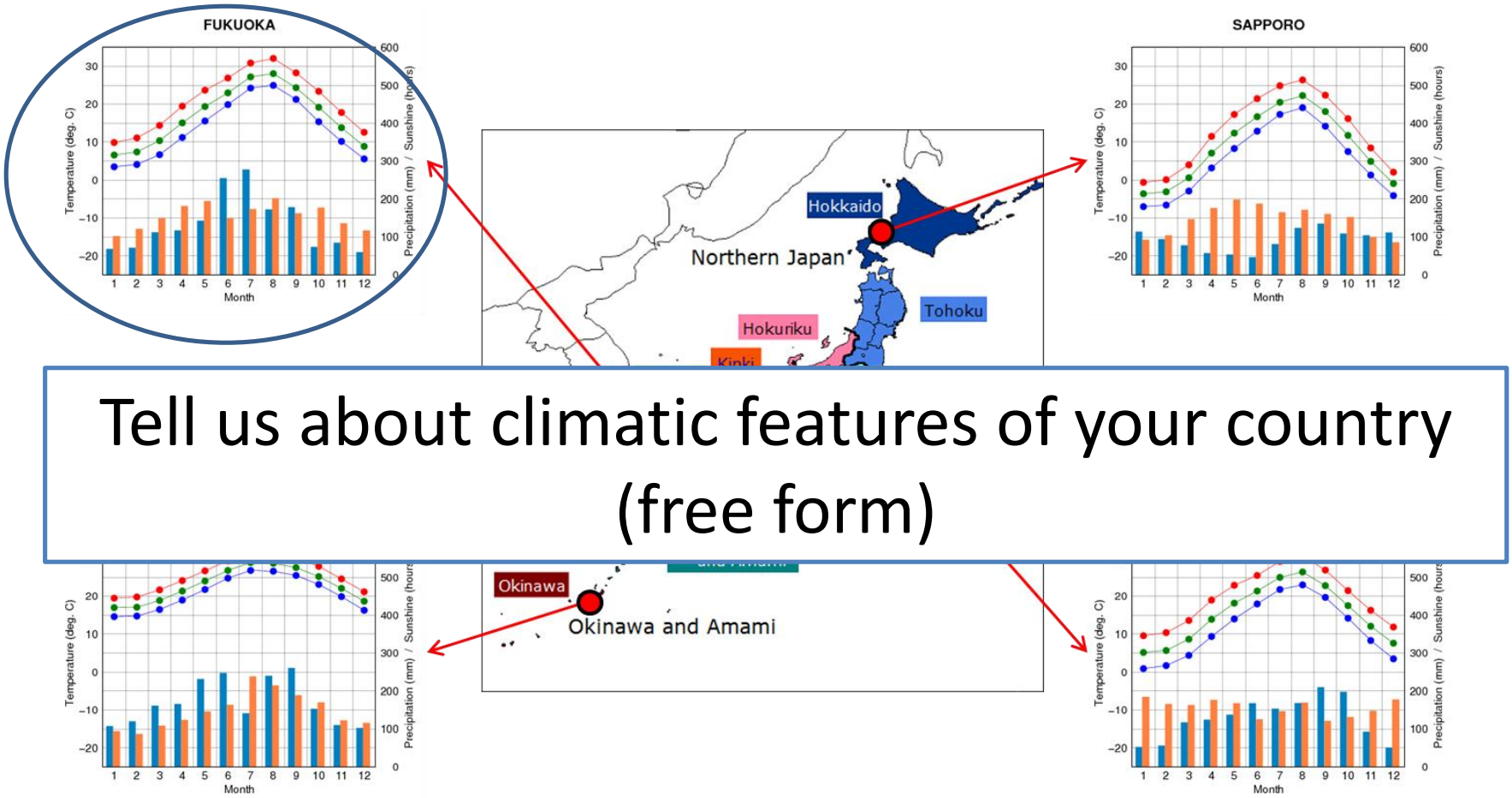
Other points:

- At the beginning of your presentation, please introduce climate features of your country.

Example:

Heatwave in Japan in boreal summer 2018

Climate of Japan

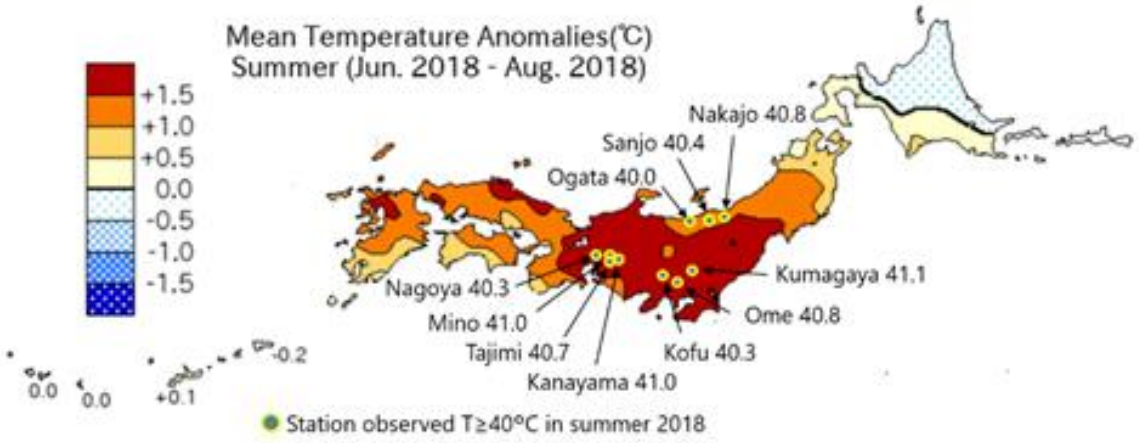


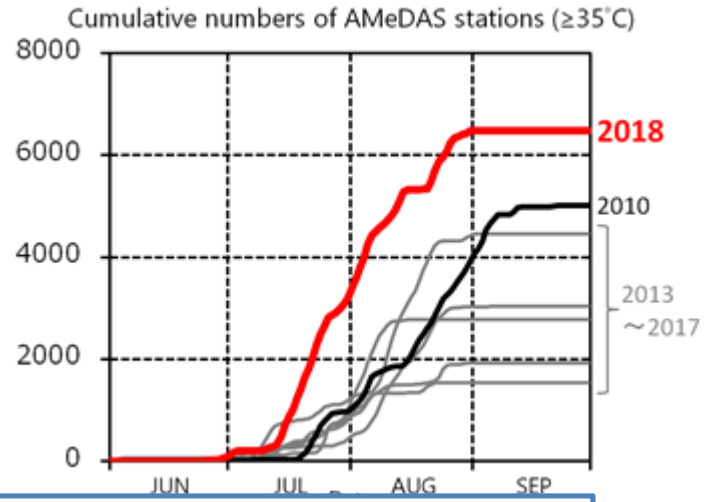
Tell us about climatic features of your country (free form)

Japan has four distinct seasons with a climate ranging from subarctic in the north to subtropical in the south.

Early summer is the rainy season, known as the Baiu. Its precipitation is caused by a stationary front, called the Baiu front. In the second half of summer, the North Pacific Subtropical High extends northwestward around Japan, bringing hot and sunny conditions to the country.

Surface climate condition in boreal summer 2018

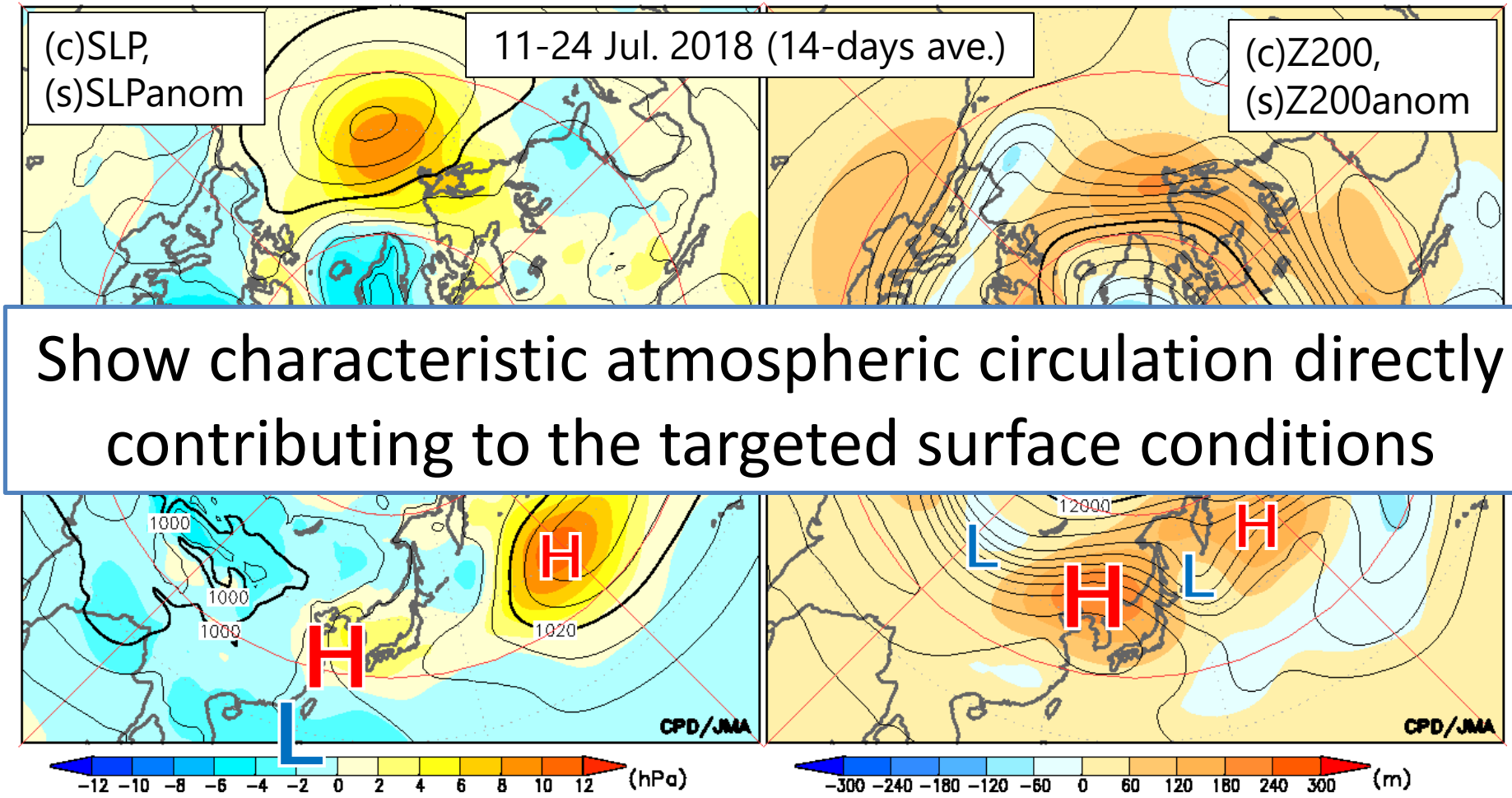




Show surface climate conditions and impacts

- The monthly mean temperature anomalies for July 2018 (+2.8°C) and JJA 2018 (+1.7°C) in eastern Japan were the highest on record for July and JJA since 1946, respectively.
- On 23rd July a new national record maximum temperature of 41.1°C was recorded at Kumagaya in Saitama Pref.
- A cumulative total of 6,483 AMeDAS stations observed daily temperatures of 35°C or higher from June to September was the highest since 1976.

Atmospheric circulation



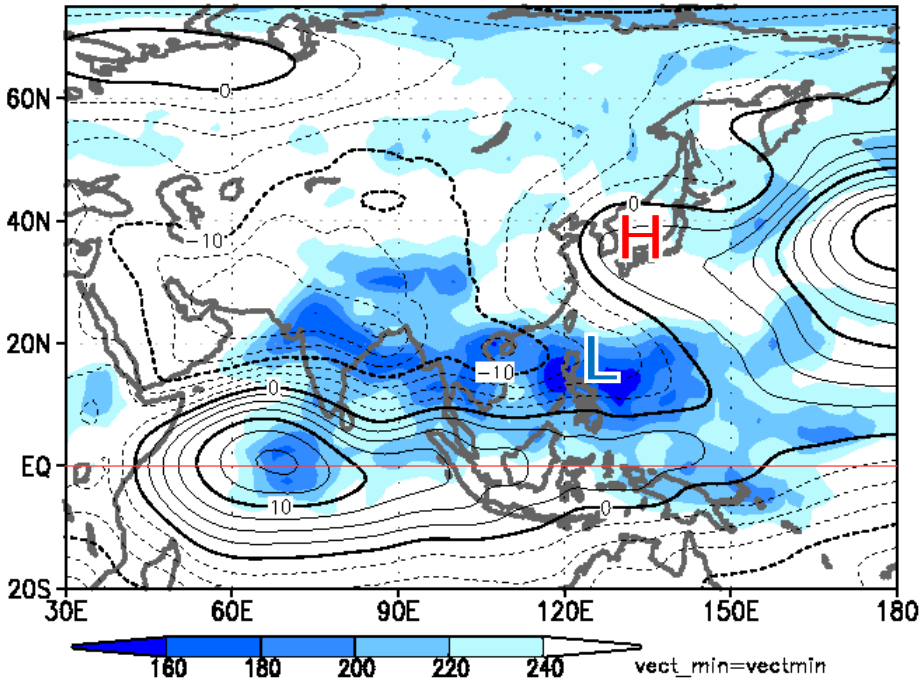
Show characteristic atmospheric circulation directly contributing to the targeted surface conditions

- Both the North Pacific Subtropical High and the Tibetan High expanded to the main islands of Japan and persisted.
- Surface temperatures in Japan increased, due mainly to high-pressure systems with warmer-than-normal air covering the islands, predominant sunny conditions and downward flow associated with the pressure systems, influenced by northward meandering of the subtropical jet stream in the vicinity of Japan.

Atmospheric circulation

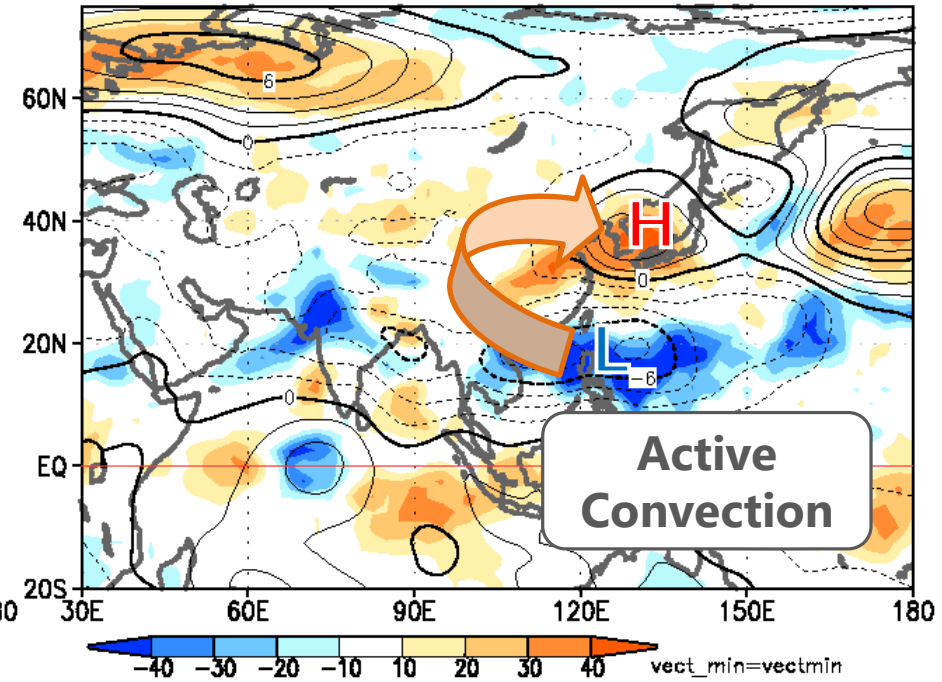
11-24 Jul. 2018(14-days ave.)

(c)PSI850 [$10^6 m^2/s$], (s)OLR [W/m^2]



<- Active convection

(c)PSI850anom [$10^6 m^2/s$], (s)OLRanom [W/m^2]



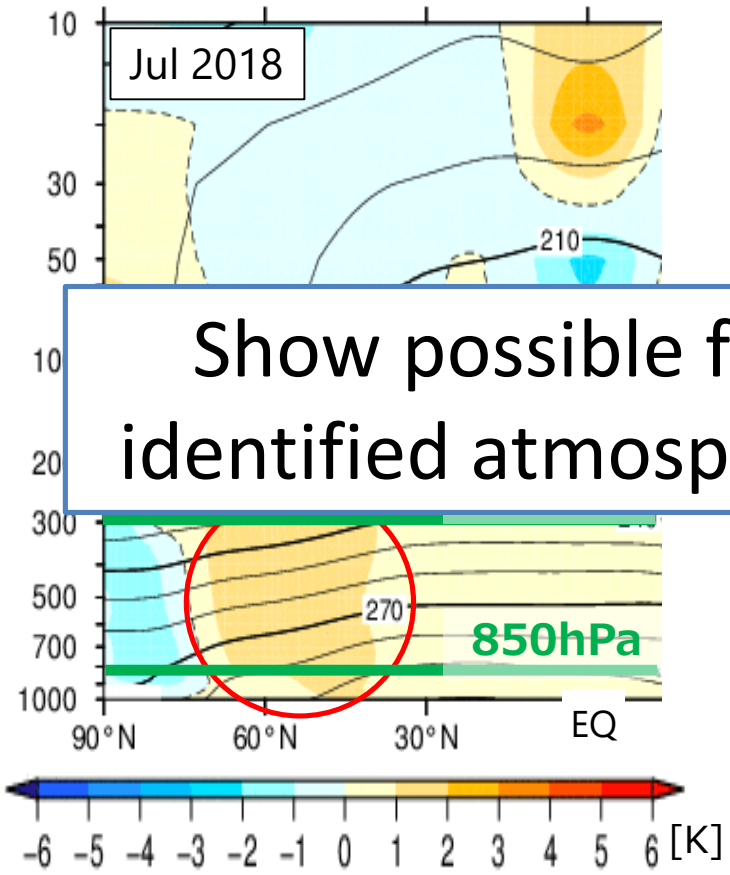
<- Active convection

Inactive -> convection

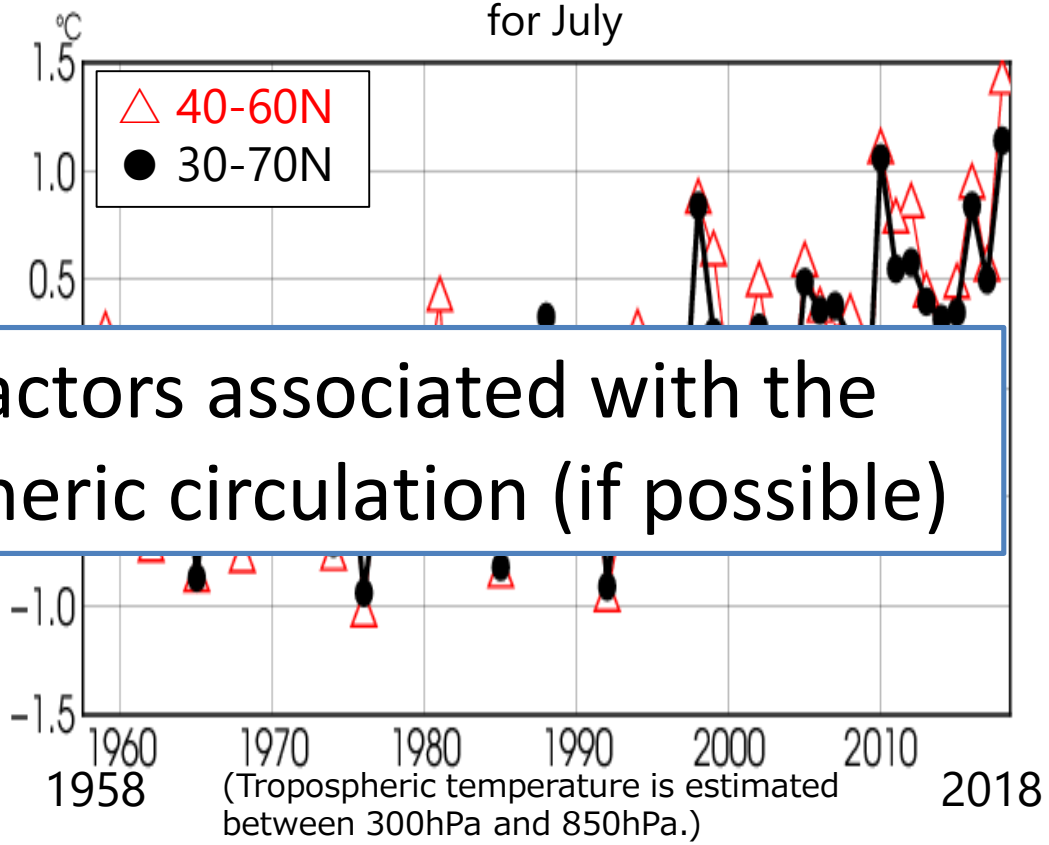
- The expansion of the North Pacific Subtropical High in the vicinity of Japan was attributable to enhanced convective activity over and around the Philippines with stronger-than-normal large-scale lower-level cyclonic circulation over the area from Southeast Asia to the Philippines (the Pacific-Japan (PJ) pattern (Nitta 1987; Kosaka and Nakamura 2010)).

Factor analysis: High temperature in NH mid-latitude

(c) Zonal mean temperature [K],
(s) Zonal mean temperature anom. [K]



Zonal mean tropospheric temperature anomaly for July



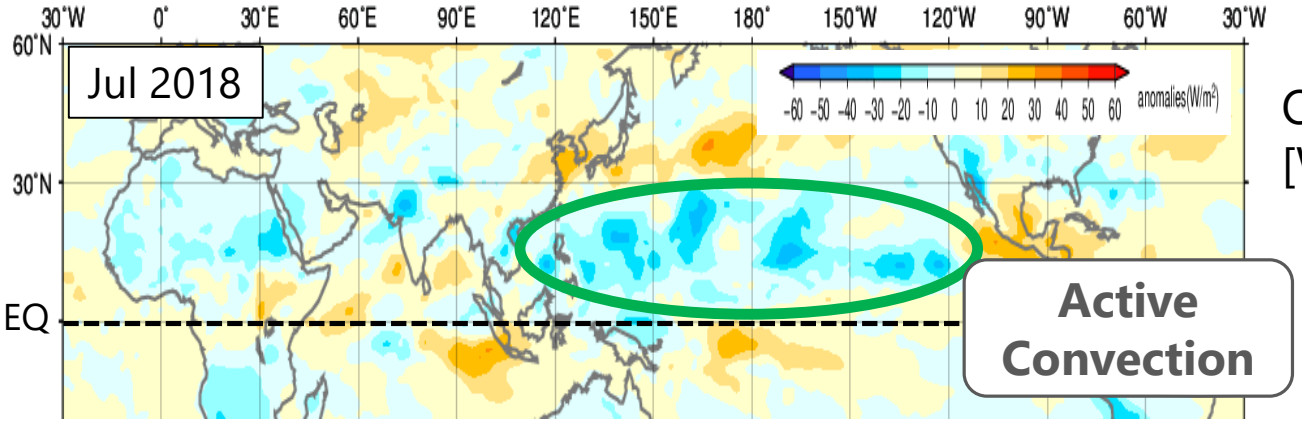
(Tropospheric temperature is estimated between 300hPa and 850hPa.)

Show possible factors associated with the identified atmospheric circulation (if possible)

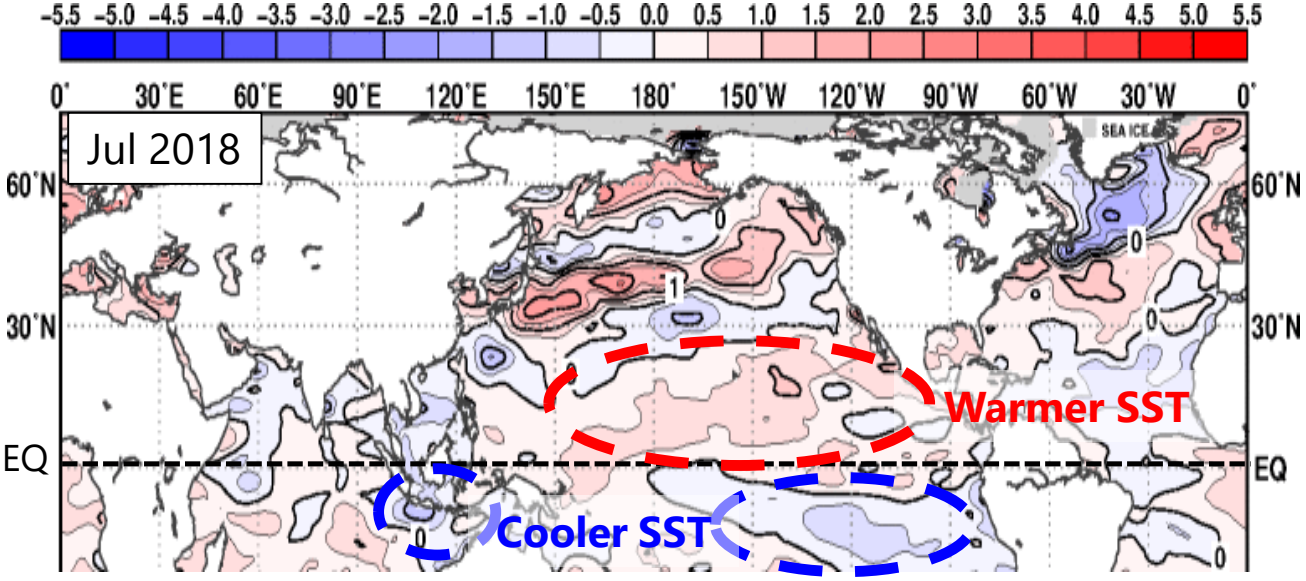
Zonally averaged tropospheric air temperatures in the mid-latitudes of the Northern Hemisphere (NH; e.g., 40 – 60°N) had been high since boreal spring 2018, and the value for July 2018 was the highest for July since 1958.

Factor analysis: High temperature in NH mid-latitude

This high temperature in the mid-latitudes of the NH was attributable to enhanced convective activity over a wide area of the NH in association with higher (lower)-than-normal SSTs over the tropics in the NH (SH).



OLR anom [W/m^2]



SST anom [°C]

Summary

- Extension of the North Pacific Subtropical High (NPSH) and the Tibetan High over Japan brought extreme high temperatures there through strengthening downward air flow and above-normal sunshine duration.
- The expansion of the Tibetan High to Japan was attributable to the [redacted] ty of Japan with varying but persistent extents.
- The expansion of the NPSH in the vicinity of Japan appears attributable to enhanced convective activity over and around the Philippines as well as the significant meandering of the subtropical jet stream.
- Zonally averaged tropospheric air temperatures in the mid-latitudes of the Northern Hemisphere were significantly higher than normal. This was attributable to enhanced convective activity over a wide area of the Northern Hemisphere.

Conclude your findings from your exercise