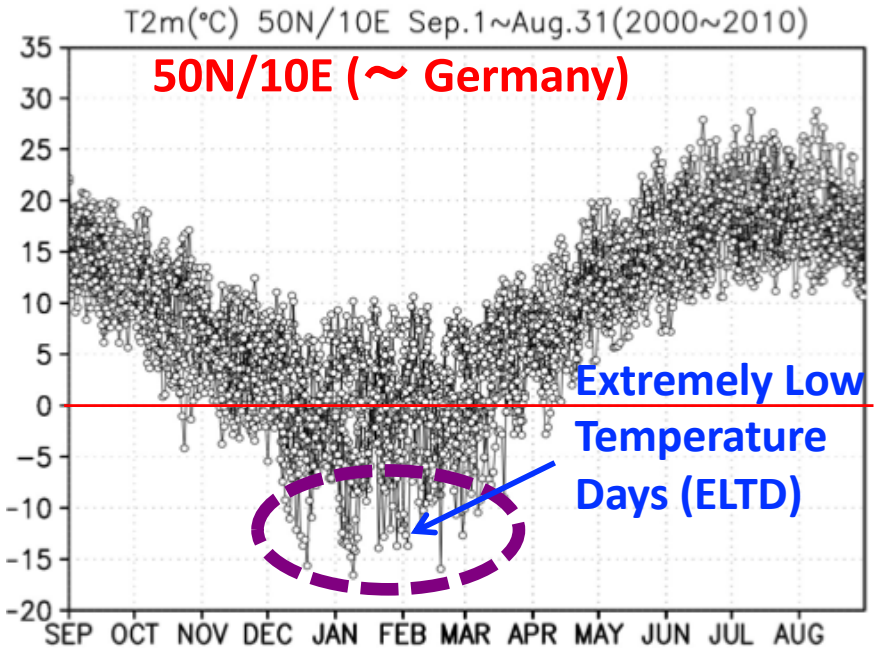
CL2.3 Synoptic Climatology Room 0.49/50 EGU22-2186 Virtual presentation (27 May 2022)

Synoptic climatological analysis on the appearance features of extremely low temperature days around Germany for 1971/72 to 2010/11 winters

Composite of Daily Sequences of Mean Surface Air Temperature (T2m)(℃) for 2000/01～2010/11 based on the NCEP/NCAR re-analyses data



"Fasnacht –In Nordtirol und Südtirol"
(by Thomas Nußbaumer (2010), *loewenzahn, Innsbruck*)

Kuranoshin Kato (1), K. Otani(2), C. Miyake (3), K. Nagayasu (4) and H. Kato (5)

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Detailed knowledge of the seasonal cycle including its variability（e.g., day-to-day, intraseasonal and interannual variations）in various regions

is the **"Common Basis"** for deeper understanding of

(1) **Seasonality** of the Climate change/ variations including the **"Extreme Meteorological or Climatological events"**

e.g., Heavy rainfalls, heavy snowfalls, extremely cold events, heat waves, etc.

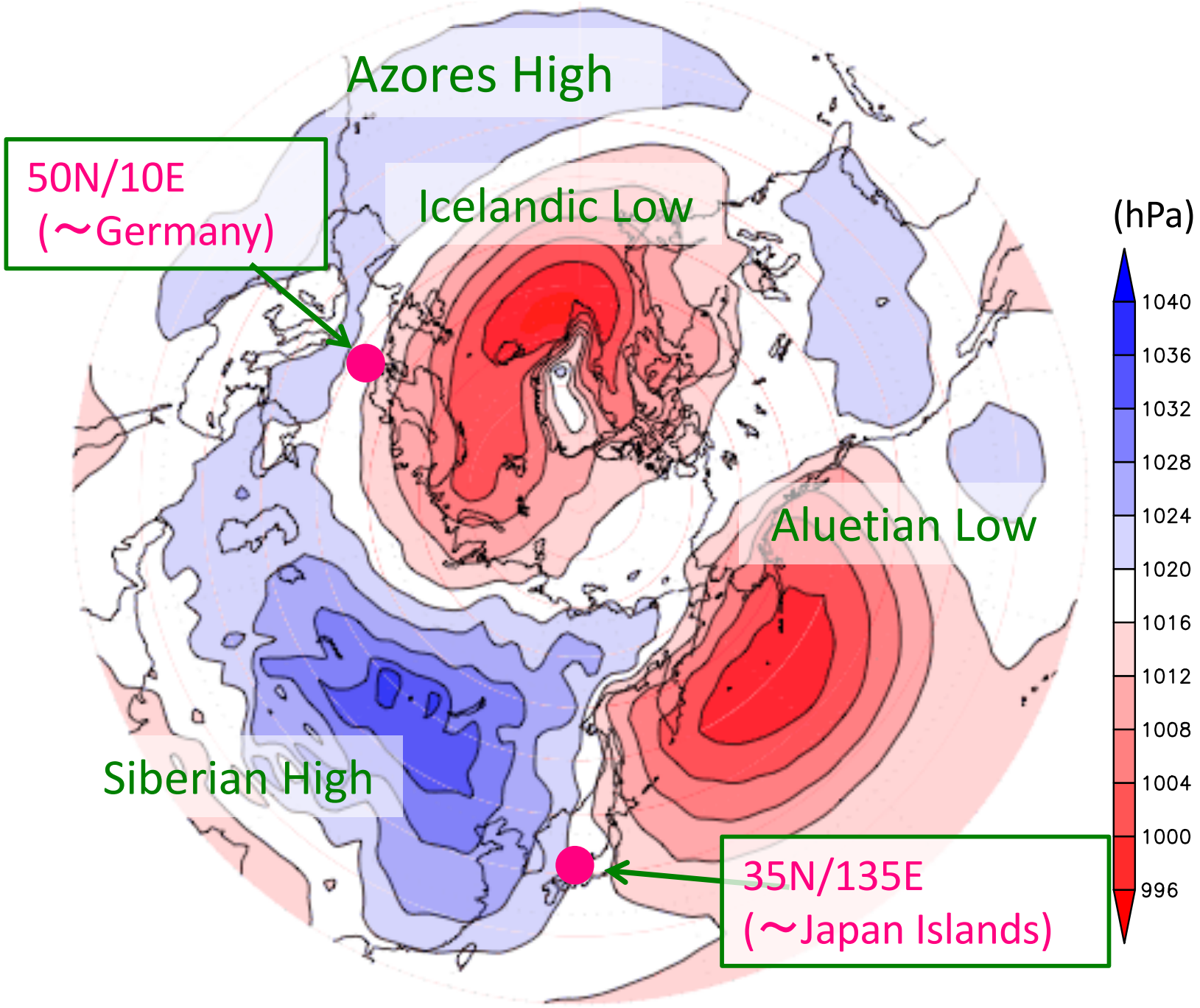
and

(2) **Background of the Cultural Generation** affected greatly by the **Variety of "Seasonal Feeling"** from region to region.

＊A traditional event called "Fasnacht" for driving winter away is held about a month before the Easter around Germany and Austria with the "seasonal feeling" of the very severe winter there.

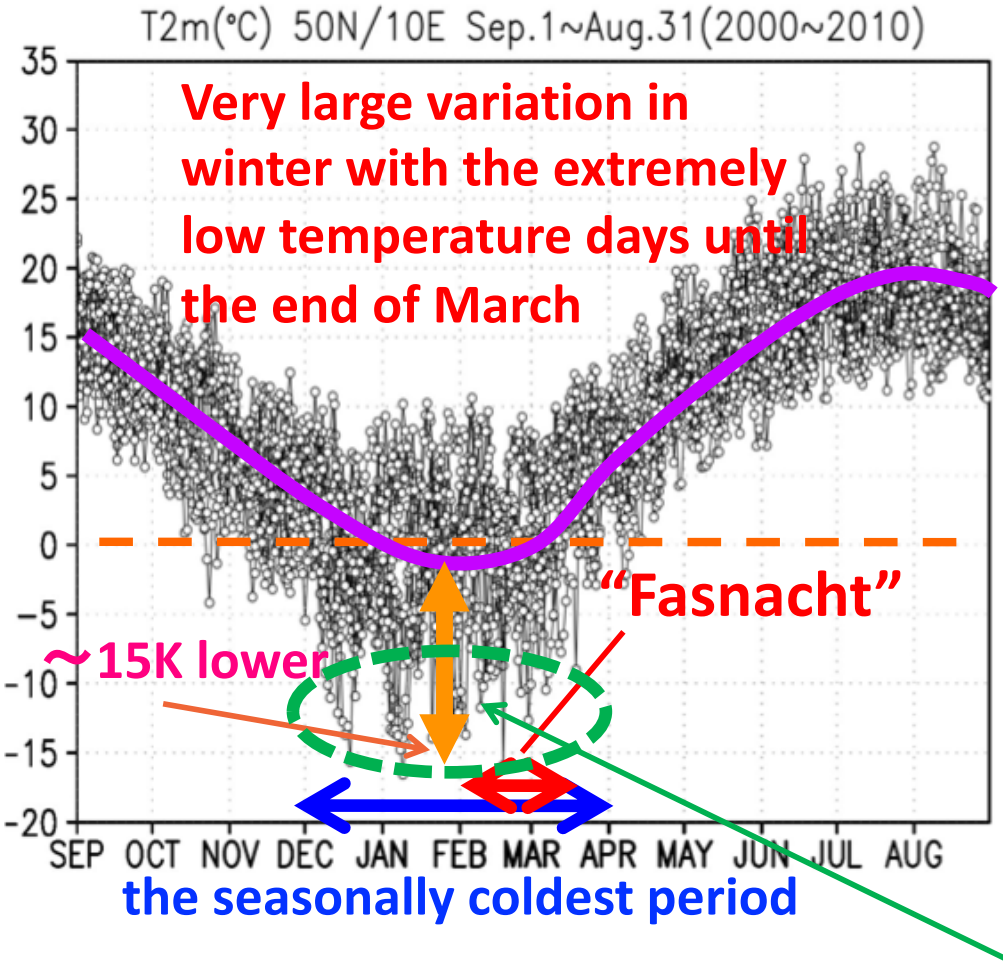
"Fasnacht –In Nordtirol und Südtirol" (by Thomas Nußbaumer (2010), *loewenzahn, Innsbruck*)

Sea-level pressure (SLP) in January averaged for 1971～2010（hPa）

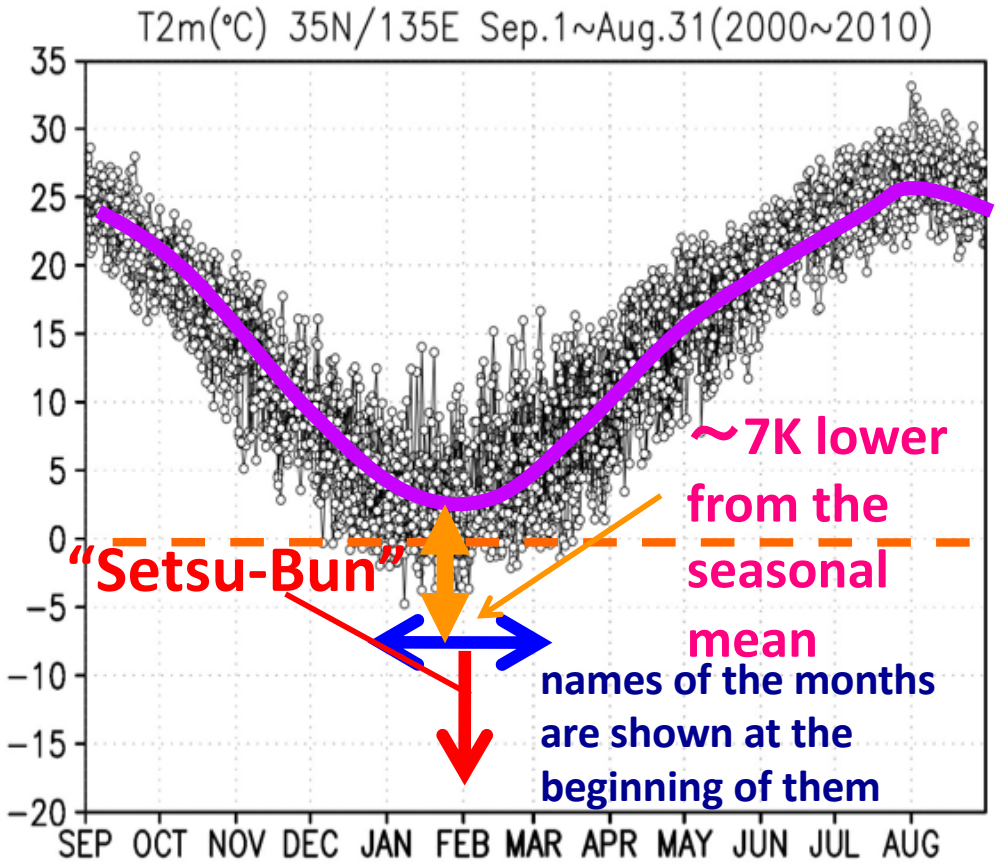


Composite of Daily Sequences of Mean Surface Air Temperature (T2m)(℃) for 2000/01～2010/11 based on the NCEP/NCAR re-analyses data

50N/10E (～ Germany)



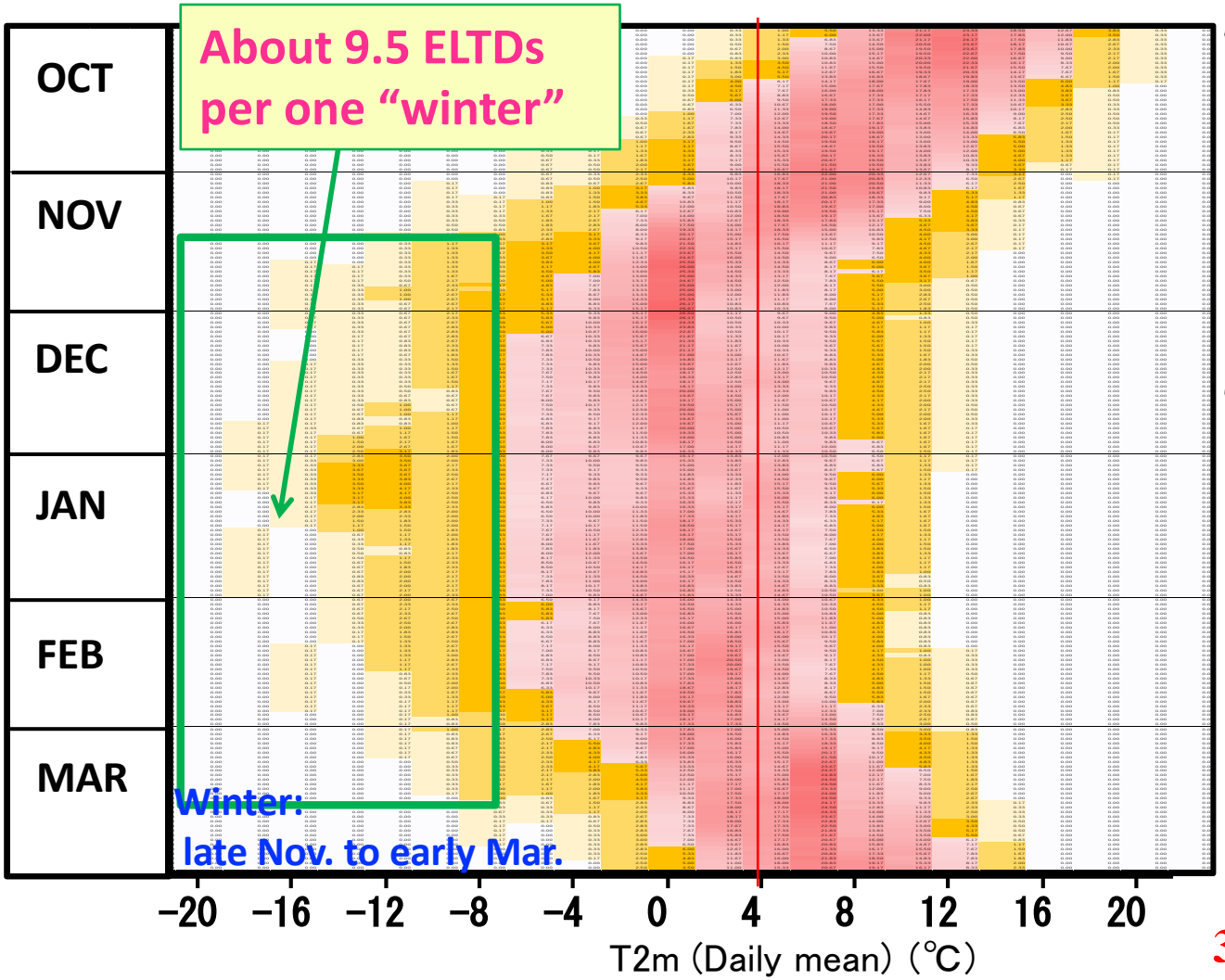
35N/135E (～ Japan Islands)

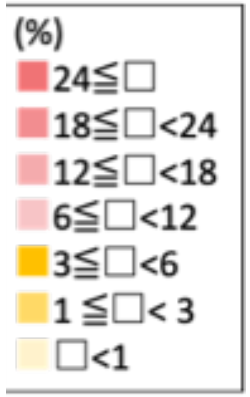


A day with daily mean surface air temperature ≦ -7℃ is referred to as Extremely Low Temperature Day (ELTD), in this study.

Seasonal progression of appearance frequency for every 2K range of the daily mean surface air temperature (T2m) **around Germany (50N/ 10E)** for 1971/71～2010/11 winters, based on the NCEP/NCAR re-analyses data (%). The frequencies corresponding the specified date were computed for the data from 7 days before to 7 days after (for 15 days in total). We tentatively call this kind of **figure the 15-day running histogram**.

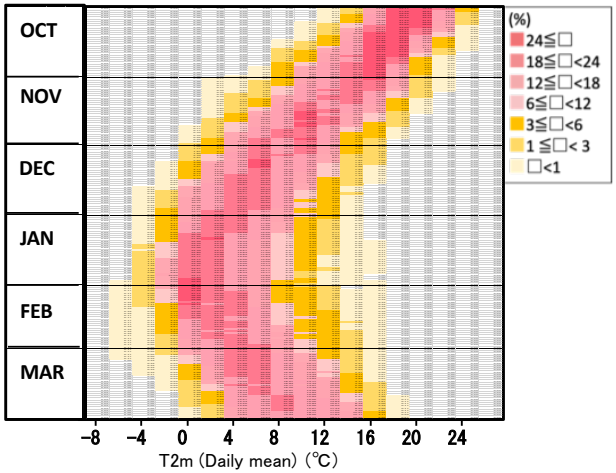
15-day running histogram (50N/ 10E) for 1971/72～2010/11





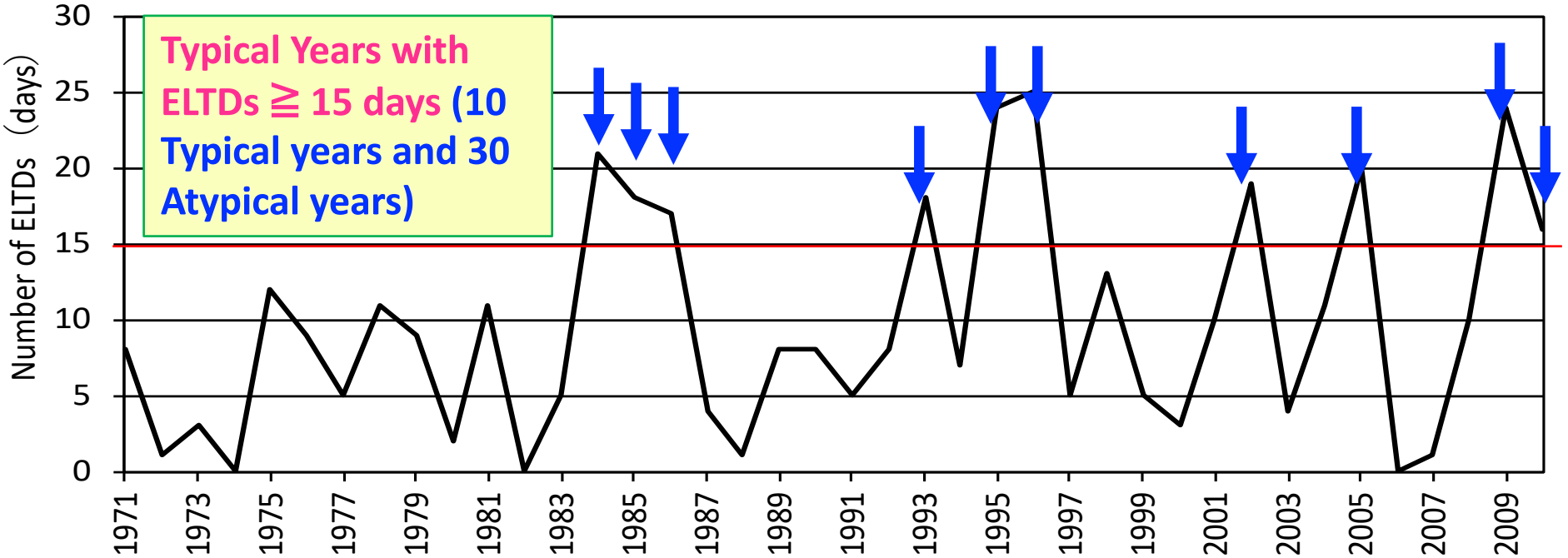
For example, value of -8℃ in the abscissa indicates for the range -9℃＜T2m≦-7℃

15-day running histogram (35N/ 135E) for 1971/72～2010/11 winter

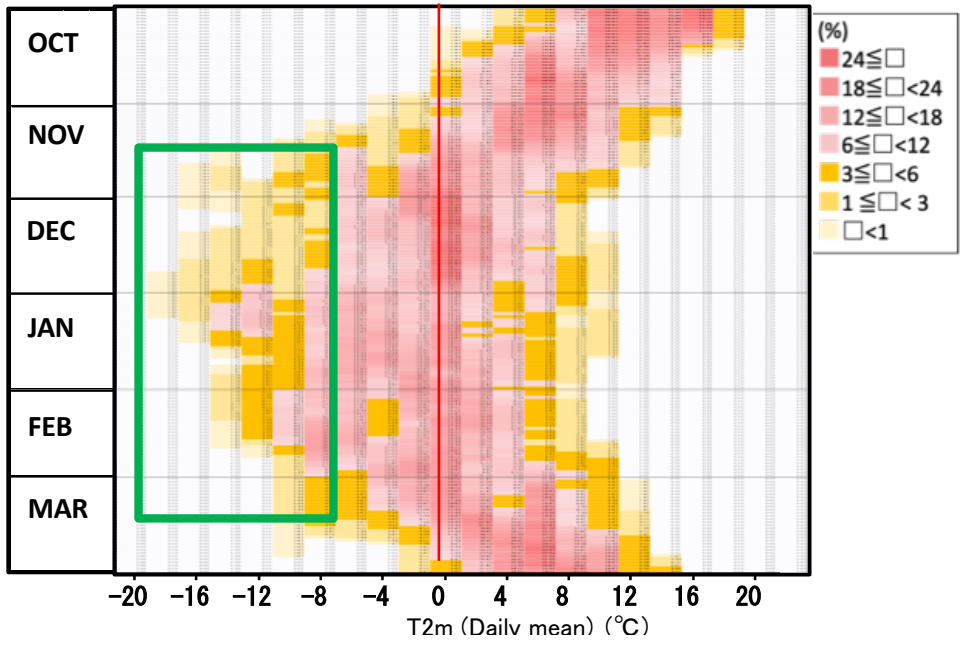


35N/135E（～Japan Islands）

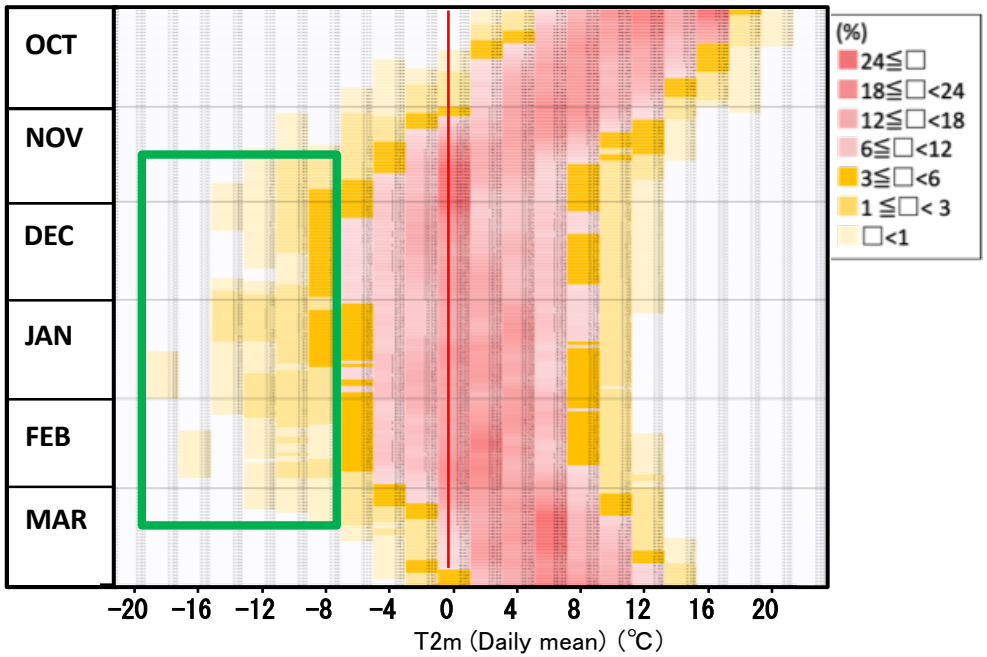
Number of ELTDs at 50N/10E (1971/72～2010/11winter (Oct. to next Mar))



15-day running histogram (50N/ 10E)
for 1971/72～2010/11 winter (Typical years)

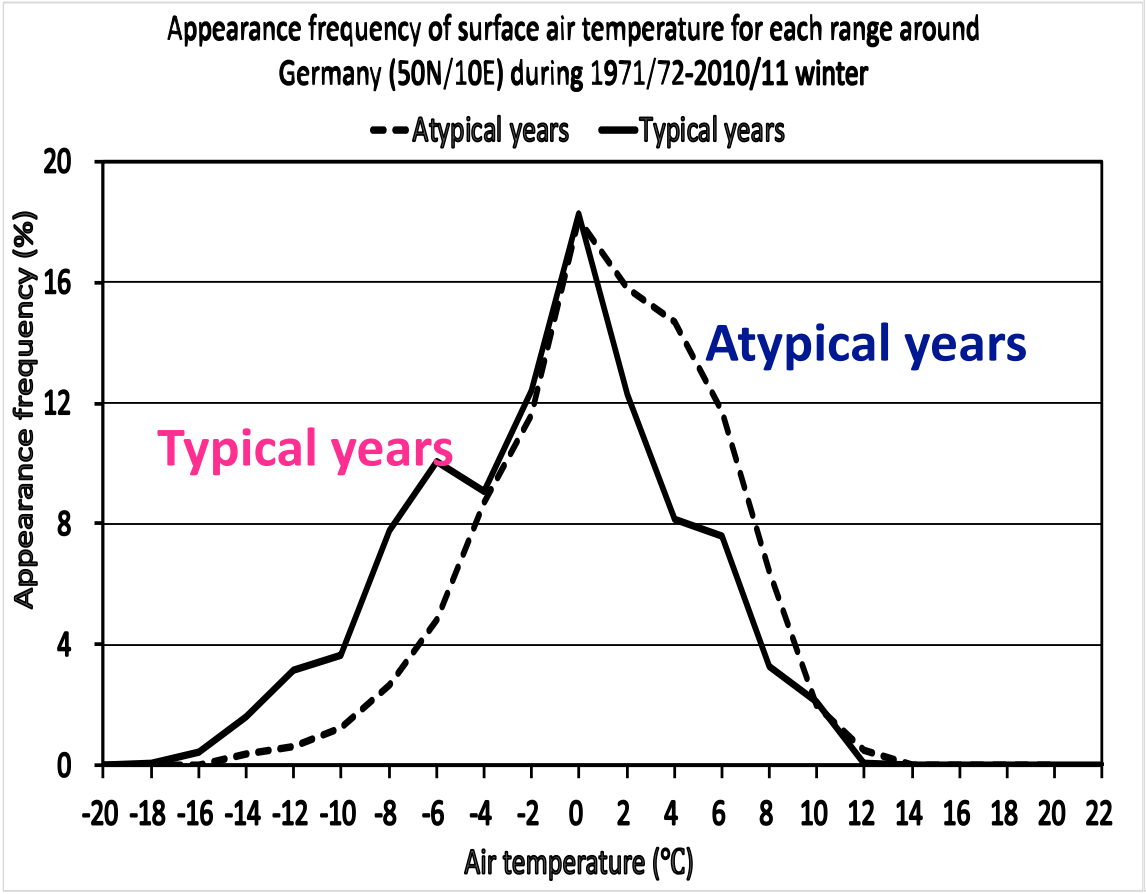


15-day running histogram (50N/ 10E)
for 1971/72～2010/11 winter (Atypical years)

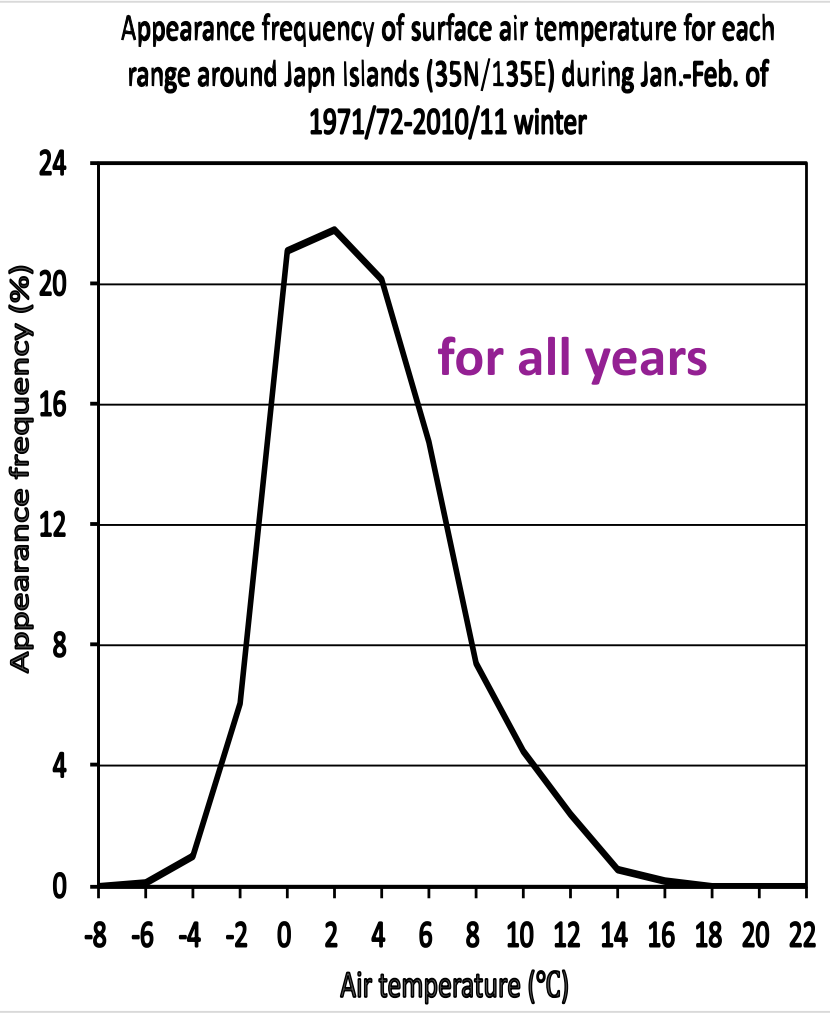


Histogram of Appearance frequency of surface air temperature for each range for 1971/72-2010/11 winter

～Germany (50N/10E) (16 Nov. – 15 Mar.)

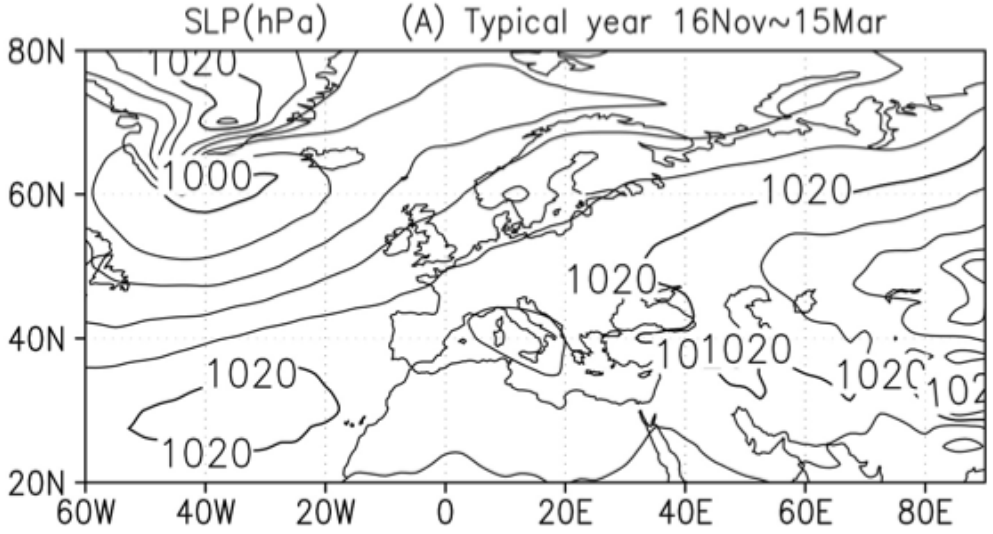


～Japan Islands (35N/135E) (01 Jan. – 28 Feb.)

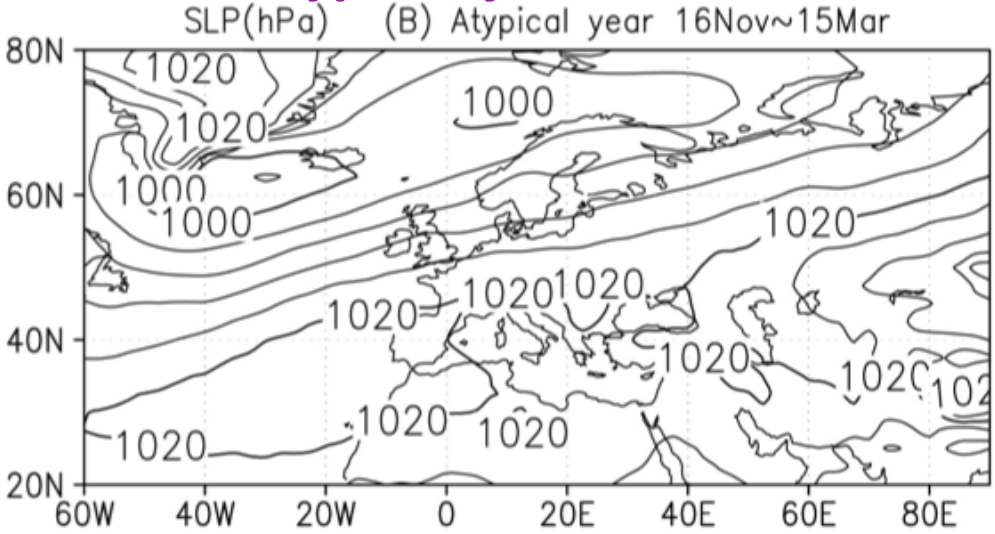


Mean fields in “winter” (Late November to early March)

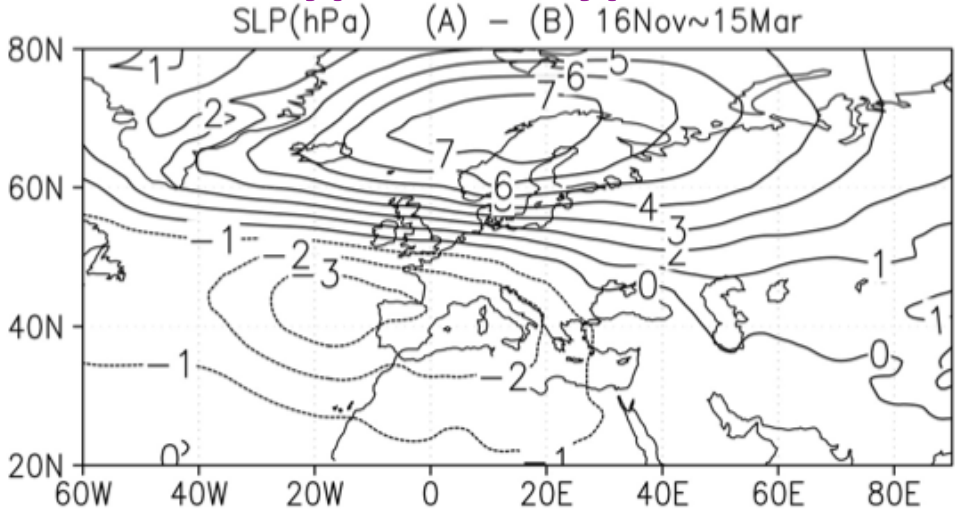
SLP （Typical years）



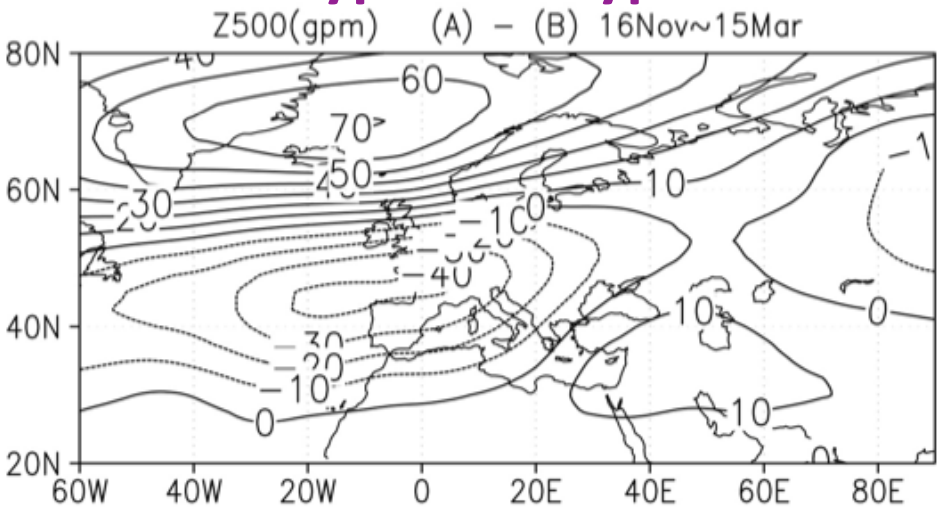
SLP （Atypical years）



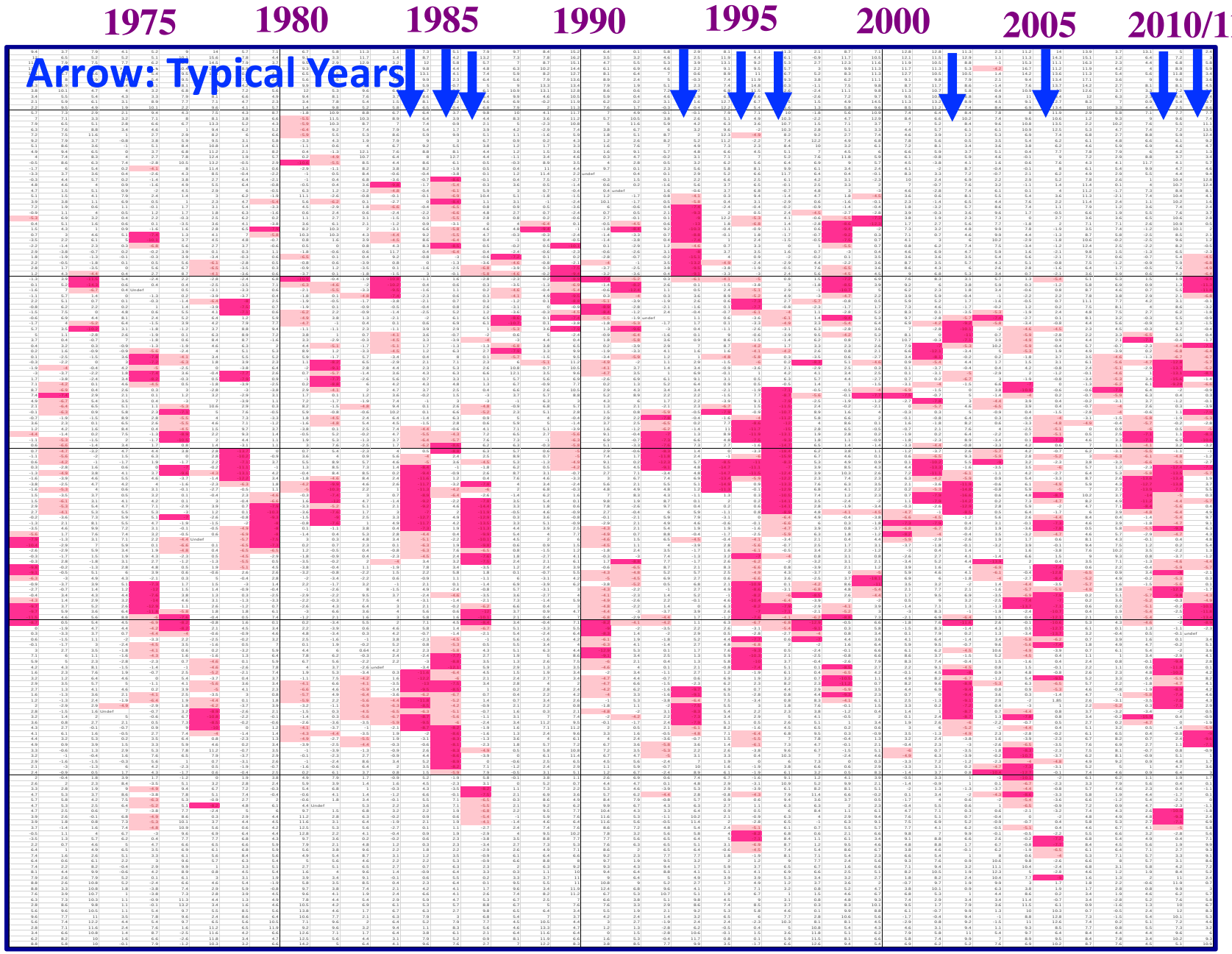
SLP：Typical - Atypical



Z500：Typical - Atypical

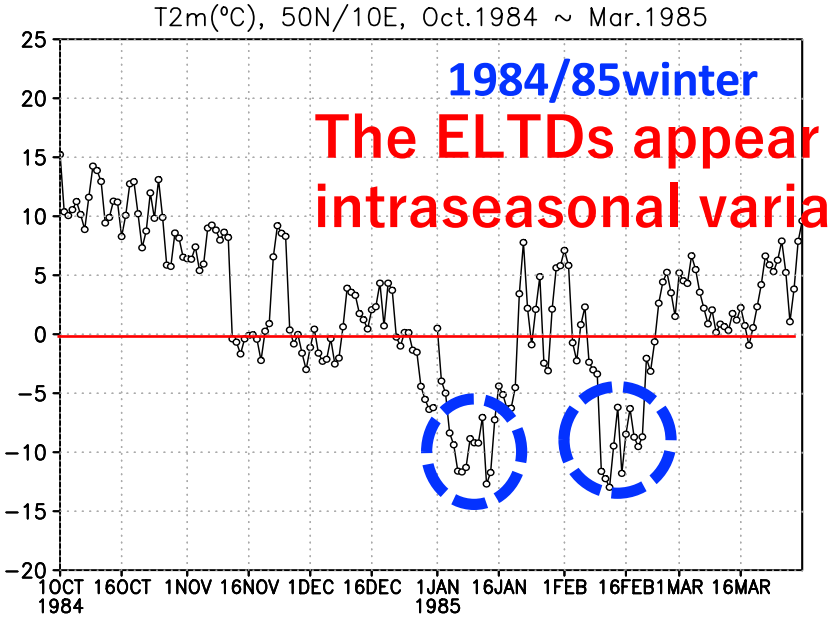


Daily Appearance of the Extremely Low Temperature Days (ELTD) around Central to Southern part of Germany（50° N/10° E), based on the NCEP/NCAR re-analysis data

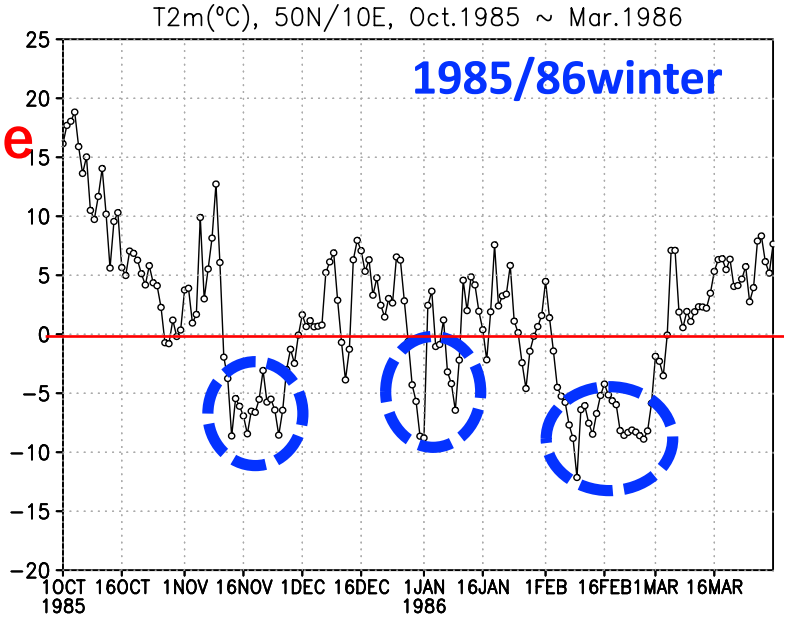


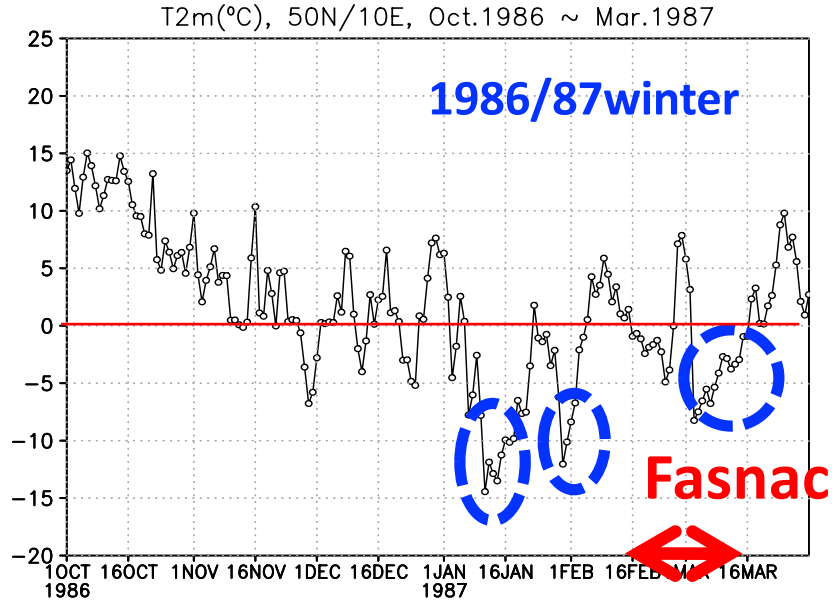
：T2m ≦ -7℃ (Extremely Low Temperature Days, ELTD),　：-7℃ < T2m ≦ -4℃

Examples of time series of daily mean surface airtemperature around Germany (50N/10E, ℃) in the Typical years

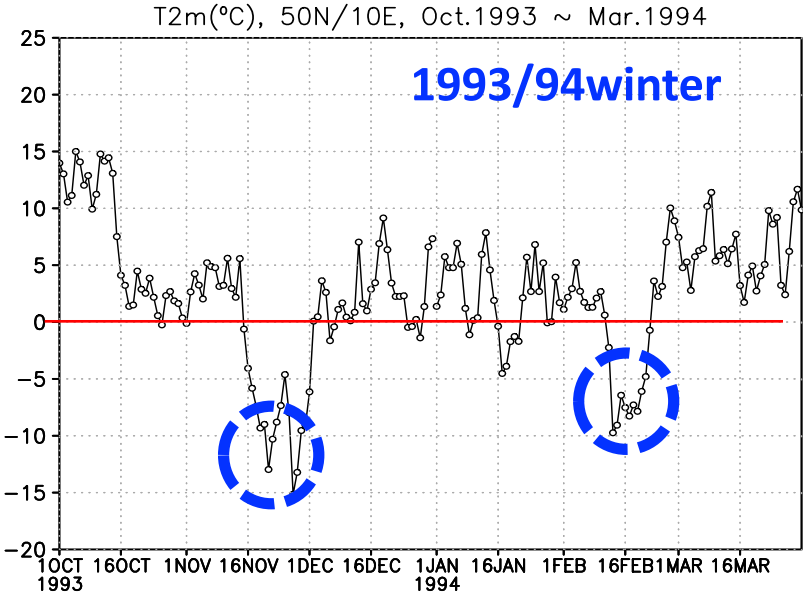


The ELTDs appear as the intraseasonal variations

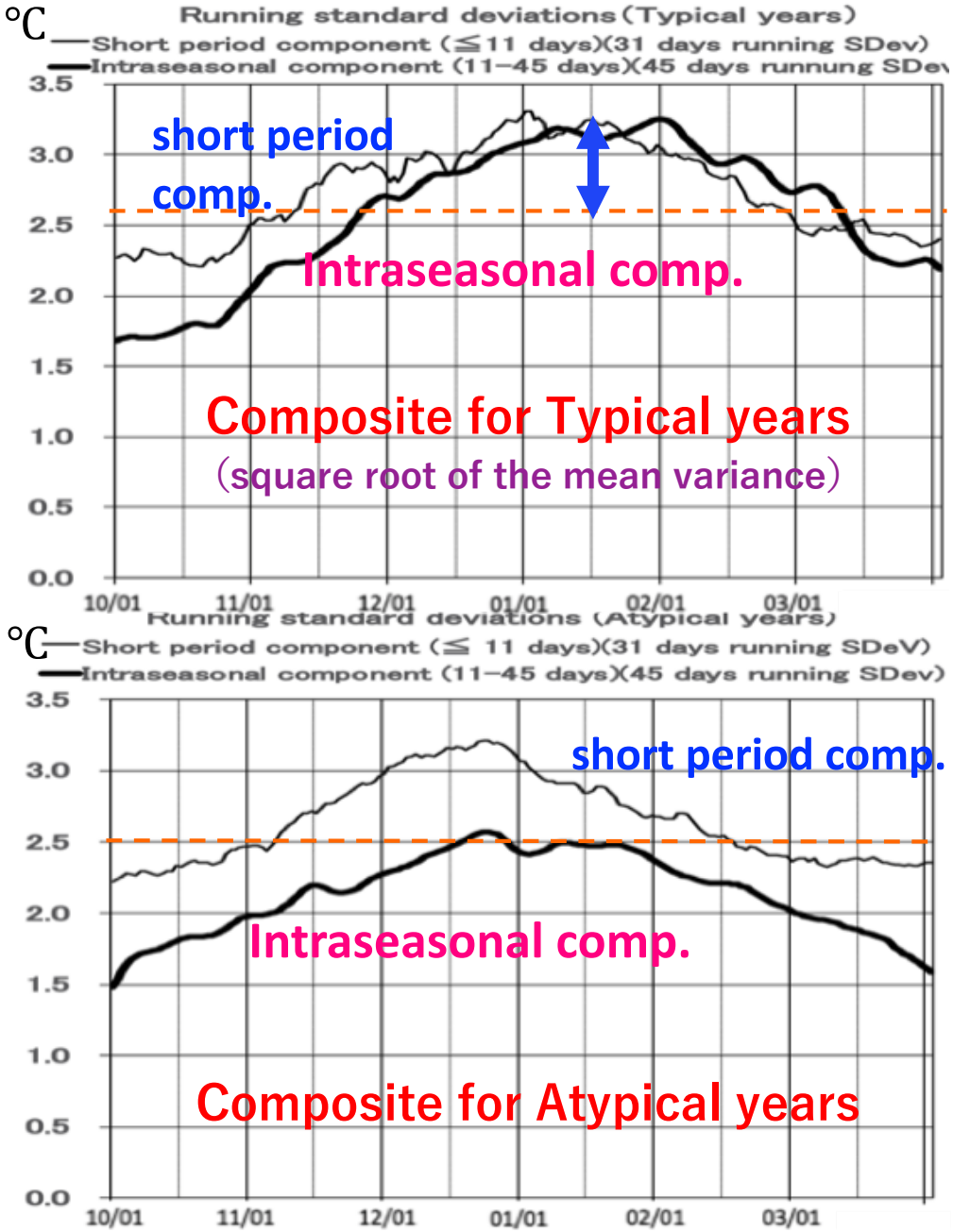




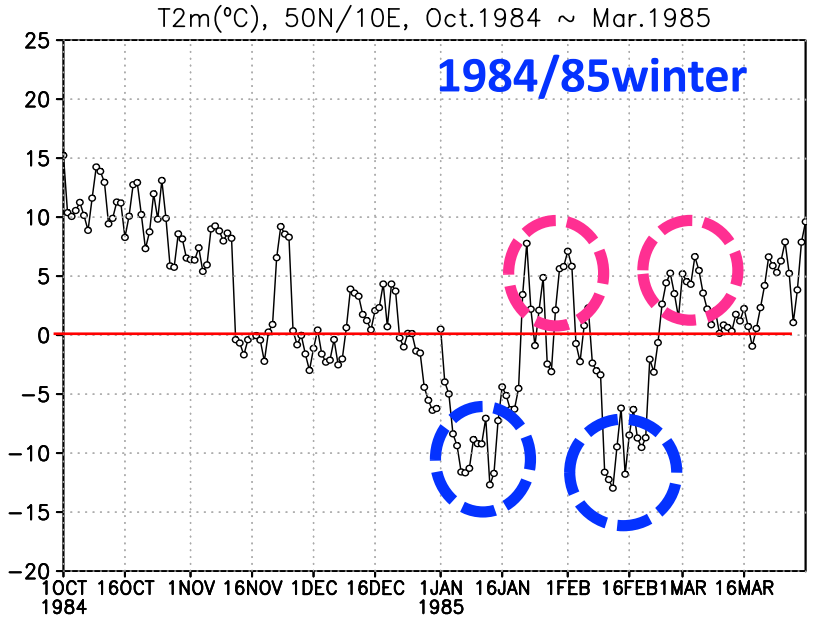
Fasnacht



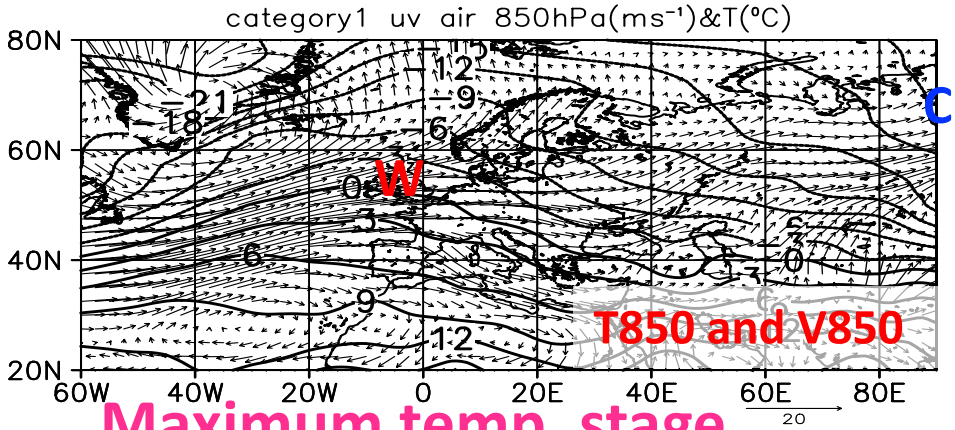
Seasonal progression of amplitude of the daily mean surface temp. variations around Germany (50N/10E)(℃)

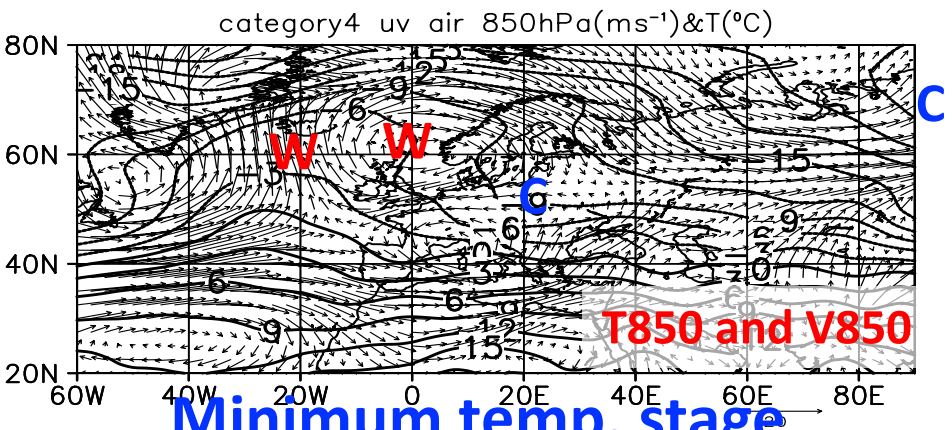


The ELTDs appear as the intraseasonal variations



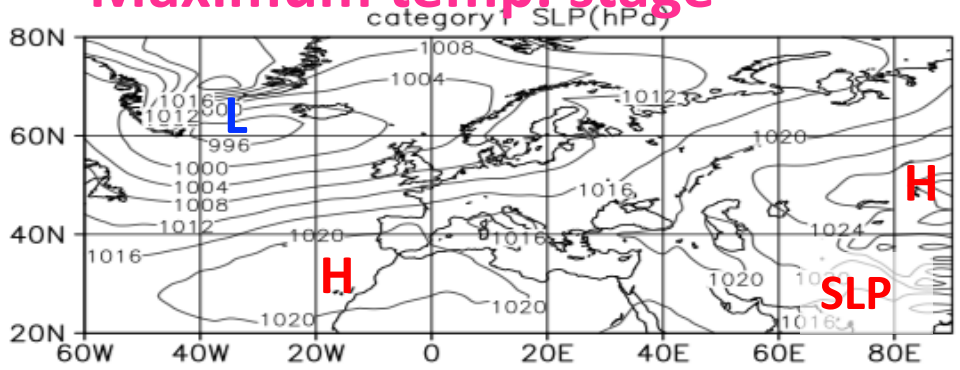
Composite atmospheric fields for the maximum and the minimum temperature stages of the intraseasonal variations around Germany (50N/10E) for the "winter" of the typical years

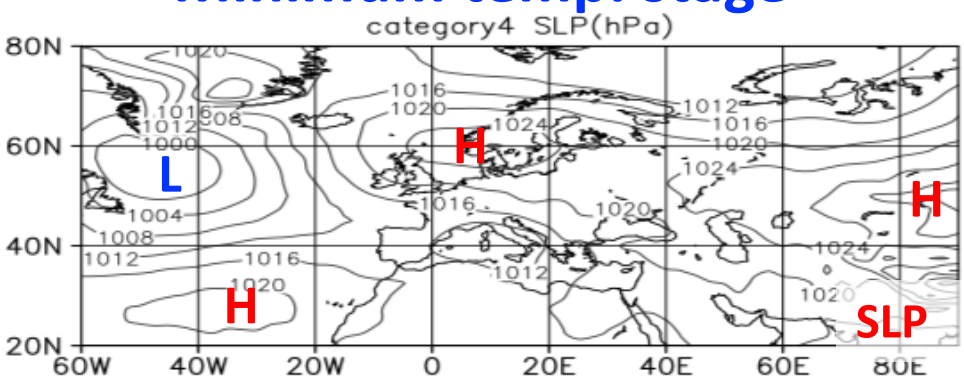


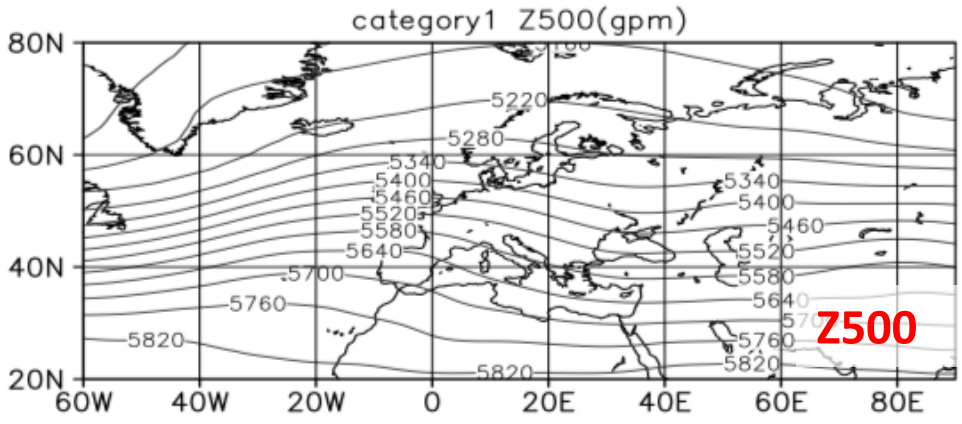


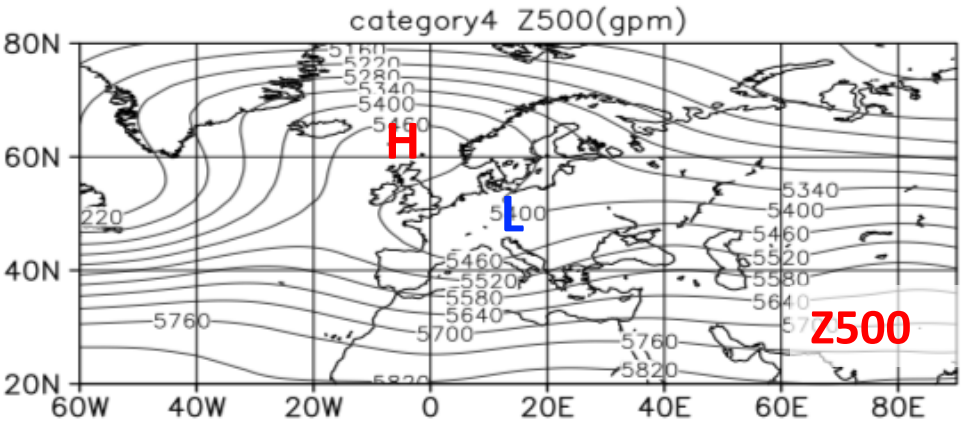
Maximum temp. stage

Minimum temp. stage









Summary

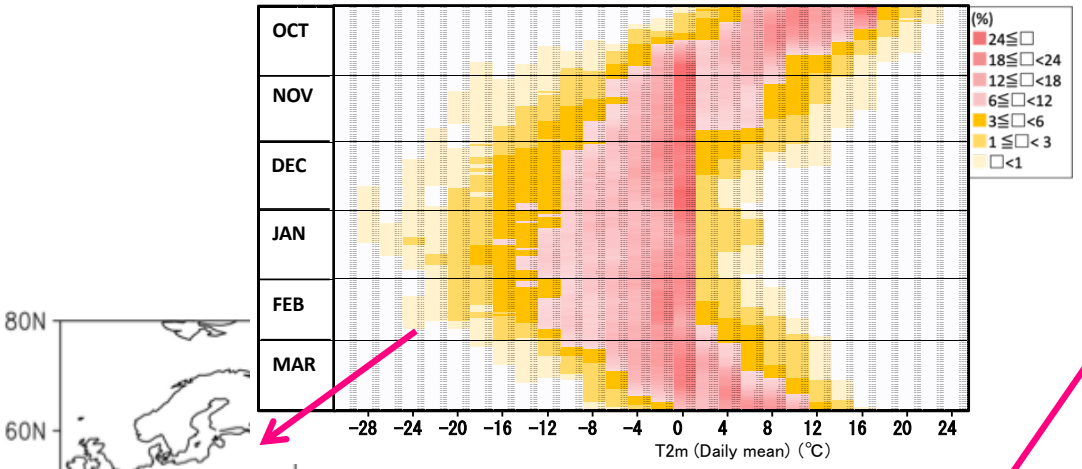
In this study, climatological features in association with appearance of the **“extremely low temperature day” (ELTD) with daily mean surface air temperature (TA) ≦ -7℃ around Germany (about)** were examined for 1971/72 to 2010/11 winters, based on the NCEP/NCAR reanalysis data.

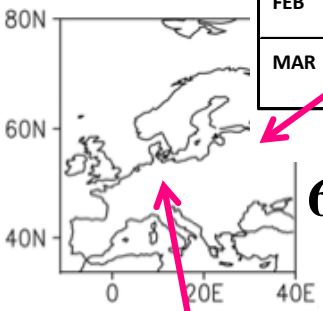
As a whole, the day-to-day variability of TA show the rapid seasonal increase around late November, which is sustained until early March. Besides, **events of the ELTDs** there with the **persistency of about a week** appeared intermittently in the “**Typical years**” (10 years in total), in association with the **intraseasonal variation**. Such persistent events occurred 2 or 3 times during a winter, resulting in the higher appearance of the ELTDs in these years (**more than 15 days a winter**). However, the such intraseasonal variation of TA was not so prominent in the “Atypical years”.

While TA around Germany was relatively high at the eastward shift phase of the Icelandic low, the Icelandic low was weakened and the upper-level trough as an upper-level wave train was located around Germany in the persistent ELTDs events. We should note that such features are also related to appearance of the ELTDs as the intraseasonal variations.

15-day running histogram of mean surface air temperature (℃) for 2000/01～2010/11, based on the NCEP/NCAR re-analyses data

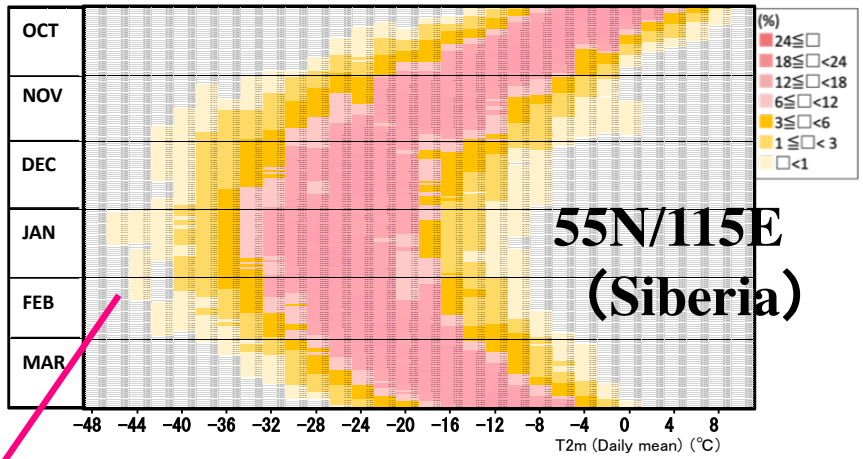
15-day running histogram (50N/ 30E) for 1971/72～2010/11 winter





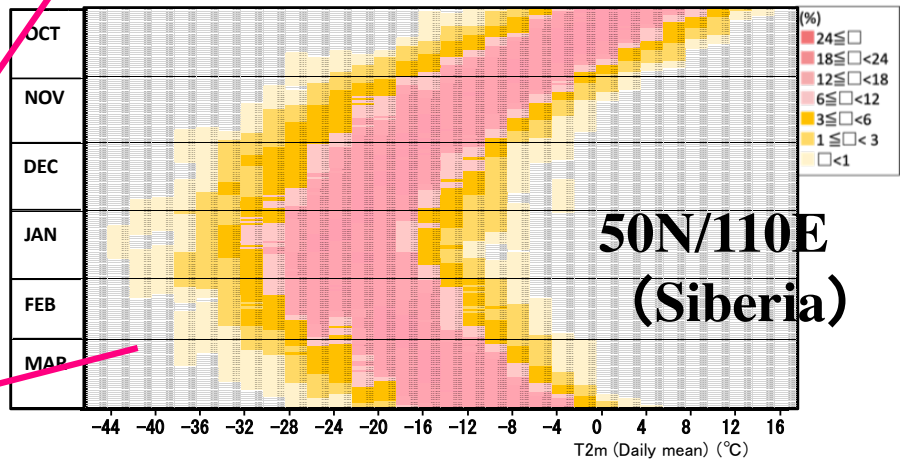
60N/30E（northern Europe）

15-day running histogram (55N/ 115E) for 1971/72～2010/11 winter



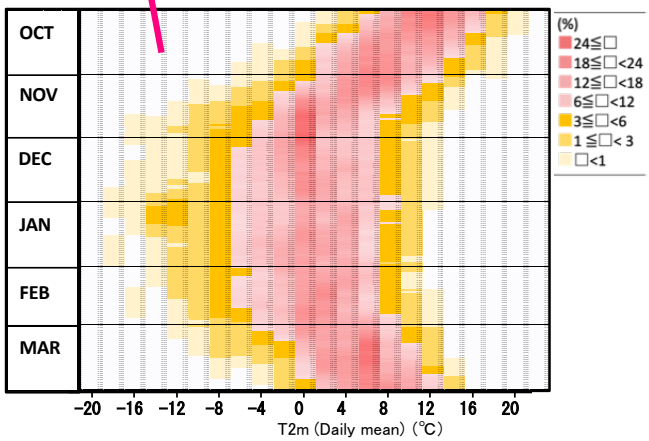
55N/115E（Siberia）

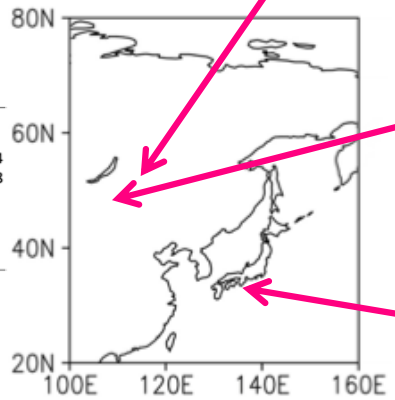
15-day running histogram (50N/ 110E) for 1971/72～2010/11 winter



50N/110E（Siberia）

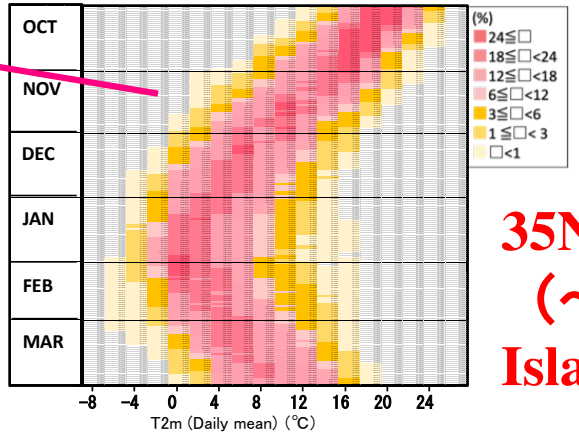
15-day running histogram (50N/ 10E) for 1971/72～2010/11





50N/10E（～Germany）

15-day running histogram (35N/ 135E) for 1971/72～2010/11 winter



35N/135E（～Japan Islands）