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# Synoptic climatological analyses on the seasonal transition from winter to spring in Europe also with attention to the day-to-day variability (Comparing with that in East Asia)

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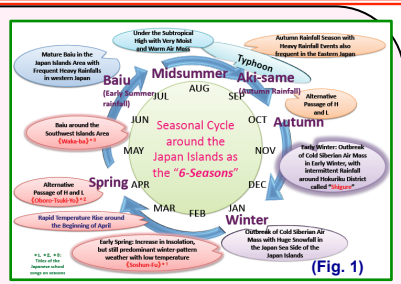
## 【 Background of the present study 】

There are many stages with rapid seasonal transitions in East Asia, greatly influenced by the considerable phase differences of seasonal cycle among the Asian monsoon subsystems, resulting in the variety of "seasonal feeling" (Fig. 1). The seasonal cycle has been an important background for the generation of many kinds of arts also in Europe around the western edge of the Eurasian Continent. Especially around Germany, there are so many music or literature works in which the "May" is treated as the special season. However, more detailed examination of the seasonal evolution from winter to spring including before May and its comparison with the features in East Asia would be interesting. Deeper knowledge on the seasonal cycle would contribute greatly to the cultural understanding as mentioned above, as well as for considering the detailed response of the regional climate to the global-scale impacts such as the global warming.

As such, the present study examined, based mainly on the NCEP/NCAR reanalysis data during 1971-2010, the synoptic climatological features on the seasonal transition from winter to spring in Europe with also attention to the day-to-day variability, by comparing with those in East Asia (detailed analyses were made mainly for 2000/01 - 2010/11 winters).

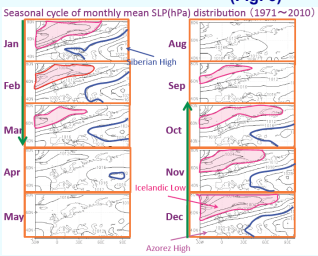


(Fig. 1)

## 【 Relation to seasonal cycle of the time mean Icelandic Low 】

It is interesting that the region where such large day-to-day amplitudes of TS and SLP were observed corresponded to the southeastern periphery zone of the Icelandic Low in the seasonal mean field, during the season when the Icelandic Low in the time mean field appears (Figs. 3 and 6).

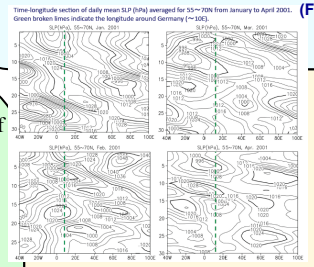
(Fig. 6)



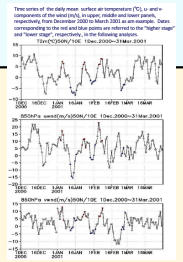

## 【 Relation to the variation of the Icelandic Low 】

Besides, sub-monthly or about 30-day-period intraseasonal variation of the eastward intrusion of the Icelandic Low near the northwestern Europe was also clearly found in winter, as well as the short-period variation of the synoptic-scale disturbances to the southeast of the intraseasonal-scale Icelandic Low (Fig. 7).

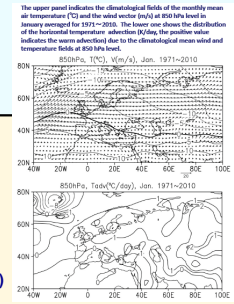
(Fig. 7)



(Fig. 8)



(Fig. 9)

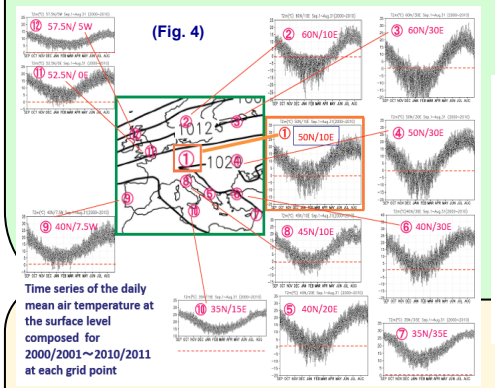


## 【 Day-to-day variation of air temperature from autumn to spring 】

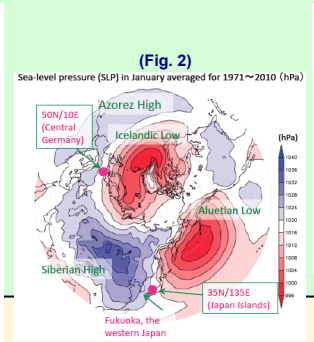
Figure 2 indicates the climatological distribution of monthly mean sea level pressure (SLP) in January. Germany is located southeastward of the mean Icelandic Low and the Japan Islands is located just between the Siberian High and the Aluetian Low.

Around the region from Germany to Turkey or northern Europe, the surface air temperature (TS) showed rather larger day-to-day variation (including the interannual or intraseasonal variation) throughout a year than in the Japan Islands area in East Asia (Figs. 3 and 4). Especially from December to March (the minimum period of the climatological TS in the European side), the day-to-day variation is extremely great around Germany and its northern region (to the north of ~45N/10E). Thus, the extremely low temperature events sometimes appeared around Germany till the end of March, although the seasonal mean TS is lower than in Japan only by about 5°C.

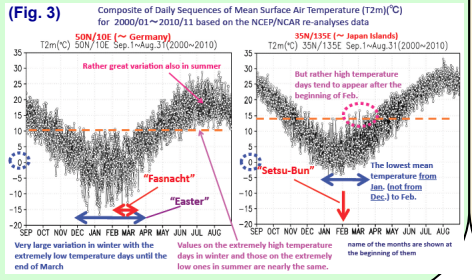
(Fig. 4)



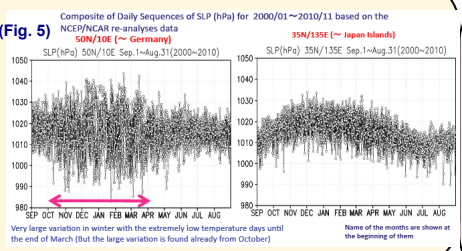

(Fig. 2)

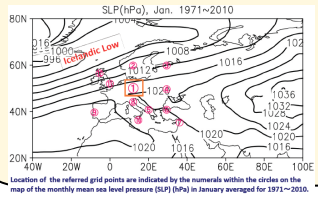



(Fig. 3)




(Fig. 5)



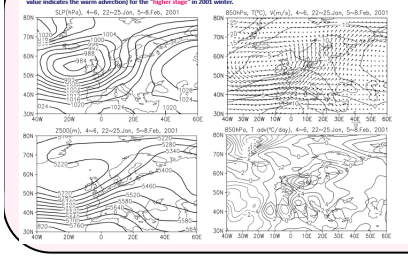




The day-to-day variation of sea level pressure (SLP) was also very large where such large amplitude of TS was found, although the extremely large day-to-day variation of SLP was found from the earlier season (October to March) (Fig. 5).

The temperature variation was rather large also in the intraseasonal time-scale. The maximum period (referred to as the "**higher stage**" (and the opposite situation as the "**lower stage**")) was associated with the increase mainly in the westerly wind component (not with the southerly wind component) (Fig. 8).

In the seasonal mean field, warm air advection in the lower layer was found to the southeast of the Icelandic Low due to the strong westerly wind (Fig. 9). Such warm air advection can be intermittently enhanced especially when the Icelandic Low intruded more closely to the northwestern Europe, resulting in the rather increase in the low-level air temperature (Fig. 10). On the other hand, although the northerly wind component is not always very strong in the "lower stage", not so weak cold air advection was found then (Fig. 11). These seem to result in the large day-to-day variation of TS around Germany and its northern region until the seasonal weakening of the Icelandic Low from March to April.

(Fig. 10)



(Fig. 11)