The Climatological Consideration to the Arid and Humid Climate in Japan using the Papadakis's Method

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The Climatological Consideration to the Arid and Humid Climate in Japan using the Papadakis's Method

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Key words : arid and humid climate, Japan, Papadakis's method, potential evapo-transpiration.

Abstract

Taking into consideration of climatological water balance, the Thornthwaite's method using potential evapo-transpiration (=PET) has been well-known as one of its ways. However there are some problems in his method, for example, the calculating PET value dosen't fit to several areas, especially high or low latitudes in the world.

In this study, the authors have tried to investigate the crop-climatological arid (= dry) or humid (= wet) area in Japan by using the Papadakis's method which is one of the ways to calculate PET value. And then the authors analyzed the detail distribution of its condition. To calculate the PET value of Papadakis's method requires the climatic data about some vapor pressure values as following expression.

$$PET=0.5625\ (e_{ma}-e_{d})$$

or

$$PET=0.5625\ (e_{ma}-e_{m1-2})$$

where e_{ma} is the saturation vapor pressure (hPa) to monthly mean maximum temperature, e_{d} is monthly mean vapor pressure (hPa) and e_{m1-2} is the saturation vapor pressure (hPa) to monthly mean minimum temperature minus 2℃.

Because of using the climatic data set from 1921 to 1930 including monthly mean vapor pressure etc. as above-mentioned, in this report the authors calculate its PET value after Papadakis's method at the 80 meteorological stations (Fig.1). But the whole plan of this study will finally deal with the data from 1921 to 1950.

The main results of this research are summarized as follows;

1. Roughly speaking in Japan there is not the station recording the value of P/PET less than 1.0 throughout the year or annual mean value of it. Therefore annual water deficit dosen't occur in Japan.

2. In spite of the fact as above-mentioned, the condition of monthly value of E/PET in Japan is different from that of annual value. Namely Fig.2 shows the monthly annual change in the occurrencefrequency of recording the value of P/PET less than 1.0 in several stations in Japan. In connection with Fig.2, Fig.3 shows the spatial distribution of the occurrence frequency of monthly value of P/PET less than 1.0. From these Fig.2 & 3, it will be able to point out the inland area of Japan or the western part of Japan are most frequent in August. Contrary to this, the northern part of Japan, that is, Hokkaido do the same situation in May, June and July. Moreover the Setouchi District, for example, Okayama and Matsuyama aremost frequent in October or November as well as in August.

3. In comparison with the Thornthwaite's method after Isozaki(1933) or Fukui(1948) in Fig.4, the tendency of occurrence fequency in water deficit or dry area in Japan is similar to the results of this study except in detail result.

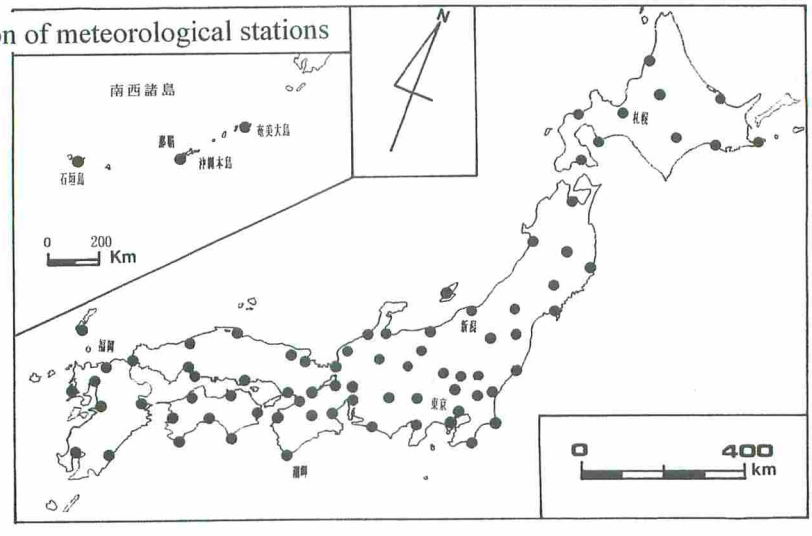

Fig.1 Locations of the 80 meteorological stations used in this study.

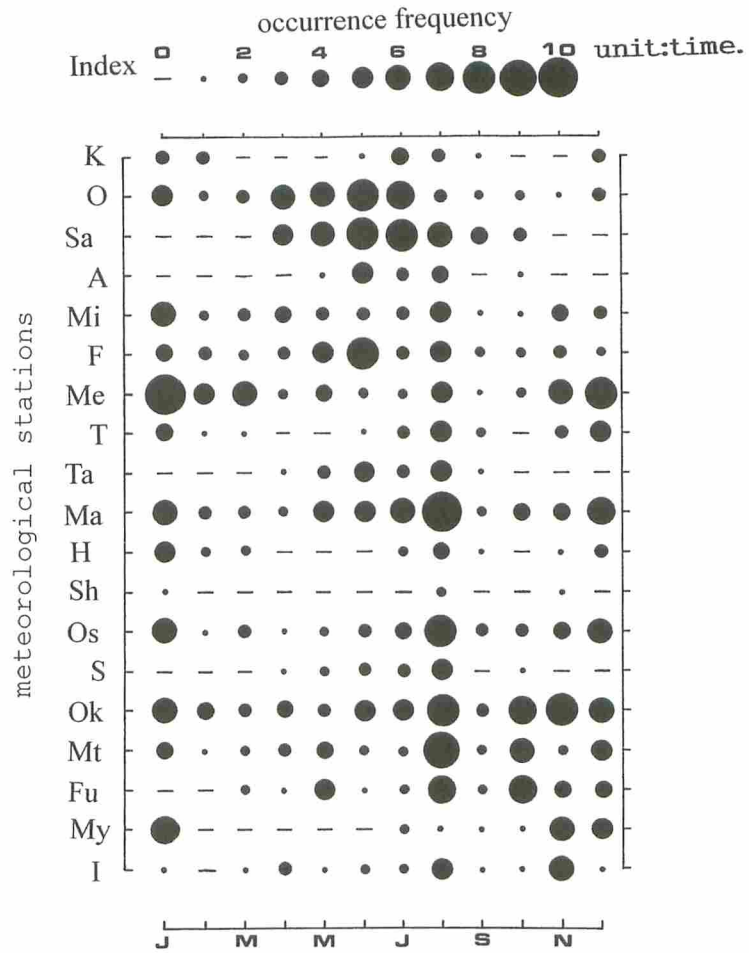

Fig.2 Occurrence frequency of monthly value of P／PET of less than 1.0
(unit : time. analysis period:from 1921 to 1930)

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K:Kushiro, O:Obihiro, Sa:Sapporo, A:Akita, Mi:Miyako, F:Fukushima, Me:Maebashi, T:Tokyo, Ta:Takada, Ma:Matsumoto, H:Hamamatsu, Sh:Shionomisaki, Os:Osaka, S:Sakaiminato, Ok:Okayama, Mt:Matsuyama, Fu:Fukuoka, My:Miyazaki, I:Ishigakijima.

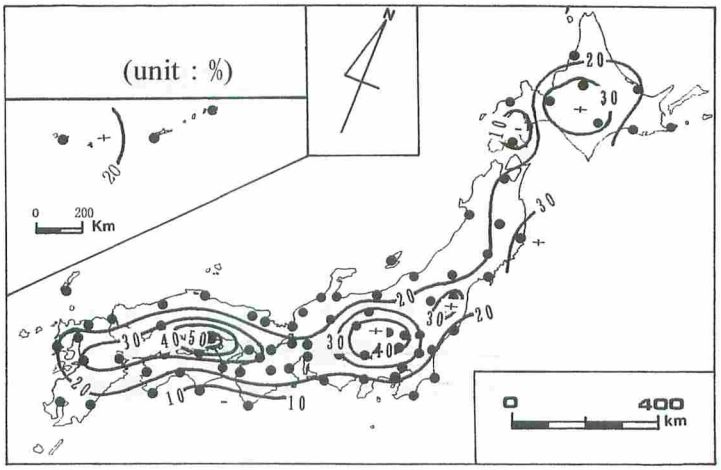

Fig.3 Spatial distribution of occurrence frequency of monthly value of P／PET of less than 1.0.

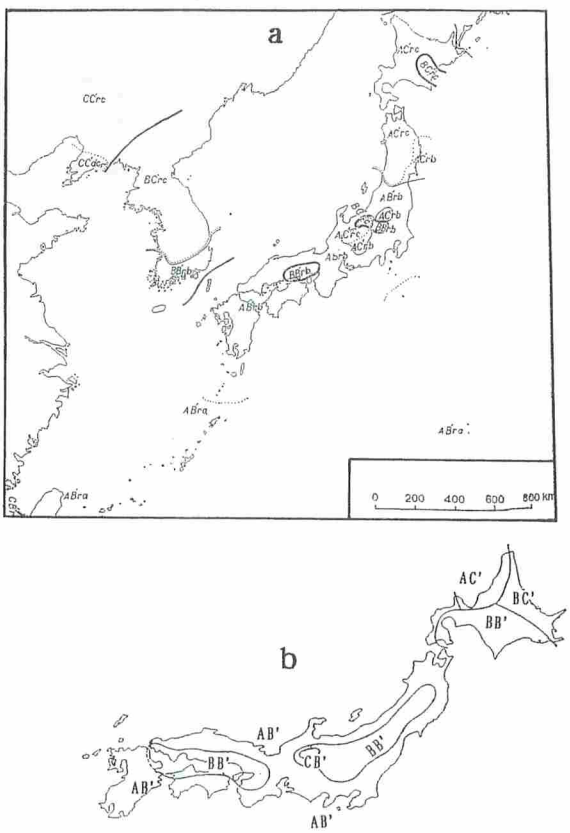

Fig.4 Climate division of Japan based on the Thornthwaite's method.
(a : by Isozaki:1933 after Thornthwaite's method in 1931.)
(b : by Fukui:1957 after Thornthwaite's method in 1948.)

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