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The Comparative Study on hydro-Climatological Features in Nara and Kyoto Basins : Year Climatic analysis by Thornthwaite's Method

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The Comparative Study on hydro-Climatological Features in Nara and Kyoto Basins
—— Year Climatic analysis by Thornthwaite's Method ——

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Nara and Kyoto basins belong under Setouchi climate and they are closely bonded to each other. However, the abnormal climate in Nara has been "droughts" while one in Kyoto has been "heavy rains" and "floods".   In this Study, especially taking notice of dry-wet climate between Nara and Kyoto, the author calculated potential evapo-transpiration by Thornthwaite's method using meteorological data from 1954 to 2012 in Nara and Kyoto.   Based on these result, water budget was computed and climatic classifications were analyzed year to year.

It was proved by analysis that annual evapo-transpiration in Kyoto exceeds one in Nara and the maximum difference between Kyoto and Nara is 76.8 mm/yr.   The annual water surplus in Kyoto is more than one in Nara and the maximum difference between Kyoto and Nara is 446.7 mm/yr.   On the contrary, annual water deficit in Nara exceeds one in Kyoto and the maximum difference between Nara and Kyoto is 93.4 mm/yr.

As a result of climatic classifications, Kyoto has warmer and wetter climate than Nara and most frequency of climate type in Nara is B_2B_2' rb_3' (23.7%) and one of Kyoto is AB_2' rb_3' (18.6%).   These are different from average climatic classification.

Key words : Climatic water budget, Potential evapo-transpiration, Thornthwaite, Year climate

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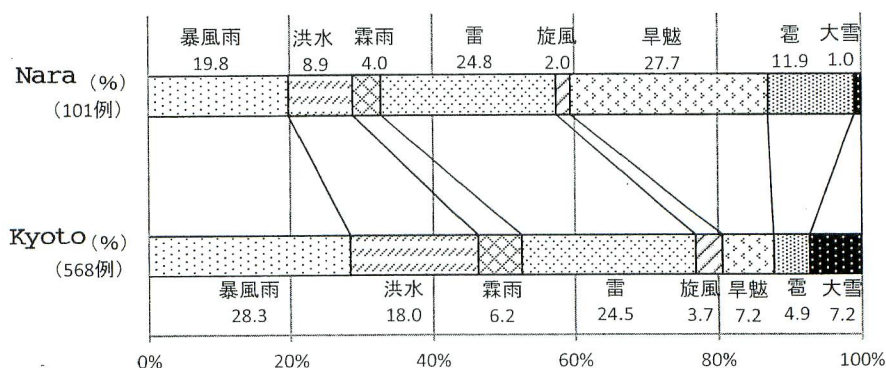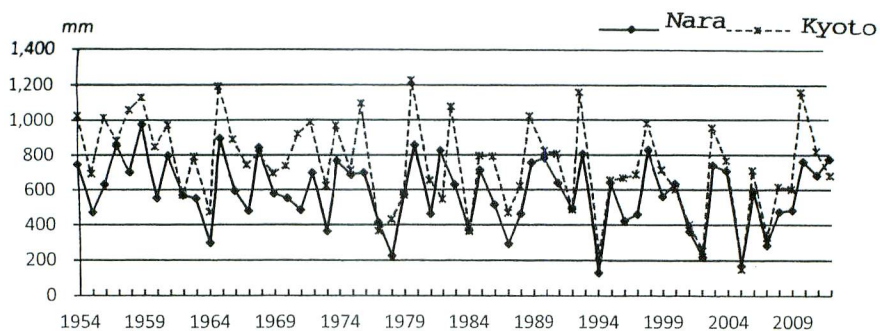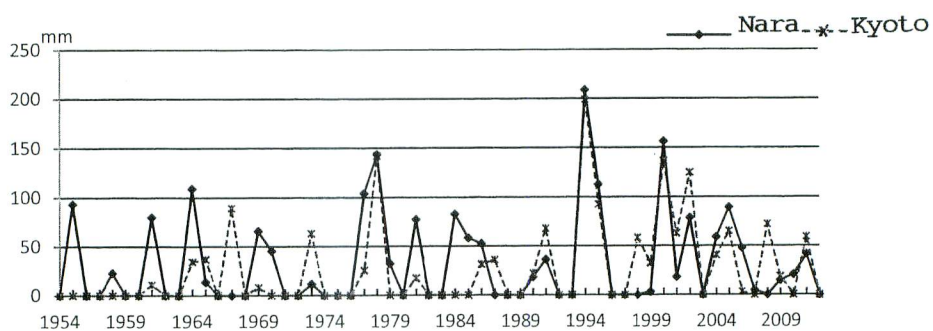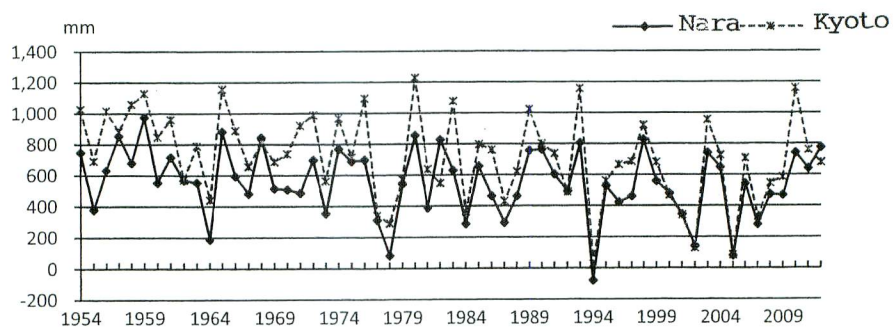

Fig.1   Frequencies of climatic disasters in Nara and Kyoto during 601 to 1200

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第2-1図　水過剰量年合計値の比較（1954～2012）

(water surplus)


第2-2図　水不足量年合計値の比較（1954～2012）

(water deficit)

第2-3図　水収支（水過剰量と水不足量の年合計値の差）の比較（1954～2012）

(water budget)

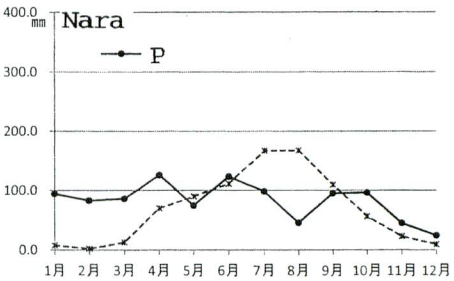Fig.2　Potential evapo-transpiration by Thornthwaite's method at Nara and Kyoto(1954~2012)

Table 1 Statistical results of evapo-transpiration, water surplus, water deficit and water budget

（単位：mm/ 年）

	potential evapo-transpiration		water surplus		water deficit		water budget	
	Nara	Kyoto	Nara	Kyoto	Nara	Kyoto	Nara	Kyoto
平均値	809.3	858.6	585.3	746.2	32.2	26.2	553.1	720.0
中央値	808.6	857.9	589.5	737.7	3.0	0.0	553.2	715.0
標準偏差	27.1	32.3	195.5	257.1	47.2	43.2	221.5	280.1
最小値 （出現年）	764.9 (1965)	798.3 (1957)	129.2 (1994)	149.6 (2005)	0.0	0.0	− 79.4 (1994)	29.8 (1994)
最大値 （出現年）	874.3 (1994)	934.7 (1998)	974.9 (1959)	1,228.2 (1989)	208.6 (1994)	199.0 (1994)	974.9 (1959)	1,228.2 (1980)
奈良と京都の差 （平均値）	49.3 （奈良＜京都）		160.9 （奈良＜京都）		10.3[*] （奈良＞京都）		166.8 （奈良＜京都）	
奈良と京都の最大差 （出現年）	76.8（1972） （奈良＜京都）		446.7（1983） （奈良＜京都）		93.4（1955） （奈良＞京都）		446.7（1983） （奈良＜京都）	
奈良＞京都（年数）	0		9		21		7	
奈良＜京都（年数）	59		50		13		52	

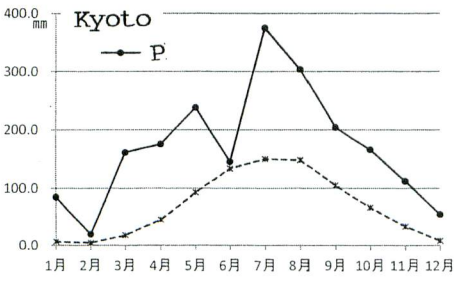[*]水不足量の計算は，奈良と京都の水不足が共に 0.0 mm 以上であった年のみで行った
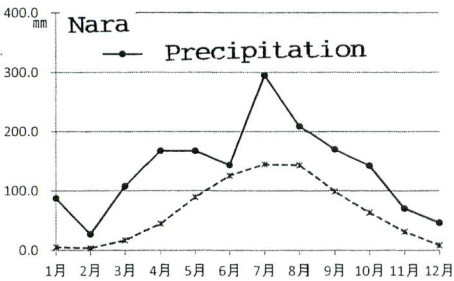
第 3-1 図　月別可能蒸発散量（P.E.）と降水量の比較（1980 年，奈良）

第 3-2 図　月別可能蒸発散量（P.E.）と降水量の比較（1980 年，京都）

第 3-3 図　月別可能蒸発散量（P.E.）と降水量の比較（1964 年，奈良）
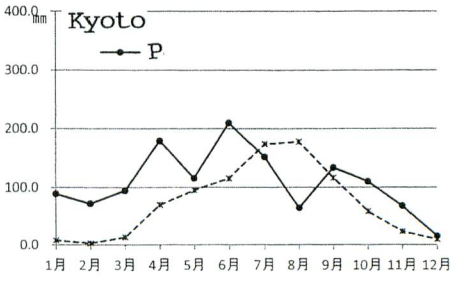
第 3-4 図　月別可能蒸発散量（P.E.）と降水量の比較（1964 年，京都）

Fig.3 Comparisons of monthly potential evapo-transpiration and precipitation in Nara and Kyoto

出現頻度

■Rf>0（水過剰）　☑Rf=0（水過不足0）
□Rf<0（水不足）

Fig.4　Comparison of water surplus and
water deficit in Nara and Kyoto(1954~2012)

Table 2　Climatic classifications by Thornthwaite's
method in Nara and Kyoto(1954~2012)

	Na (回 (%))	Ky (回 (%))
$AB_2'\,rb_3'$	5 (8.5)	11 (18.6)
$AB_2'\,rb_4'$	2 (3.4)	3 (5.1)
$AB_3'\,rb_3'$	0 (0.0)	4 (6.8)
$AB_3'\,rb_4'$	0 (0.0)	2 (3.4)
$B_4B_3'\,rb_4'$	1 (1.7)	0 (0.0)
$B_4B_3'\,rb_3'$	0 (0.0)	9 (15.2)
$B_4B_2'\,rb_4'$	3 (5.1)	0 (0.0)
$B_4B_2'\,rb_3'$	11 (18.6)	5 (8.5)
$B_3B_3'\,rb_4'$	0 (0.0)	1 (1.7)
$B_3B_3'\,rb_3'$	1 (1.7)	6 (10.1)
$B_3B_2'\,rb_4'$	1 (1.7)	1 (1.7)
$B_3B_2'\,rb_3'$	13 (22.0)	5 (8.5)
$B_3B_2'\,sb_3'$	1 (1.7)	0 (0.0)
$B_2B_3'\,rb_3'$	0 (0.0)	5 (8.5)
$B_2B_2'\,rb_3'$	14 (23.7)	1 (1.7)
$B_2B_2'\,rb_2'$	0 (0.0)	1 (1.7)
$B_1B_3'\,rb_3'$	0 (0.0)	2 (3.4)
$B_1B_2'\,rb_3'$	3 (5.1)	0 (0.0)
$B_1B_2'\,rb_2'$	1 (1.7)	0 (0.0)
$C_2B_3'\,rb_3'$	1 (1.7)	2 (3.4)
$C_2B_3'\,sb_3'$	0 (0.0)	1 (1.7)
$C_2B_2'\,rb_3'$	1 (1.7)	0 (0.0)
$C_2B_2'\,sb_3'$	1 (1.7)	0 (0.0)

■A: Perhumid　　☒B4: humid　　☑B3: humid
☒B2: humid　　☑B1: humid　　□C2: Moist Subhumid
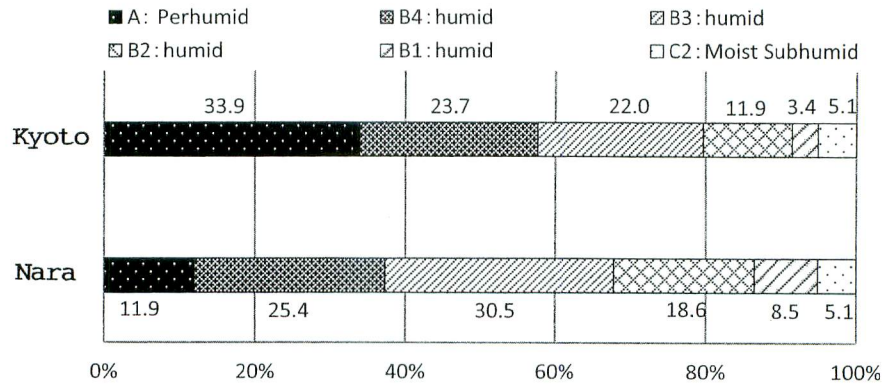
Fig.5　Classification of moisture index in Nara and Kyoto(1954~2012)