Hydrology and
Earth System
Sciences
Discussions

Interactive comment on "Characteristics and controlling factors of the drought runoff coefficient" *by* Rei Itsukushima

Anonymous Referee #1

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"general comments" This manuscript by Itsukushima clarified that the controlling factors of drought runoff coefficient depend on drought severity. As is mentioned in the manuscript, many researchers have pointed out the importance of the controlling factors introduced in this manuscript, but the quantitative analysis for them is not enough. Especially, the effective factors for the drought have not been clarified theoretically. I believe this manuscript contributes the effective water resource management. However, the following point is not clear for me. In this manuscript, snowfall and rainfall pattern is considered to be the important factor, but the related factors to them are not included in 11 (or 12) controlling factors. What is the relationship between snowfall or rainfall pattern and the selected controlling factors? I hope this point will be elucidated. Moreover, hypothesis of the mechanism in 4.2.2, which is about geological condition,

is a little bit unclear compared with other sections. I ask you to make discussion more convincing one.

"specific comments" Here are my line-by-line comments: 96 "The drought runoff coefficient of . . . by annual precipitation" How did you deal with the amount of water withdrawal upstream of the stations? I guess the amount of water withdrawal is not negligible during drought season in some rivers.

110 "topographical gradient" How did you calculate this parameter? Explain the definition by showing the difference from the channel slope.

122 "Of the 11 indicators" & 129 "10 controlling factors" I might misunderstand, but why are they 11 and 10? I thought you selected 12 factors in addition to the metamorphic rock. Then you excluded topographical gradient from them, right? Moreover, you show 12 controlling factors in Figure 4 while you excluded the topographical gradient. It is confusing.

122 "the topographical gradient was excluded" Why did you exclude the gradient instead of cropland? It is reasonable to exclude one of them, but it is necessary to consider the cause of strong correlation. Moreover, in the discussion chapter, it is better to discuss which is the fundamental cause of high or low drought runoff coefficient.

151 "CF and SR were . . . of the second axis" Isn't SR placed in the negative direction of the first axis, too?

186 Does "Gr" mean "TGr" in Figure 4? Unify the abbreviation. Moreover, didn't you exclude the topographical gradient from the analysis?

"4.1 Difference in drought runoff coefficient between areas" In this section, you analyzed the difference of runoff coefficient by focusing on the snowfall and rainfall pattern. You mentioned Group A corresponds to heavy snow area and Group C corresponds to southwest Japan. However, the relationship between these regional characteristics and 11 controlling factors is unclear. It seems that rainfall or snowfall pattern determine

the drought runoff coefficient regardless of 11 controlling factors, but the heavy snow area concentrates in the second and third quadrats where is characterized by low ratios of urban area and plutonic rock as well as high ratios of mixed coniferous-broadleaved forest. Explain the relationship carefully.

211 "Group C was composed of watersheds with a high ratio of sedimentary rock (Figure 4)." How about Group A? It may be related to my comment in line 151, but Group A seems to be composed of watersheds with a high ratio of sedimentary rock in Figure 4.

235 "Mushiake et al. (1981) used the average drought value based on a relatively short-term period." How do you think the average value on a short-term period differs from your values? Introduce the reason why their result is opposite to your result.

239 "Therefore, it is necessary for one to consider both geology type and geological age as indicators" Geological age of sedimentary rock and the difference between quanternary and old volcanic rock are the important factor as Mushiake or Yokoo and Oki showed before. But I do not know the study which addressed the geological age of granite. Explain your hypothesis how the geological age affects the runoff process.

"technical corrections"

Figure 2 "CR" in the legend is considered to be "CF"

Figure 4 & Table 2 Abbreviation of the Roundness is "Ro" in Figure 4 and is "RO" in Table 2. Unify the abbreviation.

191 "FR and CLR . . . were not selected" What is CLR? Isn't it Ro (RO)?