

Spatio-temporal Change of Extreme Drought Severity Due to Climate Change: Change of Standardized Precipitation Index (SPI)

○Kyoungjun KIM, Eiichi NAKAKITA, Toshiya MIYAKE, Yuichiro OKU

1. Introduction

Climate change may affect the water resources environment. Drought is a representative water-related extreme disaster. In this study, we applied the standardized precipitation index (hereafter SPI) to the assessment of climate change induced extreme drought. The outputs from MRI-AM20km were used to assess the spatio-temporal change of extreme drought events.

2. Standard Precipitation Index (SPI)

SPI has been widely used to monitor, assess and forecast the drought condition among a large number of drought indices like PDI, SWSI, SMI and so on. SPIs indicate whether current condition is dry or wet. Theoretically, SPIs range from $-\infty$ to $+\infty$, but generally those below -2.0 are regarded as extreme droughts. In this study, frequency, severity and seasonal change of extreme drought events were focused.

3. Results and discussions

The monthly maximum SPIs were calculated with respect to durations and months. Fig.1 shows the change of three months SPI (3-SPI) of May. For example, 3-SPI can express the agricultural drought and May is the most important period for agricultural activities. In Fig. 1, we can find the severity of extreme drought may be increased with very significant rate. From comparing frequency of extreme drought events and maximum drought severities, it could be found that even though the

extreme drought might not occur more frequently, the severity of drought might increase (Fig.2).

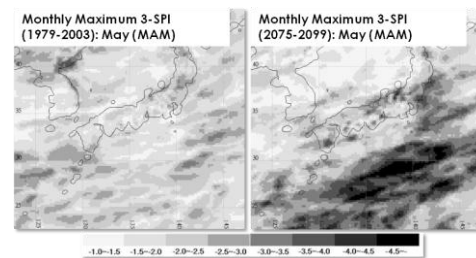


Fig.1. Change of maximum 3-SPIs of May to the current (left) and the end of 21st century (right).

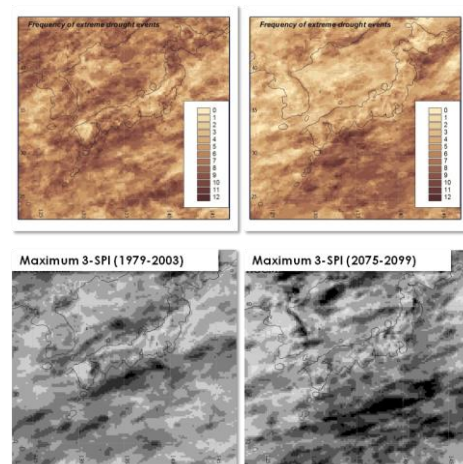


Fig.2. Frequency of extreme drought event (upper panel) and maximum drought severity (lower panel).

4. Conclusion

We can find that it is possible to assess the extreme drought using SPIs considering the seasonality of drought and the temporal scale. It, however, may be needed to validate the results using observed rainfall data and historical drought events. And in future it should be performed to apply to another climate scenario and to expand the study area to the East Asia.