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Study on the spatio-temporal variations of precipitation and soil moisture in Xinjiang, China

Haemi Park[1*], mei sun[1], Akihiko Kondoh[2], Ichirow Kaihotsu[3]

[1]Graduate Course of Science, Chiba Univer, [2]CEReS, Chiba University, [3]Hiroshima University

Xinjiang Uygur Autonomous Region is the arid land located in western part of China. Tian Shan Mountains divides south and north Xinjiang. Taklimakan is the largest desert in Asia, and is located in south Xinjiang. Climate of Xinjiang is arid due to large distance from oceans and leeward effect of Karakorum and Kunlun Mountains. Annual average precipitation is below 500 mm, however, rainfall intensity is large. Xinjiang is water scarce region based on the water budget, however, snowmelt water from mountains supports arid land agriculture and sometimes suffered by flash flood.

Soil moisture and its spatio-temporal variation affect regional water and energy budget. It is an important subject in climate change studies, and closely relate to the life of local people. This paper analyzes the characteristics of precipitation and soil moisture distribution, and their correlation.

Hydrological data in desert region hardly be obtained in such a sparsely populated region. Satellite observation should be utilized to monitor hydrological elements, such as precipitation and soil moisture. In this study, APHRODITE (Asian Precipitation - Highly-Resolved Observational Data Integration Towards Evaluation) is used to analyze the characteristics of precipitation. APHRODITE (Yatagai, 2007) is high spatial resolution (0.25 deg.) daily precipitation dataset. Ground observed data combined with satellite observation are used to interpolate point data to get gridded data. By using APHRODITE, maximum no-precipitation period, annual average precipitation, and relative precipitation intensity (RPI) are calculated and made distribution maps. RPI is a ratio of maximum daily precipitation over annual average precipitation.

Daily soil moisture datasets by AMSR-E (Kaihotsu et al., 2009) is used to characterize soil moisture distribution. Soil moisture distribution and its temporal variation is compared to APHRODITE's precipitation distribution.

Annual average precipitation in Xinjiang is ranged from 20 to 500 mm. Maximum no-precipitation period reaches 130 days. Relative precipitation intensity is more than 100 % in most area in Xinjiang. This shows large precipitation event is the characteristics in Xinjiang, and implies the occurrence of flash flood events.

Correlation between APHRODITE's precipitation and soil moisture by AMSR-E is high in summer and low in winter. Correlation is high in north Xinjiang. The characteristics of the both datasets will be presented in the JpGU meeting.

Keywords: Xinjiang Uygur Autonomous Region, precipitation characteristics, soil moisture, spatio-temporal variation, APHRODITE, AMSR-E