THE APPLICABILITY OF GCM INFORMATION FOR WATER RESOURCES MANAGEMENT IN KOREA

CHANG SAM JEONG [1], JUN-HAENG HEO [2],
DEG-HYO BAE [3], ICK HWAN KO [4]

[1]Senior Researcher, Water Resources Research Institute,
Korea Water Resources Corporation.
(Tel: +82-42-860-0433, e-mail: chs1229@kowaco.or.kr)
[2]Professor, School of Civil & Environmental Eng., Yonsei University, 134 Shinchon-Dong, Seodaemun-Gu, Seoul, 120-749, Republic of Korea.
(Tel: +82-2-2123-2805, Fax: +82-2-364-5300, e-mail: jhheo@yonsei.ac.kr)
[3]Associate Professor, Department of Civil & Environmental Engineering, Sejong University, 98 Gunja-Dong, Gwangjin-Gu, Seoul, 143-747, Republic of Korea.
(Tel: +82-2-3408-3814, Fax: +82-2-3408-3332, e-mail: dhbae@sejong.ac.kr)
[4]Director, Water Resources Research Institute,
Korea Water Resources Corporation
(e-mail: ihko@kowaco.or.kr)

Abstract

The objective of this study is to assess the applicability of GCM information for Korean water resources management through uncertainty analysis. The methods are based on probabilistic measures of the effectiveness of GCM simulations of an indicator variable for discriminating high versus low regional observations of a target variable. The formulation uses the significance probability of the Kolmogorov-Smirnov test for detecting differences between two variables. An estimator that accounts for climate model simulation and spatial association between the GCM data and observed data is used. Atmospheric general circulation model (AGCM) simulations done by ECMWF (European Centre for Medium-Range Weather Forecasts), and METRI (Meteorological Research Institute, Korea) were used for indicator variables, while observed mean areal precipitation (MAP) data, discharge data and mean areal temperature data on the seven major river basins in Korea were used for target variables. A Monte Carlo simulation was used to establish the significance of the estimator values. Monthly analyses by season and tercile discrimination condition were used for the analysis. The results show that GCM simulations are useful in discriminating the high from the low of the observed precipitation, discharge, and temperature values. Temperature especially can be useful regardless of model and season.

REFERENCES

Arakawa, A. and Schubert, W.H. (1974). "Interaction of a cumulus cloud ensemble with the large-scale environment Part I," *J. Atmos. Sci.*, Vol.31, pp. 674-701.

Georgakakos, K.P. (2003) "Probabilistic climate-model diagnostics for hydrologic and water resources impact studies," *J. Hydrometeorol.* Vol.4, pp. 92-105.

Hoskins, B.J. and Simmons, A.J. (1975). "A multi-layer spectral model and the semi-implicit method Quart," *J. Roy. Meteor. Soc.*, Vol.101, pp. 637-655.

Ryu, J.-H. (2001) *Implementation of an entraining-detraining plume model to the cumulus*

parameterization in the METRI GCM. PH. D. dissertation, Department of Atmospheric Sciences, Pusan National University, Pusan, 167pp. (in Korean).

Simmons, A.J. and Burridge, D.M. (1981). "An energy and angular-momentum conserving vertical finite difference scheme and hybrid vertical coordinates," *Mon. Wea. Rev.*, Vol. 109, pp. 758-766.

Tiedtke, M. (1989). "A comprehensive mass flux scheme for cumulus parameterization in large-scale models," *Mon. Wea. Rev.*, Vol.117, pp. 1779-1800.

Tokioka, T. A., Ymazaki, K., Yagai, I., and Kitoh, A. (1984). "A description of the Meteorological Research Institute atmospheric general circulation model (MRI GCM-I)," *MRI Tech. Report* No. 13, Meteorological Research Institute, Ibaraki-ken, Japan, 249 pp.