Geophysical Research Abstracts
Vol. 17, EGU2015-8020, 2015
EGU General Assembly 2015

Statistical Downscaling of AGCM Precipitation Output with a Formatted Regression Frame

Sunmin Kim (1), Yasoto Tachikawa (1), and Eiichi Nakakita (2)
(1) Graduate School of Engineering, Kyoto University, (2) Disaster Prevention Research Institute, Kyoto University

The downscaling issue has been taking an important role to bridge research in climate change and impact assessment. Especially, the SDS (statistical downscaling) issue has a long history of research and development in the field of hydrology and several types of SDS methods are already successful in other applications. The main advantage of SDS compared to DDS (dynamic downscaling) is that it does not take high computing resources, and can easily apply to any place with a minimum of observation data available.

However, SDS also has limitations. Some statistical relationships between model variables are not strong enough to build a stable SDS model. Most critically, we cannot sure whether the statistical relationship developed with the present climate data can simulate the statistical relationship of the future climate.

We have been developing a SDS method that can avoid the critical issue of the conventional SDS method, and take as many advantages of DDS as possible, based on analyzing two different spatial resolutions of AGCM outputs, 20-km and 60-km. By establishing a statistical relationship between the 60-km and 20-km output for both present and future separately, and by applying the relationship to the ensemble output of 60-km AGCM, it is able to produce ensemble output at 20-km spatial resolution with the independent statistical relationship for the present and future climates.

In details, the downscaling target is 60-km resolution of daily precipitation for 20-km resolution data. We have considered a window having (3x60-km)x(3x60-km) of area, and the downscaling target is the 3x3 of 20-km resolution grids in the center of the downscaling window. For the evaluation of the proposed method, we have prepared 15 years (1979-1993) of observation data, and identify the parameters with the square root information filter scheme. We optimize the parameters on a monthly basis, and apply the regression model to 10 more years of testing period (1994-2004). The proposed regression model provides very effective and efficient results with a certain level of estimation error.