Downscaling simulations of future climate in Poyang lake basin of China

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Abstract

In this research, a comparison between Coupled Model Inter-comparison Project Phase 5 (CMIP5) data and observations at 83 meteorological stations in Jiangxi province was carried out and a statistical downscaling scheme with a combination of regression method and high accuracy surface modelling method (HASM) was used to downscale the mean annual temperature(MAT) and mean annual precipitation (MAP). For MAT, ordinary least squares (OLS) linear equation that used latitude and elevation as explanatory variables was employed to give the spatial trend, and HASM was used to interpolate the residual. The method produced the MAT is abbreviated as HASM-OLS. For MAP, geographical weighted method (GWR) using latitude, longitude, elevation and impact coefficient of aspect as independent variables was applied to produce the spatial distribution, and HASM was used to modify the residual. This method is abbreviated as HASM-GB. The spatial downscaling from 1o to 1km grids for period 1976-2005 and future scenarios were achieved by using the mentioned downscaling methods. The prediction accuracy was assessed at validation site from Jiangxi province, with mean absolute error (MAE) and mean relative error (MRE). Results indicate that MAT was underestimated about 1.16oC while MAP was underestimated about 191.48mm in general in the whole land of Jiangxi province. The CMIP5 output exhibits large uncertainty. MAE of MAT was reduced by 72.90% and MRE of MAT was reduced by 72.91% after using downscaling method. Meanwhile, MAE and MRE of MAP were reduced by 51.52%, 51.54% respectively. In terms of downscaled scenarios of RCP2.6, RCP4.5 and RCP8.5, from T1(1975-2006) to T2(2011-2040),the whole land of Jiangxi would become drier under all the scenarios. And the MAE exhibits rising except in RCP 2.6. The study area would become wetter and warmer under all RCPs routines from T2 to T3(2041-2070) and T3 to T4(2071-2100), except in RCP2.6 scenario from T2 to T3.

Keywords: Downscaling method, Future climate, HASM, Temperature, Precipitation, Poyang lake, China

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