Present-day and future climate of seasonal surface temperature and precipitation over Malaysia using PRECIS regional climate modelling system

ABSTRACT

Climate change has an adverse impact on Malaysia, especially because the economics of the region rely on agriculture and natural resource development and extraction. The aim of this paper is to evaluate model performance and project future climate scenarios for Malaysia based on the A2 and B2 emission scenarios of the IPCC. Boundary conditions were obtained from the global atmospheric model HadAM3H using the PRECIS-RCM as a downscaling tool. For the present-day climate, an evaluation test between downscaled model with observation and reanalysis data indicates that the model simulate the surface temperature well, by producing a slightly cold bias. Meanwhile, the precipitation did not perform as well as temperature especially in DJF. In the future period 2071-2100, the Malaysian domain is expected to experience a warming with the increase of surface temperature by 3.1°C and 2.2°C for the A2 and B2 scenarios respectively. Such changes are statistically significant at 95% confidence level for both scenarios over the whole domain of investigation. Moreover, the seasonal temperature in JJA was larger than DJF. The changing trends for precipitation are highly varied under the both scenarios. The mean annual precipitation decreased by about 11% and 13% for both scenarios, with respect to the present climate. In addition, there is a tendency for Malaysia country to be drier in the future. The dry precipitation in Malaysia during DJF was clearly higher than JJA. We performed a comparison analysis for Malaysia, with the focus on Malaysian Peninsula and Malaysian Borneo. In Malaysian Peninsula, the temperature is projected to have larger increases in surface temperature compared to Malaysian Borneo. For precipitation, Malaysian Borneo is projected to become drier than Peninsula Malaysia. However, the changing pattern is different in JJA, with response to the geographical location and atmospheric circulation. Study results suggest that a significant change in climate variability may potentially increase the climate-related risks.