Future Changes in Asian-Australian Monsoon and Vegetation Simulated by CMIP5 Coupled Climate Carbon Cycle Models

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The global monsoon is an essential component in maintaining the hydrological cycle in the globe. The monsoon and water cycle affect the terrestrial vegetation activity, which is in turn able to modify the climate. This study investigates the future changes of Asian-Australian monsoon characteristics in terms of the area and intensity of monsoon simulated by 14 earth system models (ESMs) from the phase five of the Coupled Model Intercomparison Project (CMIP5). These models are designed to simulate the interactive carbon cycle and associated vegetation changes. It is found that there is no significant change in the A-A monsoon domain. Overall the models tend to simulate the increase of global mean precipitation over land and the leaf area index (LAI). The change of precipitation over Asian-Australian monsoon (AAM) regions shows increase trend about 3.5 %/℃ and 1.8 %/℃ respectively. For focusing on the regional detail over Asian, the change rates of precipitation are region-dependent such as in Indian monsoon (3.6 %/℃), East Asian monsoon (4.6 %/℃) and West Northern Pacific monsoon (2.4 %/℃), respectively, as revealed from the multi-model ensemble mean. It is also found that the monsoon circulation shows decreasing trend with the rate of about 3.7 %/℃ for the Asian monsoon region and 3.3 %/℃ for the Australian monsoon region, respectively. The moisture budgets are compared between current and future climate in order to understand the impact of the vegetation change on the monsoon rainfall and contributions from the local evapotranspiration and large-scale water vapor transport by monsoon circulation.

Key words: CMIP5, Leaf area index (LAI), Future change, East Asia Monsoon

References

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