Assessment of IMERG precipitation over Taiwan at multiple timescales

Wan-Ru Huang, Ya-Hui Chang, and Pin-Yi Liu
National Taiwan Normal University, Department of Earth Sciences, Taipei, Taiwan (wrhuang@ntnu.edu.tw)

Since March 2014, the Global Precipitation Measurement (GPM) Integrated Multi-satellite Retrievals for GPM (IMERG) has provided satellite precipitation estimates across the globe. Using gridded surface precipitation data derived from local rain gauges as a reference, this study evaluated the performance of IMERG in depicting the spatial-temporal characteristics of precipitation variations over Taiwan at multiple (including annual, seasonal, intraseasonal, diurnal and semidiurnal) timescales. The analysis focused on the period of March 2014-February 2017. Our results show that, quantitatively, IMERG underestimated the magnitude of precipitation over most of Taiwan for all the examined timescales; spatially, the bias in variability was larger over the mountainous areas than over the plain areas; temporally, the bias in variability was larger in the warm seasons than in the cold seasons. Despite the magnitude differences, IMERG was capable of qualitatively depicting several distinct features of Taiwan precipitation changes, listed as follows: (1) a bimodal pattern, with a peak in May and another peak in September, in the annual evolution of precipitation area averaged over Taiwan; (2) a seasonal counterclockwise rotation feature, with the precipitation maximum located over northern Taiwan in the winter, over northwestern Taiwan in the spring, over southwest Taiwan in the summer and over eastern Taiwan in the autumn; (3) a 10-to-35-day intraseasonal oscillation feature, with a transition of variations from smaller amplitudes in the cold seasons to larger amplitudes in the warm seasons, occurring around mid-May (i.e., the so-called Meiyu onset in Taiwan); and (4) a roughly out-of-phase feature, with a morning precipitation maximum in the winter and an afternoon precipitation maximum in the other seasons, for the diurnal evolution of the area-averaged precipitation over Taiwan. In addition, IMERG was capable of qualitatively depicting the phase evolution of semidiurnal precipitation over Taiwan in most seasons, except for the winter season.