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Estimation of Thermodynamic and Dynamic Contribution on Regional Precipitation Intensity and Frequency Changes under Global Warming

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From global point of view, an increased tendency of mean precipitation, which is associated with a shift toward more intense and extreme precipitation, has been found in observations and global warming simulations. However, changes in regional precipitation might be different due to contributions of thermodynamic and dynamic components. It implies that changes in regional rainfall intensity and frequency, which is connected to regional mean precipitation changes, should be more complicated under global warming. To understand how regional intensity and frequency will change under global warming, the global warming simulations from the World Climate Research Programme (WCRP) Coupled Model Intercomparison Project phase 3 (CMIP3) multimodel dataset in the A1B scenario were examined in this study. Over regions with increased mean precipitation, positive precipitation anomaly is usually contributed by more frequent heavy rain and enhanced rainfall intensity, even though there are less light rain events in the future. On the other hand, over regions with decreased mean precipitation, negative precipitation anomaly is associated with decreases in frequency for almost every rain events and weakened rainfall intensity, even though there are more very heavy and light rain events. The thermodynamic component is uniform in different regions, and tends to enhance precipitation frequency and intensity, while the dynamic component varies with regions, and can either enhance or reduce precipitation frequency and intensity.