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Citation	The 10th General Assembly of the European Geosciences Union (EGU 2013), Vienna, Austria, 7-12 April 2013. In Geophysical Research Abstracts, 2013, v. 15, no. EGU2013-7170
Issued Date	2013
URL	http://hdl.handle.net/10722/190281
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Teleconnection between some climate patterns and global precipitation anomaly

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Many studies have shown that global climate patterns can affect the precipitation around the world. Since the relationship between some climate patterns like, El Niño–Southern Oscillation (ENSO), Indian Ocean Dipole (IOD), Arctic Oscillation (AO) and Antarctic Oscillation (AAO), with the global precipitation is not constant, a systematic analysis of the influence of the climate patterns on precipitation anomaly over the world is necessary. This motivates our current study. The global precipitation data used are from the Global Precipitation Climatology Project (GPCP), and the study period is from 1979 to 2011. First, this study develops a model to simulate the precipitation anomaly around the world using four key climate pattern indexes (namely, ENSO, IOD, AO and AAO index). Second, this study explores the varying relationship between the climate patterns and the global precipitation. Finally, this study explores the relationship between the climate patterns and some extreme precipitation events over the world.

The model in this study makes use of the climate pattern indexes as predictors, and then the influence of climate patterns on the regional precipitations can be identified. The study results reveal that the strength of the correlation of the climate patterns with the precipitation varies. Moreover, the stronger the relationship between climate patterns and the precipitation anomaly, the better the model performs. From the analysis of the regions with higher relationships between the precipitation and the climate patterns, this study discloses that the precipitation over different regions is significantly correlating with different major climate patterns. In addition, in some regions the dominating climate pattern, which affects the precipitation over the region, changes throughout the year, and this indicates that the precipitation over those regions may depend on different climate patterns in different seasons. Specifically, this study investigates the possible influence of these four climate patterns on some extreme precipitation events over the world during the study period. The study also explores the mechanism of the varying relationship between the climate patterns and the regional precipitations. This can validate the performance of the four index model. Overall, this study would be valuable for the prediction of extreme precipitation events through using different climate patterns.