

Springtime extratropical cyclones in Northeast Asia and their impacts on long-term precipitation trends

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Springtime extratropical cyclones (ETCs) in Northeast Asia and the associated precipitation anomalies are examined by objectively tracking ETCs from reanalysis data. The cluster analyses reveal that Northeast Asian cyclones are largely grouped into the two distinct tracks, i.e., north- and south-tracks, depending on their pathways. The south-track ETCs typically form over South China and travel toward the Japanese islands, while the north-track ETCs are first detected around Mongolia and move southeastward to the Korean peninsula. Unlike the latter ones, the former ones exhibit a significant negative trend in their occurrence frequency (-1.17 per decade from 1979 to 2014), explaining a negative precipitation trend over the broad regions from South China to the Kyushu islands. It is argued that the reduction of the south-track ETCs is at least in part caused by the strengthened convection over the tropical western Pacific. The resulting Gill-type response in the subtropics tends to drive reduced moisture supplies to Southern China, likely resulting in an unfavorable condition for the development of the south-track ETCs.

Key words: extratropical cyclone, precipitation, Northeast Asia, long-term change