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A quantitative study of moisture transport variation on the interdecadal variation of the summer precipitation in South China from 1979 to 2015

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The summer precipitation in South China (SC) has experienced a pronounced interdecadal variation during 1983–2013

with trend transition in the late 1990s. This study quantitatively investigates the precipitation variation and its connection to

water vapor transport by combining the Lagrangian trajectory-based Dynamic Recycling Model and the clustering method

of self-organizing map. The external moisture outside of SC explains most (84%) of the mean and the interdecadal variation

of the summer rainfall, mainly through the southwest transport pathways. A long-distance southwest pathway related to

cross-equatorial flow and eastward flow over the Northern Indian Ocean explains 31.5% of mean precipitation and 50.4% of

the upward precipitation trend before 1997. The other branch of the southwest pathways has relatively shorter length over

North Indian Ocean, South China Sea, and Southeast Asia, explaining 35.7% of the mean and 51.2% of the downward trend

after 1997. Also, for the downward trend, the westerly-driven moisture transport over Eurasia acts as the second contributor

(32.2%) to the precipitation decrease. However, the western-Pacific pathway explains the smallest portion (≤ 3%) of

the trends, suggesting weak influence from the subtropical high. The large-scale circulation anomaly in the form of zonal

and meridional wave trains control the interdecadal variability of the SC precipitation. It is found

that the circumglobal teleconnection

and Pacific–Japan teleconnection significantly correlate to the two wave trains, whose match relation strongly

modulates the trend transition in the 1990s for the SC summer precipitation.