

Future projections of western disturbances: a CMIP5 multi-model assessment

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Winters over north India and Pakistan are frequently punctuated by eastward-moving mid-tropospheric eddies, known as western disturbances (WDs). WDs are often associated with extreme precipitation events in this region, which are typically generated by an interaction of moist, lower-tropospheric, southerlies from the Arabian Sea and the steep orography of south Asia. The thermodynamics of both the subtropical westerly jet, in which WDs are embedded, and the tropical lower troposphere through which the induced southerly moisture flux passes, are expected to change under most future climate projections.

Here, we use an objective feature-tracking algorithm to identify WDs in CMIP5 future climate experiments. Almost all projections indicate a significant decline in frequency, with a trend of approximately -0.1/year in the RCP8.5 multi-model mean. Causes of this trend are discussed, particularly in the context of mid- and upper- tropospheric baroclinicity and barotropicity, and the implications of these results in the context of winter rainfall over Pakistan and north India are explored.

Key words: western disturbances, subtropical jet, baroclinicity, India, climate