

Effects of the North Pacific subtropical front on the Baiu/Meiyu rainband in a 60-km AGCM

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Atmospheric effects of the North Pacific subtropical sea surface temperature (SST) front (STF) on the Baiu/Meiyu rainband in late May are investigated using an atmospheric reanalysis and atmospheric general circulation model (AGCM) experiments. The Baiu/Meiyu rainband in the reanalysis is tilted to the northeast with minimum rainfall along the STF, consistent with satellite observations. The reanalysis data and two AGCM experiments based on high-resolution SST and spatially smoothed SST fields identify three effects of the STF. The first is ocean evaporation, which provides a large amount of moisture for the rainband, because of high SST in the STF region. The second is transient eddies, which induce the weak rainfall along the STF. Subsynoptic-scale lows that develop in the atmospheric baroclinic zone anchored by the STF, together with a synoptic high in the main storm track, bring about strong northeasterly winds, which carry dry air to the north of the STF and cause the eddy moisture divergence and the weak rainfall. The third is the mean cyclonic circulation, which forms over the STF and is associated with the intensified subtropical jet in the middle and lower troposphere. The mean cyclonic circulation intensifies the mean moisture convergence by convergent flows and advection, causing the rainband to tilt northeastward. The mechanism of the mean cyclonic circulation is discussed.

Keywords: SST front, Rainband