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# Impact of the Pacific–Japan Teleconnection Pattern on July Sea Fog over the Northwestern Pacific: Interannual Variations and Global Warming Effect

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The northwestern Pacific (NWP) is a fog-prone area, especially the ocean east of the Kuril Islands. The present study analyzes how the Pacific–Japan (PJ) teleconnection pattern influences July sea fog in the fog-prone area (where sea fog occurrence frequency is high) using independent datasets. The covariation between the PJ index and sea fog frequency (SFF) index in July indicates a close correlation, with a coefficient of 0.62 exceeding the 99% confidence level. Composite analysis based on the PJ index, a case study, and model analysis based on GFDL-ESM2M, show that in high PJ index years the convection over the east of the Philippines strengthens and then triggers a Rossby wave, which propagates northward to maintain an anticyclonic anomaly in the midlatitudes, indicating a northeastward shift of the Northwestern Pacific subtropical high. The anticyclonic anomaly facilitates the formation of relatively stable atmospheric stratification or even an inversion layer in the lower level of the troposphere, and strengthens the horizontal southerly moisture transportation from the tropical–subtropical oceans to the fog-prone area. On the other hand, a greater meridional SST gradient over the cold flank of the Kuroshio Extension, due to ocean downwelling, is produced by the anticyclonic wind stress anomaly. Both of these two aspects are favorable for the warm and humid air to cool, condense, and form fog droplets, when air masses cross the SST front. The opposite circumstances occur in low PJ index years, which are not conducive to the formation of sea fog. Finally, a multi-model ensemble mean projection reveals a prominent downward trend of the PJ index after the 2030s, implying a possible decline of the SFF in this period under the conditions of RCP4.5 scenario from CMIP5 data.