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Analysis of the boundary layer characteristics and cause for a spring sea fog over Fujian

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Abstract: A large-scale sea fog developed from south to north in Fujian coastal area and Taiwan Strait on March 3-4 2018. Fujian coastal automatic station, buoy station data, microwave radiometer, wind profiler radar, FY-2F satellite data and ERA-Interim reanalysis data are used to analyze the causes, formation and elimination mechanism of sea fog, the boundary layer characteristics and the air-sea interaction are analyzed intensively. The results show that the maintenance of near-surface inversion layer, the humidity area, the middle dry and warm cover layer, small wind speed and temperature dew point, the increase of liquid water content and integrated water vapor are beneficial to the formation of sea fog. The reduction of vertical wind shear contribute to the warm and humid air in the lower layer difficult to transport upward, which is beneficial to the formation and development of sea fog. Water vapor from the western Pacific is transported to Fujian coast and the Taiwan Strait, the high value area of 925~1000 hPa water vapor flux is over the sea, the vapor flux convergence between Fujian coast and Taiwan Strait are different. The air-sea temperature difference in the range of 0-3 centigrade is favorable for the formation and development of sea fog, which makes the cooling of warm and humid air above the cold sea surface reach saturation to form sea fog. Turbulent heat transfer between air and sea is the cooling mechanism of sea fog, there are negative latent heat flux and positive sensible heat flux during the occurrence, development and maintenance of sea fog.

Keywords: sea fog, air-sea temperature difference, boundary layer characteristics, heat flux