



Analysis and Numerical Modeling of A Heavy Coastal Fog Event over Mid-latitude Ocean in 2016

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A heavy coastal fog episode that occurred over the Bohai Sea on 18-19 November 2016 is investigated. The coastal fog patch, with a spatial scale of 900 kilometers from Hebei to Jilin province with southwest-northeast direction along the west coastline of the Bohai, the width of fog region from 100 km along coastal areas at its formation stage to the whole Bohai area and the north-west of the Yellow sea at its mature stage, reduced visibility to 133m or much less at most sites. Himawari-5 satellite images, surface and offshore platform observations, and sounding analyses are used to describe and analyze this event. The analysis indicates that the fog can be categorized as frontal cooling fog with fog top up to 700 m. The main features of this coastal fog including fog area and its movement are reasonably reproduced by the Weather Research and Forecasting Model (WRF). Model results suggest as: due to the stable westerly wind of the bottom of the polar cloud cyclone and high-pressure system locating at the East sea, southwesterly warm/moist advection resulted in a strong sea-surface-based inversion with its high to 925hPa; the passage of western weak cold front coming together with long wave radiation cooling, the fog occurs at inland areas firstly before dawn, then extends to offshore and occupies further to the north of the Yellow sea finally, although the local Air-sea temperature difference is up to 7 Celsius; the western weak cold front is the trigger of the coastal thick fog; but slightly stronger cold wind destroyed the inversion and dissipated the coastal fog. Model modification also shows the sensibility of the initial field. The latest initial field fails to repeat the fog event while 12 hours earlier initial field perfectly.