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Statistical Analysis and Case Study of the Evaporation Duct over South China Sea

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Atmospheric duct is a local inversion phenomenon that occurs in the lower atmosphere by the sea-air interaction. When it happens, electromagnetic waves are often affected by atmospheric refraction, resulting in deviations in the propagation path, and affects the effectiveness of communications and radar equipment. Atmospheric ducts often appear on the ocean in East Asia, especially the evaporation ducts in the low altitude. Evaporation ducts, which are caused by a rapid decrease in the refractive index of the lower atmosphere, are known to trap radio waves between the evaporation duct layer and the sea surface, and it exist over large bodies of water such as a sea or ocean, offers the possibility of long-range communication link because of a high percentage of occurrence with acceptable average duct height which allows trapping of radio wave propagation, primarily in the tropical regions of the world.

This study analyzes the evaporation duct height distribution that calculated by the WRF and the Paulus-Jeske evaporation duct model under two different weather patterns in 2017, and uses the high-resolution sounding data of the Dongsha Island, Taiping Island and R.V. Ocean Research I in the 2017 South China Sea Two-Island Monsoon experiment (SCSTIMX),and it was found that the results of the Paulus-Jeske evaporation duct model were lower than the results of the sounding data, indicating the Paulus-Jeske evaporation duct model is not applicable in the South China Sea atmosphere and walrus environment; in addition, after correcting the important parameters of the Paulus-Jeske evaporation duct model according to the characteristics of the South China Sea environment, the accuracy of the results can be greatly improved.