Remote Sensing of an Atmospheric Front over the South China Sea caused by the Strengthening of the Northeast Monsoon

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An atmospheric frontal system over the South China Sea caused by the strengthening of the northeast monsoon is investigated by using multi-sensor satellite data, weather radar data, and a numerical model. The strengthening is caused by the replenishment of the northeast monsoon due to the merging of two high pressure areas over the Chinese continent. The near-sea surface wind field associated with this event was measured by the Advanced Scatterometer (ASCAT) onboard the European MetOp satellite and the Advanced Synthetic Aperture Radar (ASAR) onboard the European Envisat satellite. The high resolution ASAR image reveals unprecedented details of the coastal near-sea surface wind field and the frontal line separating this wind field from the synoptic-scale ambient wind field. It shows rain cells embedded in the frontal line as confirmed by weather radar images of the Hong Kong Observatory. Information on the time evolution of the frontal line is obtained by combining the ASCAT and ASAR data with 1) cloud images from the Japanese geostationary satellite MTSAT-1R, 2) weather radar images from the Hong Kong Observatory, and 3) cloud liquid water content maps retrieved from the American DMSP F-15 satellite
Finally, the remote sensing data are compared with simulation results of the pre-operational version of AIR (Atmospheric Integrated Rapid-cycle) forecast model of the Hong Kong Observatory. We find that the AIR forecast model can successfully prognosticate the evolution of the frontal system, in good agreement with the observational data.