Convective bursts with gravity waves in tropical cyclones: case study with the Himawari-8 satellite and idealized numerical study

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Convective bursts occur frequently in tropical cyclones and help their intensification by diabatic heating, but their quantitative importance has not been established. By using the high-frequency observation of infrared brightness temperature with Himawari-8, a latest-generation geostationary meteorological satellite, convective bursts in Typhoon Lan (2017) were studied. Aided with a series of numerical simulations, it was revealed that the anvil edges of many bursts are associated with finite-amplitude gravity waves consistent with internal bores, creating warm anomalies by subsidence ahead of the edges. As the edges spread, they are thinned, and their propagation speeds are often decreased. In many such instances, gravity waves, now linear, are separated from the edges to propagate away, spreading convective heating. It is proposed that by quantifying these processes with geostationary satellites, diabatic heating by convective bursts can be estimated to diagnose their impacts on tropical-cyclone intensification.

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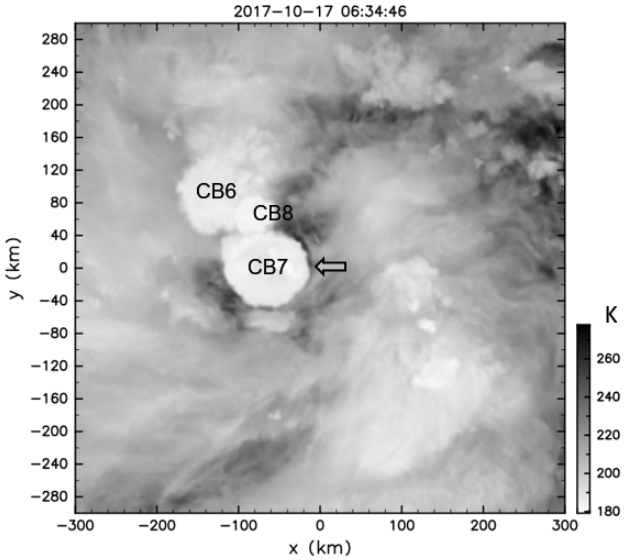
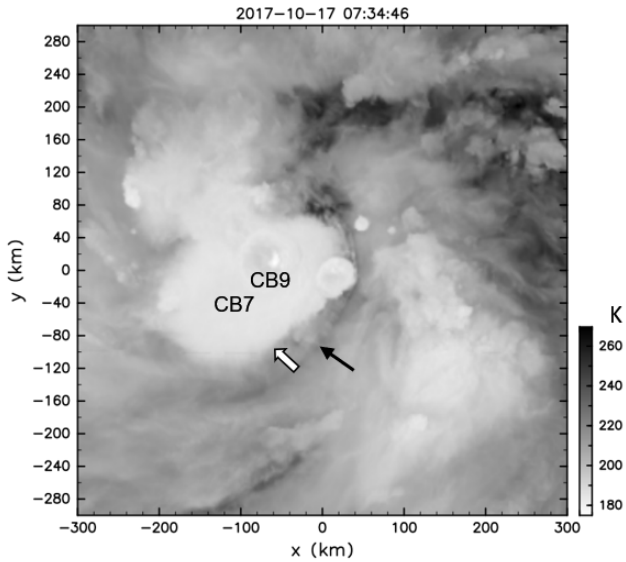


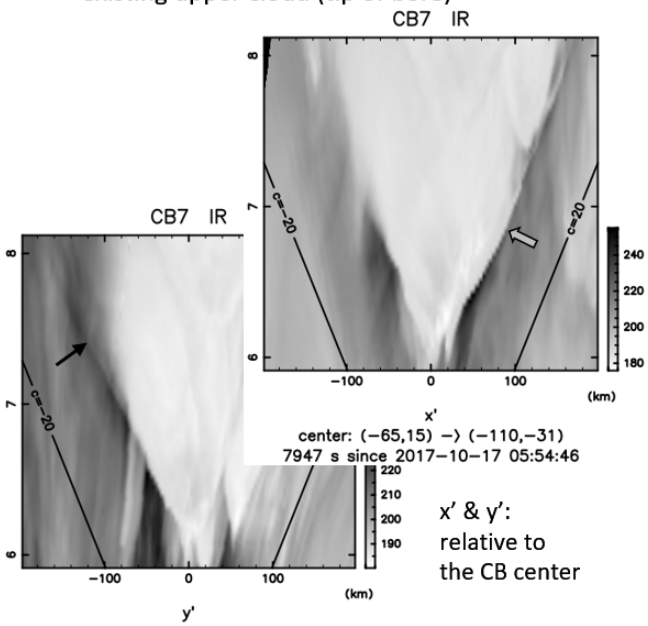


⇦ : sharp CB anvil edge fringed by brightness T increase by downward displacement of pre-existing upper cloud (tip of bore)

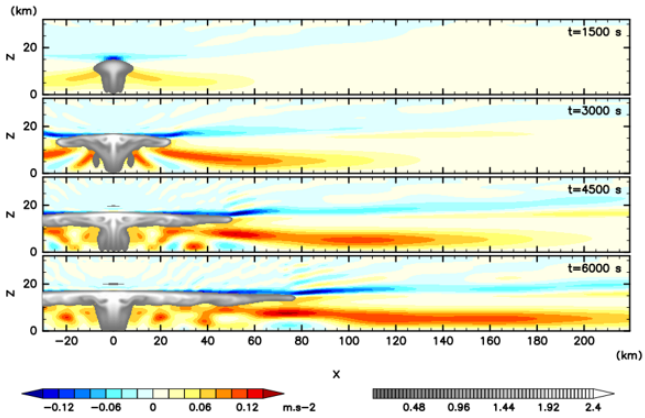
⇖ : obscured anvil edge

↖ : tip of gravity wave separated from the anvil edge

x & y: relative to the TC center (best track)



x' & y': relative to the CB center



buoyancy ∝ T anomaly

passive scalar ~ cloud