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The convective destabilization of tropical atmosphere by an approaching upper-level trough: A case study in the Eastern Australian Region

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The thermodynamic contribution from an upper-level trough of the mid-latitude baroclinic system to the convective destabilization of tropical atmosphere is investigated in cases of tropical cyclones Rewa and Theodore developed in the Eastern Australian region. The data sets from the European Centre for Medium-Range Forecasts (ECMWF) 40 years Re-analysis (ERA-40) are used for the analysis of Convective Available Potential Energy (CAPE), Convective Inhibition (CIN). The upper-level cooling accompanying the equatorwards penetration of upper-level trough increases the value of CAPE in the tropical region below. The meridional extension of upper-level trough is important for the development of meso-scale convective systems because the values of CAPE in the tropical region are dependent on the proximity to the upper-level cooling above there. However, CAPE values around the tropical cyclone at the eastern side of upper-level trough, where the upper-level cooling does not occur, are not influenced by the approach of upper-level trough. The CIN is removed broadly around the centre of tropical cyclone due to the strong surface flux while the diurnal variation of CIN is generally notable in other regions. Therefore, The large scale ascending motion near the axis of upper-level trough is not critical to the CAPE and CIN around the tropical cyclone. However, The feedback between the outflow from a tropical cyclone at the entrance of the upper-level jet results in the meridional scale change of the jet and increase of zonal temperature gradient at the surface below the jet. The understanding of the time evolution of baroclinic wave system interacting with convective systems is also necessary for the prediction of intensity change of those convective systems.