Department of Atmospheric Sciences & IPRC
Joint Seminar Announcement

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A New Time-dependent Theory of Tropical Cyclone Intensification

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You are invited to our weekly online Atmospheric Sciences Fall 2021 seminars via Zoom meeting.
When: November 3, 2021 at 3:30PM HST
Meeting admission: 3:15PM HST

Register in advance for this meeting:
https://hawaii.zoom.us/meeting/register/tJwlcOmtpz8iGtFAfj1LmB2t-J89CV76hI1s

After registering, you will receive a confirmation email containing information about joining the meeting.
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Abstract:

In this study, the boundary-layer tangential wind budget equation following the radius of maximum wind, together with an assumed thermodynamical quasi-equilibrium boundary layer is used to derive a new equation for tropical cyclone (TC) intensification rate (IR). A TC is assumed to be axisymmetric in thermal wind balance with eyewall convection becoming in moist slantwise neutrality in the free atmosphere above the boundary layer as the storm intensifies as found recently based on idealized numerical simulations. An *ad-hoc* parameter is introduced to measure the degree of congruence of the absolute angular momentum and the entropy surfaces. The new IR equation is evaluated using results from idealized ensemble full-physics axisymmetric numerical simulations. Results show that the new IR equation can reproduce the time evolution of the simulated TC intensity. The new IR equation indicates a strong dependence of IR on both TC intensity and the corresponding maximum potential intensity (MPI). A new finding is the dependence of TC IR on the square of the MPI in terms of the near-surface wind speed for any given relative intensity. Results from some numerical integrations of the new IR equation also suggest the finite-amplitude nature of TC genesis. In addition, the new IR theory is also supported by some preliminary results based on best-track TC data over the North Atlantic and eastern and western North Pacific. Compared with the available time-dependent theories of TC intensification, the new IR equation can provide a realistic intensity-dependent IR during weak intensity stage as in observations.