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Why do tropical cyclones intensify more rapidly at low latitudes? [seminar announcement]

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GRADUATE SCHOOL OF ENGINEERING AND APPLIED SCIENCES
DEPARTMENT OF METEOROLOGY
NAVAL POSTGRADUATE SCHOOL
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Seminar
Naval Postgraduate School
Root Hall, Room 117
Monday February 24, 2014
1400

WHY DO MODEL TROPICAL CYCLONES INTENSIFY MORE RAPIDLY AT LOW LATITUDES?

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Abstract

We examine the problem of why model tropical cyclones intensify more rapidly at low latitudes. Our answer to this question touches on practically all facets of the dynamics and thermodynamics of tropical cyclones. The answer invokes the conventional spin up mechanism as articulated in classical and recent work together with a boundary layer feedback mechanism linking the strength of the boundary layer inflow to that of the diabatic forcing of the meridional overturning circulation.

The specific role of the frictional boundary layer in regulating the dependence of the intensification rate on latitude is discussed. It is shown that, even if the tangential wind profile at the top of the boundary layer is held fixed, a simple, steady boundary layer model produces stronger low-level inflow and stronger and more confined ascent out of the boundary layer found in the time-dependent, three-dimensional numerical model as the latitude of the calculation is decreased. In an azimuthally-averaged view of the problem, the most prominent quantitative difference between the time-dependent simulations at 10°N and 30°N is the much larger diabatic heating rate and its radial gradient above the boundary layer at the lower latitude. This difference, in conjunction with the convectively-induced convergence of absolute angular momentum, greatly surpasses the effects of rotational stiffness (inertial stability) and evaporative-wind feedback that have been proposed in some prior explanations.