

## On the relationship between potential intensity and CAPE

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Two approaches to diagnosing the potential intensity (PI) of tropical cyclones are compared. One uses concise expressions that refer only to bulk properties of the environment and the other uses pairs of evaluations of CAPE. We obtain concise expressions for PI that are fully consistent with the underlying model and a realistic treatment of water substance, except for small errors in the irreversible case. We also identify the approximations specific to the CAPE algorithm and show that they are similarly small.

To organize the different definitions of PI in the literature, we propose a classification based on two key distinctions: 1) whether the storm environment is taken from the observed sounding or a moist-neutral one and 2) whether the pressure intensity is coupled to the velocity at the outer eyewall. Using the observed environment in the CAPE algorithm intensifies the vortex by 60 hPa (40 hPa in the reversible limit). Coupling to the velocity has a minor effect on the surface pressure despite removing much of its sensitivity to the eyewall relative humidity.

The concise expressions can be linearized to allow computation of PI without iteration on the surface pressure. The errors due to the linearization are found to be insignificant.