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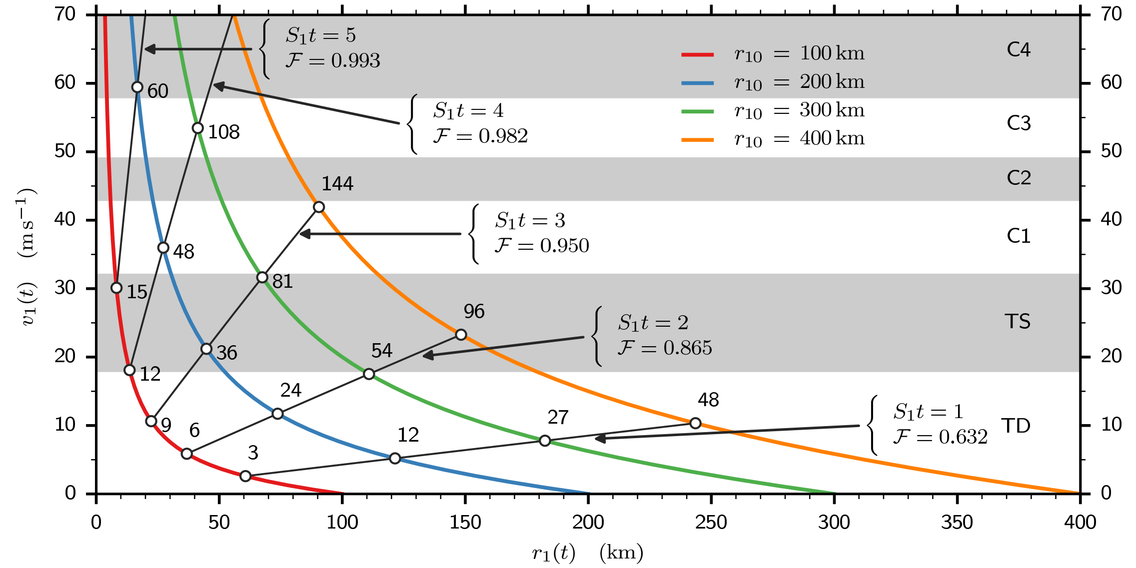

Fig. 2. Results from the two-region forced, balanced model. Plots of $v_1(t)$ versus $r_1(t)$ for four vortices that evolve from resting states with $r_{10} = 100, 200, 300, 400$ km. Labels on the right stand for tropical depression (TD), tropical storm (TS), and Category 1–4 hurricanes. The five thin black lines indicate points of similar dimensionless time ($S_1 t = 1, 2, 3, 4, 5$) and fractional volume removed ($\mathcal{F} = 0.632, 0.865, 0.950, 0.982, 0.993$). The numbers along each curve denote the time (in hours) under the assumption that the respective values of S_1 are $(3\,\text{h})^{-1}$, $(12\,\text{h})^{-1}$, $(27\,\text{h})^{-1}$, $(48\,\text{h})^{-1}$, which means that $S_1 r_{10}^2$ is the same on each colored curve.

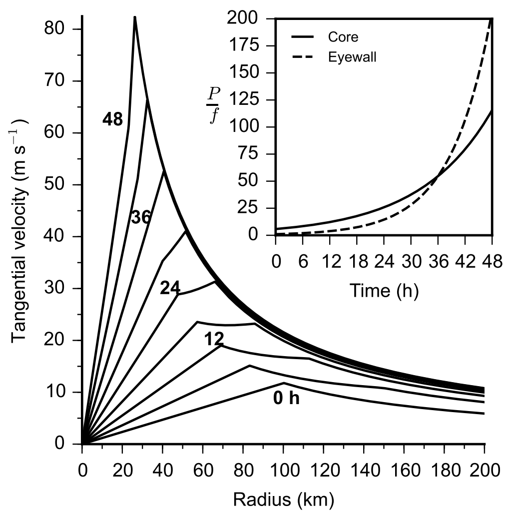

Fig. 6. Radial profiles of tangential wind at 6 h intervals for the three-region model. The kinks in $v(r,t)$ occur at the absolute angular momentum surfaces $r_1(t)$ and $r_2(t)$. Note that the radius of maximum wind shifts from r_1 to r_2 at $t \approx 18$ h. The figure insert shows the core potential vorticity (PV) and the eyewall PV as functions of time. Note that the vortex changes from a monotonic PV structure (highest PV in the core) to a hollow PV structure (highest PV in the eyewall) at $t = 36$ h.

- This study explores applications of the Salmon wave-vortex approximation to tropical cyclone intensification. The approximation can be used to describe flows with high Rossby number and low Froude number by providing analytic solutions to an elliptic problem.
- Results from the two-region forced, balanced model show why topical cyclones can have long incubation times prior to rapid intensification and provide insight into the size of the mature vortex (Fig. 2).
- Figure 6 shows results from the three-region forced, balanced model. Insight into the formation of hollow potential vorticity (PV) structures and the inward movement of angular momentum surfaces across the radius of maximum wind are provided.