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Transition Time Scales in Taylor Couette Flow RICHARD M. LUEPTOW, Northwestern University, OLIVIER CZARNY, Association Euratom-CEA — The time scale for onset and decay of vortices in a Taylor Couette system cannot be predicted from linear stability analysis, yet is important from a practical standpoint. A two-dimensional pseudo-spectral direct numerical simulation was used to examine the time scales for subcritical-to-supercritical transition and supercritical-to-subcritical transition for a variety of aspect ratios ($\Gamma = H/d = 8$, 16, 24, 32, 40, ∞) and radius ratios ($\eta = 0.5$, 0.7, and 0.9) with only the inner cylinder rotating. A time scale based on the distance between the endwalls of the system along with the viscosity and rotational speed seems to be most appropriate for the onset of Taylor vortices, although no time scale collapses the data for all aspect ratios and radius ratios. For decay, a viscous time scale using the gap width as the length scale collapses the data, especially as the aspect ratio gets large. These results indicate that the onset of vortices is a consequence of the propagation of vortical structures related to the endwalls, while decay is related to viscous dissipation from the sidewalls.

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