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The mechanisms of convective and standing wave mode generation in the wake behind very slender asisymmetric bodies by selective excitation of unstable helical modes JOSEPH T.C. LIU, KESEOK LEE, School of Engineering, Brown University — Experiments of Asai, et al. (2011) confirm earlier experiments of Sato & Okada (1966), Peterson & Hama (1976) that, for sufficiently slender axisymmetric bodies of revolution placed in a stream parallel to the axes, only convectively unstable modes exist. However, in the downstream nonlinear region, the present theoretical/computational work shows that the imposition of the most unstable helical modes results in the generation of a stationary harmonic-helical mode that persists downstream. This is elucidated from energy transfer mechanism from the mean flow and inter-mode energy transfer via triad interactions. While absolute unstable modes behind bluff bodies of revolution are a natural occurrence according to the linear theory, the presence of such modes behind very slender bodies of revolution is a consequence of downstream nonlinear interactions between the excited helical modes.

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