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3D accretion disks: investigation of global transient dynamics

PAOLA REBUSCO, MIT, ORKAN UMURHAN, Queen Mary - London, WLODEK KLUZNIAK, Zielona Gora University, ODED REGEV, Technion/Columbia University — Accretion disks are both important and ubiquitous astrophysical objects. In this work we considered the approximate nonlinear dynamics of a disturbed hydrodynamical viscous thin disk with vertical structure. By means of an asymptotic expansion we find the temporal evolution of global non-axisymmetric perturbations. While in the first order all the variables decay, in the second order the perturbed density and vertical velocity display a strong transient growth. As these perturbations grow they wind and display successive radial peaks and troughs. We argue that these transient non-axisymmetric structures may be a critical element for a new alternative picture of development of turbulence in non-magnetized astrophysical disks.

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