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Análisis de la Sección Transversal y la Turbulencia Inducida por la Inestabilidad Magnetorrotacional en Toros de Acreción bajo Distintas Configuraciones de β

A numerical study of the temporal evolution of a magnetized accretion torus is presented. Using the FLASH code with Adaptive Mesh Refinement (AMR), Magnetohydrodynamic (MHD) simulations were performed to analyze the Magnetorotational Instability (MRI) under varying plasma-beta (β) configurations. The simulation employed the Paczyński-Wiita pseudo-Newtonian potential to model gravity and initialized the gas in adiabatic equilibrium.Results demonstrate that lower β configurations significantly accelerated the exponential magnetic energy growth consistent with the MRI linear phase, leading to earlier turbulent saturation. This observation suggests that the highly magnetized plasma regime facilitates a more rapid or efficient growth mechanism for the MRI. The formation of radial inflows and increased thermal energy confirm efficient angular momentum transport, validating the code's ability to reproduce complex accretion torus dynamics.Crucially, the reduction of β resulted in higher turbulence levels, directly increasing the mass dispersion. The derived vertical scale height (H), defined as the density-weighted standard deviation , was observed to increase over time, consistent with this enhanced turbulent pressure. Furthermore, by implementing kurtosis as a statistical diagnostic of the vertical density distribution, a broadening of mass profiles was identified. This broadening manifested as a direct increase in kurtosis, clearly correlating the enhanced MRI-driven turbulence with torus thickening.

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