

The Anatomy of Angular Momentum in Galactic Discs: Insights from TNG50

Juan Manuel Pacheco-Arias¹, Benoît Epinat^{1,2}, Philippe Amram¹, and Wilfried Mercier¹

¹*Aix-Marseille Univ., CNRS, CNES, LAM, 38 Rue Frédéric Joliot Curie, 13338 Marseille, France*

²*French-Chilean Laboratory for Astronomy, IRL 3386, CNRS and Universidad de Concepción, Departamento de Astronomía, Barrio Universitario s/n, Concepción, Chile*

Angular momentum is a fundamental property in the numerical modelling of galaxies across all scales, yet its spatial distribution within galactic discs remains poorly understood. In this talk, I present a detailed analysis of its resolved structure for the first time. Using stellar specific angular momentum maps from the TNG50 MW/M31 galaxy sample, we characterise how morphological substructures—such as rings, bars, spiral arms, and asymmetries—store and redistribute angular momentum in a cosmological context.

This approach allows us to probe scales down to ~ 500 pc, complementing traditional studies where this quantity is treated as globally integrated. We find that the dynamical properties of dark matter haloes have little impact on internal angular momentum redistribution, while gas content and stellar feedback play a dominant role in shaping the morpho-kinematic evolution of discs.

Based on these results, we propose a model for the secular evolution of stellar specific angular momentum within ILLUSTRISTNG50 that reproduces recent observational findings (Pacheco-Arias, et al. 2026). Future work will extend this analysis to a wider range of simulations to explore the role of environment, interactions, and feedback mechanisms in driving angular momentum redistribution and, ultimately, galaxy evolution.