

Internship 2025/2026

Year: M2

Laboratory : Laboratoire d'Astrophysique de Marseille (LAM)

Research Team : Galaxies, Etoiles et Cosmologie (GECO)

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Project Title : Angular Momentum of Spiral Galaxies

Keywords : Astrophysics, Galaxies, Kinematics, Dynamics, Cosmology

Description: The angular momentum $\mathbf{J}$ is a physical quantity representing the cross product of the position $\mathbf{R}$ and velocity $\mathbf{V}$ vectors multiplied by the mass M : $\mathbf{J} = \mathbf{R} \times M \mathbf{V}$. For a galaxy, most of the angular momentum is found within its disk [e.g. 1]. In the central bulge or in the dark matter halo, due to random motion of the components, the resulting angular momentum is lower. It is useful to consider the specific angular momentum vector $\mathbf{j} = \mathbf{J}/M$, to remove the implicit mass scaling dependence. The specific angular momentum is a universal parameter defined for all galaxies which is conserved for isolated galaxies, but which varies during galaxy formation, galaxy interaction and galaxy merger. This universality motivates the use of the angular momentum as parameter to describe and classify galaxies. In the scenario of the cold dark matter hierarchical Universe (Λ CDM), the galaxies were born in halo of dark matter from collapsing baryonic matter, and the angular momentum have been transferred by the gravitational interaction. These processes are known as the tidal torque theory and were integrated within the hierarchical framework of galaxy formation in the Λ CDM paradigm [e.g. 2,3].

We have developed a new methodology for computing the spatial distribution of the stellar specific angular momentum and introduced a new classification scheme to tackle the physical mechanisms driving the acquisition and redistribution of angular momentum [4,5]. The aim of this internship is to study the spatial distribution of the stellar specific angular momentum for a sample of galaxies for which we have all the data.

References:

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