



PHYSICS AND ASTRONOMY SEMINAR

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Dynamics of Spiral Structure in Disk Galaxies

Abstract

In the nearby Universe, 70% of galaxies are characterized by a disk with prominent spiral arms, although our knowledge of spiral structures and their origin is still incomplete. Traditional attempts to understand galaxy morphology assume that galaxies have been perturbed by major external forces. In particular, some recent models have focused on dwarf satellite galaxies, visible or dark, to produce the spiral structures through interactions with a galactic disk. Here we report simulations of unprecedented size, following the motions of 100 million stellar particles under the influence of gravity. We compute the response of a stellar disk to perturbations caused by the collective effects of giant molecular clouds co-rotating with the stellar disk, which results in the formation of spiral arms through a process termed swing amplification. However, our results reveal outcomes unanticipated by the swing amplification theory, where spiral structure can be long-lived and how the long-term morphology is shaped by inhomogeneities in the disk that later sustain themselves. Contrary to previous claims, we argue that low-mass mergers likely play only a minor role in the development of spiral structure and our new results therefore allow for a new interpretation of the observational data.

Monday, November 07, 2011

11:00 a.m.

Clearihue Building

Room C108