TOPIC 5a - Theory of debris disks: Dynamics

Planet-Debris Disk Interactions: A Theoretical Tapestry

Our Invited Speaker

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While the number of exoplanets has surged in recent decades, the exploration of the outer regions of planetary systems has lagged behind, primarily due to the limitations of current detection techniques. A promising, indirect avenue to bridge this gap is offered by debris disks – exoplanetary cousins of our Solar System's asteroid and Kuiper belts. Debris disks, ubiquitous in planetary systems, encapsulate records of past and ongoing processes, including interactions with planets. Thus, deciphering debris disks serves as a unique lens to unravel the intricacies of planetary system formation, architecture, and evolution, and potentially unveiling hidden planets. In this talk, I review the theoretical landscape of planet-debris disk interactions, tracing its historical evolution and elucidating the diverse methods employed to constrain the presence and parameters of yet-undetected planets within debris-hosting systems. Specifically, I explore the existing theoretical tapestry designed to explicate commonly observed structures in debris disks, highlighting both its strengths and limitations. Emphasizing the often-overlooked role of disk gravity in shaping some of these structures, I then delve deeper into the potential insights that future detections or non-detections of planets, facilitated by instruments such as JWST, can provide regarding planetary systems.