Cold, Warm and Hot Dust in Extrasolar Planetary Systems

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It has now been exactly 30 years that belts of rocks and dust around Main sequence stars have been discovered. These so-called debris disks are thought to represent the leftovers from planet formation. Like in the solar system, debris disks around other stars come in different flavors, from cold exo-Kuiper belts to warm and hot exo-asteroids and exozodiacal belts. The former are by far the most studied, thanks in particular to a fleet of space facilities like IRAS, ISO, HST, Spitzer and Herschel.

About one third of nearby stars are now known to host cold dusty debris disks, which are thought to derive from collisions in Kuiper Belt analogs at tens to hundreds of AU from their host stars. Spatially resolved cold debris disks usually show asymmetries and structures caused by detected or suspected planets. Much less was known until recently about the dust in the inner few AU of debris disks. This region is of particular interest because it encompasses the terrestrial planet formation region and the habitable zone. Detecting tenuous warm and hot debris disks requires an instrumentation with high angular resolution and high contrast capabilities, currently best provided by near- and mid-infrared interferometry.

In this talk, I will start by presenting recent Herschel observations of cold debris disks analogous to our Kuiper Belt. I will show that, when combined with spatially resolved images, it is possible to derive reasonable constraints on the dust properties despite the lack of spectroscopic signature. Then, I will focus on the inner regions of extrasolar planetary systems and will review the current understanding of warm and hot dust around Main Sequence stars, both recent observational progress and theoretical advances. Finally, I will highlight the new challenges raised by the study of exozodiacal dust.