Debris disks: Now and the future

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The dusty debris disks that surround many nearby stars are believed to be analogues of the Kuiper and asteroid belts in our own Solar System. The distinction between the proto-planetary and debris disk phase is usually made on the age of the stellar system with disks generally classed in the "debris" category after about 10 million years. At such a stage disks have little or no gas content, are generally optically thin with the material being replenished through destructive collisions of large bodies (such as comets) within the system. The study of such disks can potentially tell us a great deal about the evolution of planetary systems.

Since their discovery by IRAS in the 1980's interest in debris disks has increased dramatically. Debris disks are faint compared to their more luminous proto-planetary counterparts and so their study has benefitted from the development of highly-sensitive imaging systems. In the optical and near-IR we see the disks in scattered light (e.g. from the HST), whereas beyond about 20 microns, the emission is largely thermal in origin and is observed as an "excess" above the level of the photosphere. In particular, Spitzer, and more recently Herschel, have made surveys of such disks possible for the first time, giving us the opportunity to correlate their incidence with a range of stellar parameters, such as age, spectral type, and metallicity. Such surveys are key to understanding the diversity of the architecture of planetary systems and hence allow us to address the uniqueness (or otherwise…) of our Solar System.

In this talk I will review the current status of debris disk studies, including surveys. ALMA is set to revolutionise the study in the near future - the unprecedented angular resolution allowing us to probe dust belts for clumps and cavities which are the tell-tale indicators of the presence of planets. Looking further to the future it is clear that the characterisation of the warmer component of these disks, inside a few AU (the "habitable zone"), will be a real driver for the next generation of missions such as JWST, SPICA, and eventually FIRI.