Dust Evolution in Debris Discs

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Debris discs have been detected, as dust-induced infrared excesses, around an important fraction of main sequence stars. For some bright and/or nearby systems, these discs have also been imaged, often revealing pronounced radial and azimuthal structures. Contrary to that observed in the much younger proto-planetary discs, debris-disc dust is probably not primordial and has to be replenished, most likely by erosive or destructive collisions (hence the term « debris ») from much larger parent bodies stretching up to km-sizes or even more. Unfortunately, this population of large bodies, which probably contains most of the disc's mass and also controls its dynamics, remains undetectable, leaving the dust population as the sole observable component. As an example, for many systems, the potential presence of unseen planets can only be indirectly inferred by the spatial structure of the dust.
Understanding the evolution of this dust is thus of crucial importance. However, modelling the dust population is a very challenging task, because of the complex interplay between all the processes affecting small grains in such systems: fragmenting collisions, dynamical perturbations, radiation pressure, stellar winds, possible sublimation or vaporization. As a consequence, most debris disc studies have so far focused on specific aspects of the problem, like planet-induced dust dynamics, collision-induced mass loss, dust/gas interactions, or the balance between silicates and water or CO ices, etc. I will review the main results obtained in recent years and the progress that have been made in understanding what is going on in debris discs. I will also present some crucial, yet still pending issues that need to be investigated in the close future with the help of both unprecedented observational facilities like ALMA and new generations of numerical codes that aim to perform self-consistent all-encompassing studies of debris discs.