Planet Formation and Debris Disks

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The circumstellar disks observed around several hundred main sequence stars are mainly gas poor, faint disks, which are called debris disks. They are mostly revealed by excess infrared emission around the stars. In a planetesimal disc, collisional coagulation of kilometer or larger planetesimals produces a small number of large bodies, oligarchies. Leftover planetesimals are strongly stirred by oligarchies, resulting in the violent collisions between planetesimals. The collisional fragmentation of planetesimals may form a debris disk. We aim to determine the properties of the underlying planetesimals in debris disks by numerically modelling the coagulation and fragmentation of planetesimal populations. We find that a radially narrow planetesimal disc is most likely to result in a debris disk that can explain the trend of observed infrared excesses of debris disks around G-type stars, for which planet formation occurs only before 100 million years. Planetesimal disks with underlying planetesimals of radii 100 km at 30 AU most readily explain the Spitzer Space Telescope 24 and 70 micron fluxes from debris disks around G-type stars. We expand this analisys for the AKARI debris disk samples.