Direct Imaging Polarimetry of Dust Scattering in Protoplanetary Disks

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Recent direct imaging has discovered a population of massive (a few MJ to ~15 MJ or even more massive) planets orbiting at outer regions (r>~10 AU) around their host stars. It is difficult to form those planets with the standard core-accretion model or even with the gravitational instability model; therefore their origin is controversial. One of the ways to approach to study their origin is to observationally reveal the details of dust distribution in the protoplanetary disks at the same radial regions where such outer planets reside. An imaging polarization survey of nearby young stars with the newly developed coronagraph on the Subaru 8.2-m telescope (the SEEDS project) and other telescopes has directly imaged "fine structures" such as gaps and dips in dust distribution within the scale of our Solar System. The various features discovered are considered to be a signpost of planets already formed or forming in the disks. We will discuss how the dust component discovered in the disk is correlated with the dust traced by previous submillimeter observations.