Tracing grain growth from molecular clouds to disk envelopes with coreshine

Jürgen Steinacker (IPAG Grenoble, France) and the coreshine/SEED team

The detection of a weak surface brightness in mid-infrared Spitzer images from molecular cloud cores came as a surprise. This so-called "coreshine" originates from the well-shielded cold central regions where neither stochastically-heated small grains nor thermal emission in the MIR is expected.

Meanwhile our analysis shows that we are looking at scattered light from grains in the core which have to be larger than the commonly assumed largest diffuse interstellar medium grains by a factor of about 5. Aside of extinction and thermal emission analysis, coreshine provides a new method to trace the inner parts of the cores where the star formation process starts. Moreover it has the potential to probe the seed population of grains that is continuously fed from the young stellar object's envelope onto the disk for further processing.

I will present results of our original 3D radiative transfer modeling of the core L183 which is the first core where coreshine was identified as scattered light from larger grains. Our findings of the investigation of about 100 Spitzer Archive sources will be presented revealing that more than 50% of the sources show coreshine, and that the effects is visible in all stages of early stellar evolution and spatial complexity.
Further presented results will include tracing the history of filaments or supernova-affected regions with coreshine, dust size constraints from a full JHK band plus Spitzer IRAC1 band modeling of L260, a derivation of the "flat-line" condition for detecting coreshine from the 3D radiative transfer equation, and a correlation analysis of core properties and coreshine based on supporting mm observations.
I will also report on the first result of two warm Spitzer programs one being the largest approved Cycle-8 warm Spitzer proposal in the Galactic science category with 90 sources chosen from the Planck Early Cold Cores Catalog

- *Coreshine in L1506C - Evidence for a primitive big-grain component or indication for a turbulent core history?*
  Steinacker+ 2013 A&A, submitted
- *Scattering from dust in molecular clouds: Constraining the dust grain size distribution through near-infrared cloudshine and infrared coreshine*
  Andersen+ 2013 A&A, submitted
- *3D dust radiative transfer* Steinacker, Baes & Gordon 2013 ARAA
- *The ubiquity of micrometer-sized dust grains in the dense interstellar medium*
  L. Pagani, Steinacker+ 2010 Science, 329, 1622
- *Direct evidence for dust growth in L183 from MIR light scattering*
  Steinacker+ 2010 A&A, 511, A9