3. Generating synthetical images

The model

- The debris disk is considered to consist of two populations: Parent bodies (PB) and dust grains with sizes between ~1 and 1000 microns which are continuously generated by mutual collisions between PB.
- Dust particles are subject uniquely to gravitation and radiation pressure

\[ f_p = \frac{F_{rad}}{F_{grav}} \]

- The two components are simulated separately in 3 steps, our model consists of 4 steps: 1) dynamical evolution of the PB (N-Body simulations) under the gravitational perturbation of a planet, 2) analytical computation of dust distribution, 3) computation of emitted and scattered light, and 4) simulation of real observation.

1. Step: N-Body simulations

- Dynamical evolution of planet and 25000 massless test particles representing the PB during simulation lifetime (25 Myr) using the RMVS (Regularized Mixed Variable Symplectic) integrator (Levison&Duncan, 1994)
- Initial conditions of PB: Surface density from Augereau et al. and consistent with ALMA observation data (Dent et al., 2014)
- Planet is set on circular, inclined orbit

2. Step: Dust distribution

- Assuming that every PB in final configuration produces dust grains of different grain sizes corresponding to different values of beta
- Orbital parameters (e.g. eccentricity) for grains depending on beta and on current distance of its PB to the star
- Calculate orbits for each PB and each considered beta
- Fill these orbits with quantity dust grains

3. Step: Flux maps

- Compute flux emitted by dust grains in scattered light and thermal emission using GraFIt (Augereau et al., 1999)
- Quantitative ponderation of flux emitted by different grain sizes respects the distribution of local collisional equilibrium
- Flux maps can be computed at any spatial projection

4. Step: Accounting for instrumental PSF and reduction biases

- To compare with real observation data, convolution of synthetical image with considered instrument PSF
- Using the same reduction procedures with considered instrument PSF and reduction biases

5. Step: Synthetic images of the disk at 3.8 microns reduced by the PCA method (cf. Milli et al. (2014))

3. Step: Flux maps

- Compute flux emitted by dust grains in scattered light and thermal emission using GraFIt (Augereau et al., 1999)
- Quantitative ponderation of flux emitted by different grain sizes respects the distribution of local collisional equilibrium
- Flux maps can be computed at any spatial projection

4. Step: Accounting for instrumental PSF and reduction biases

- To compare with real observation data, convolution of synthetical image with considered instrument PSF
- Using the same reduction procedures (PCA, cADI)...

References

- Telesco et al. (2005), Golimowski et al. (2006), Lagrange et al. (2012), Apai et al. (2014), Dent et al. (2014), Milli et al. (2014) to find best fitting model