PhotProject
Drizzling, Error maps, Highpass filter and other parameters affecting the PSF

Vanessa Doublier (Based on the extensive work done by P. Popesso+ 2013 and D. Lutz PICC-ME-TN-033 (2012))

PhotProject and Drizzling

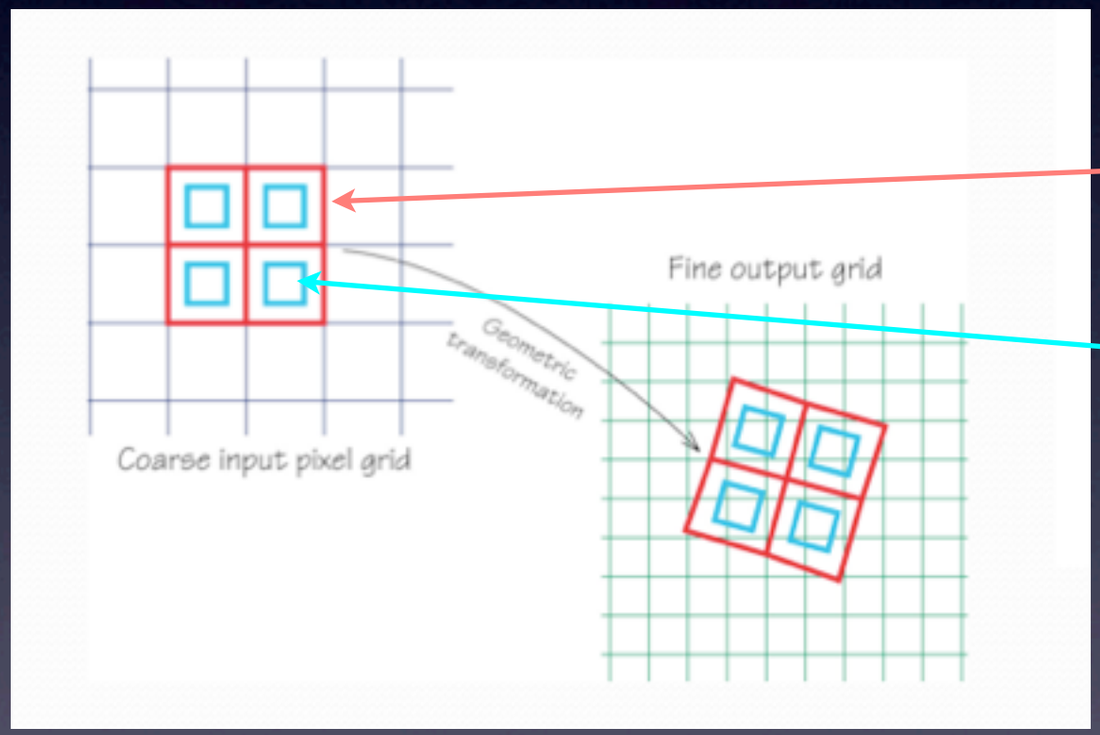
"Nothing is lost, nothing is created, all transforms"

Antoine Lavoisier 1789 citing Anaxagore [500-428 BC]

PhotProject and Drizzling

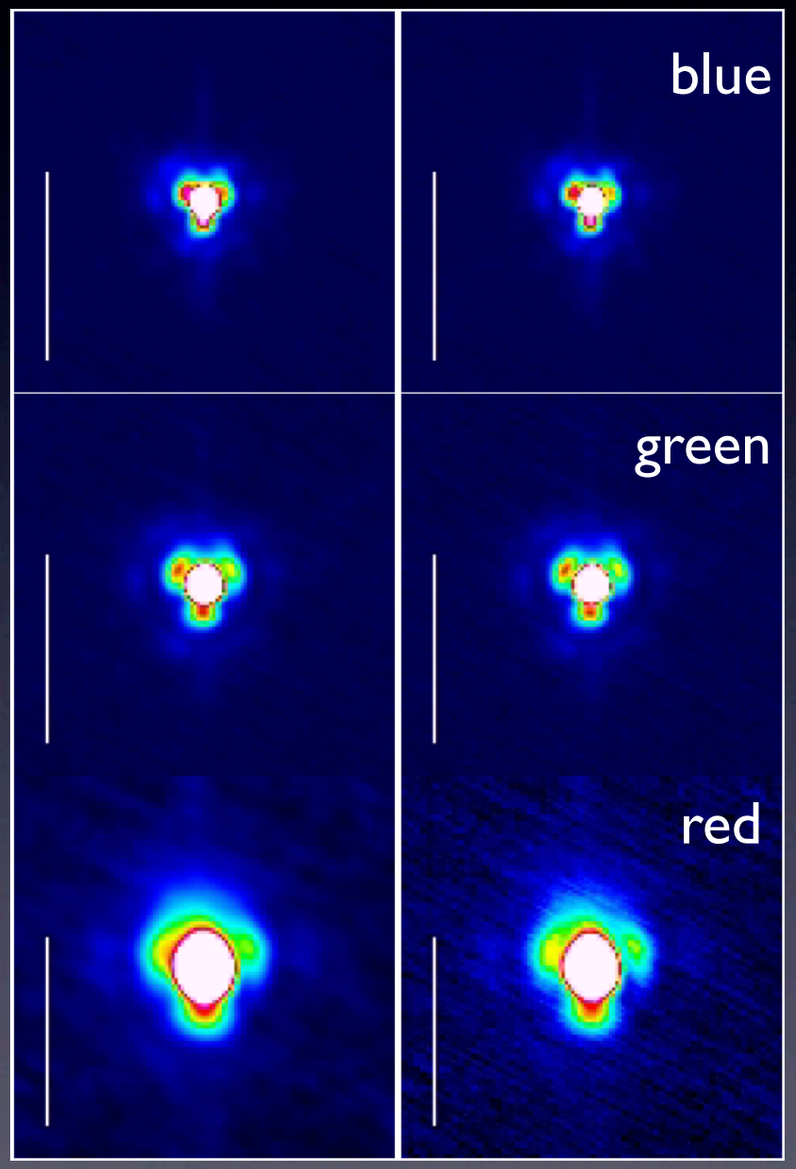
- Principles of the drizzling: re-sampling of the PSF
- Applied to photProject: projection of resamples frames onto an given size output pixel
- key parameters
  - pixel fraction or resampling fraction
  - output pixel size

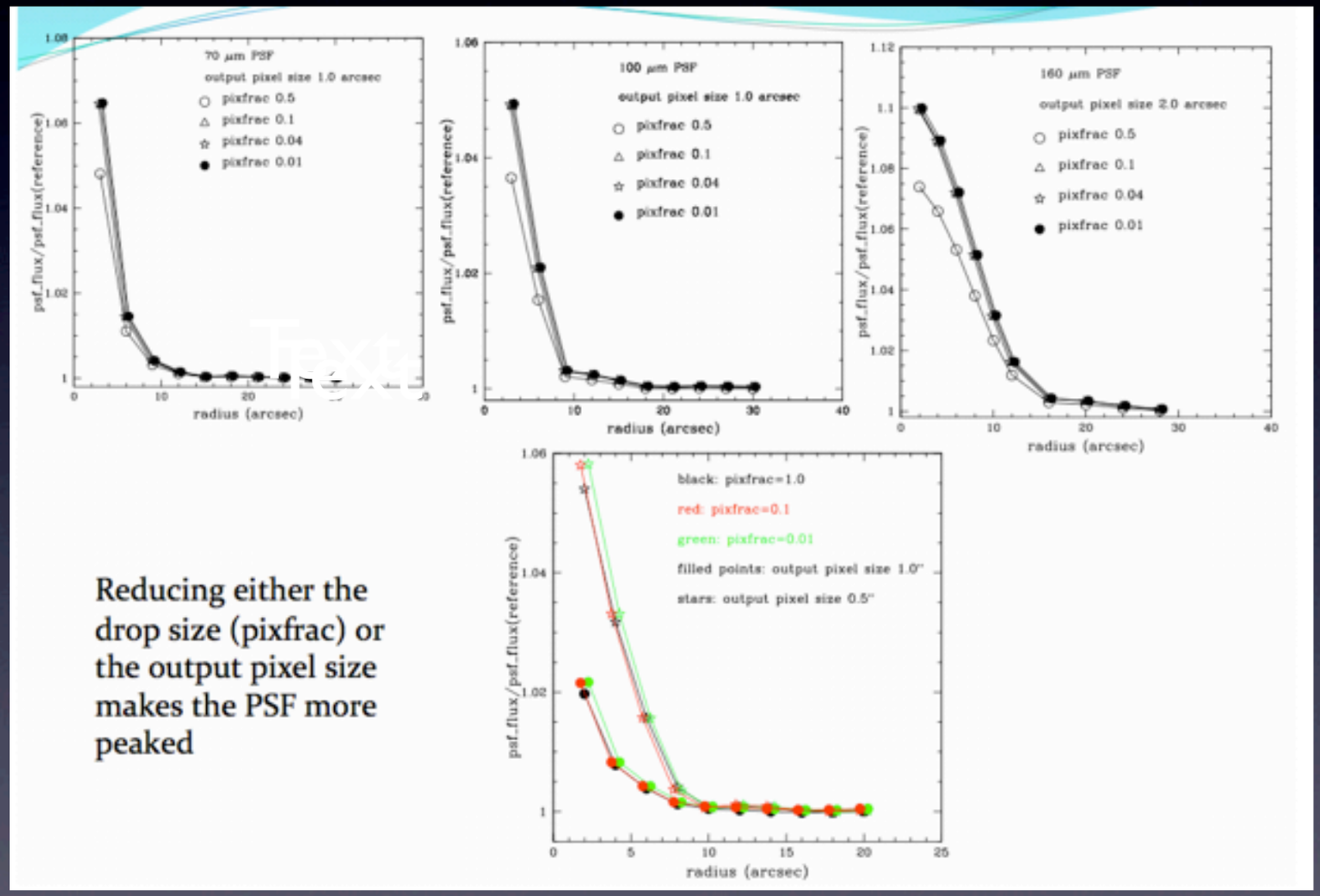
PhotProject with drizzle



- input pixel
- drop
- pixfrac = input/drop

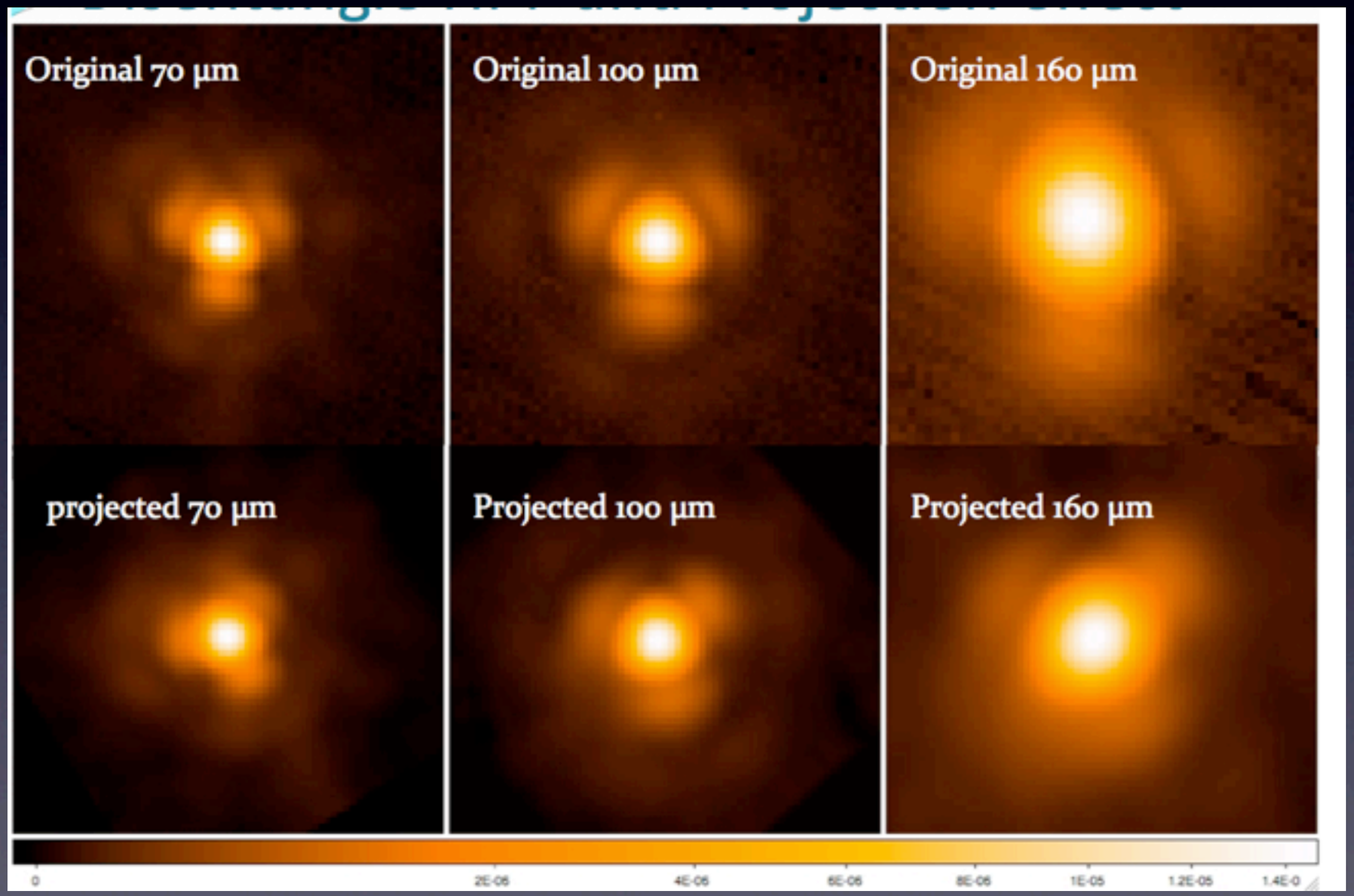
Drizzling: effect on PSF





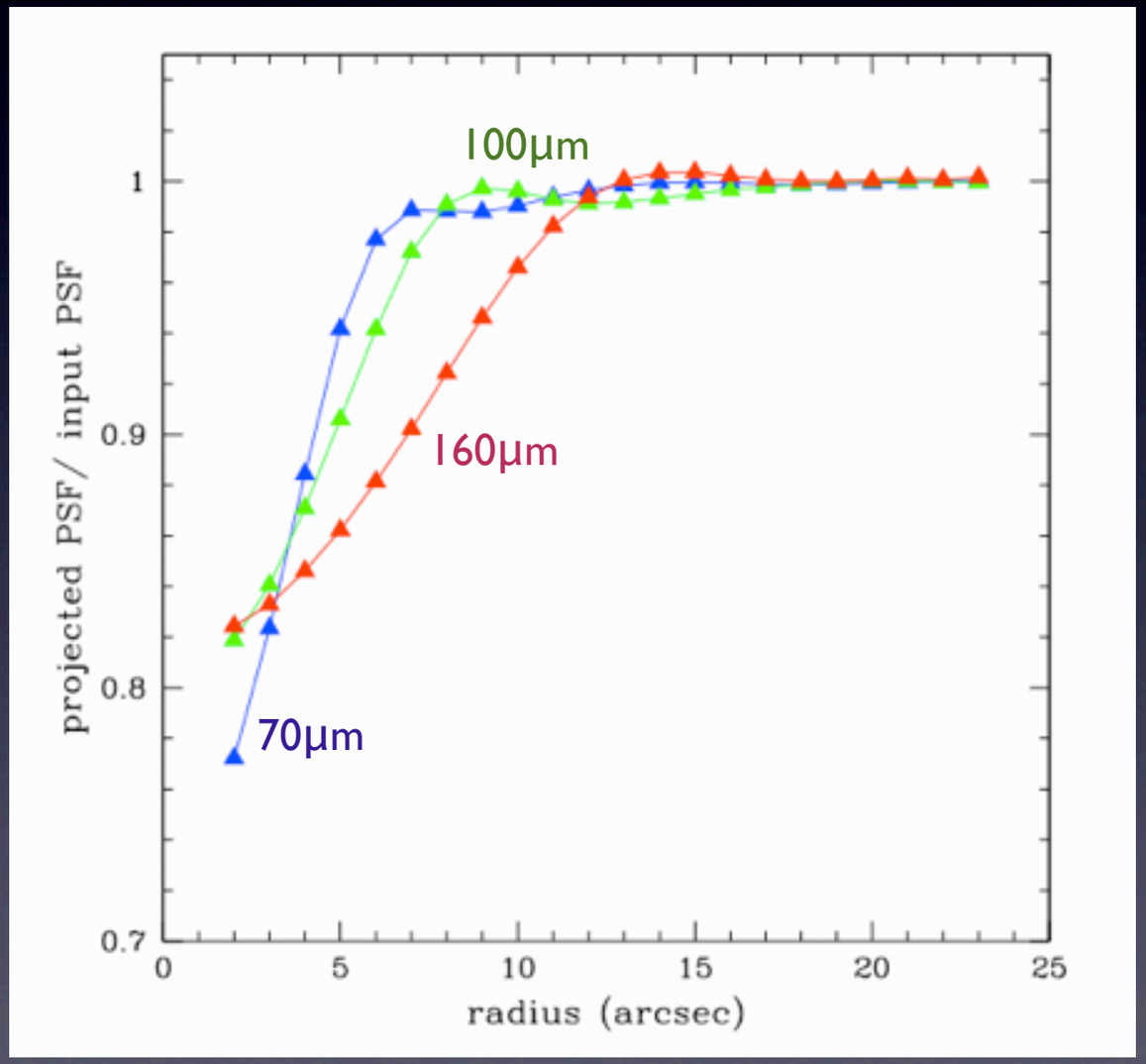
Reducing either the drop size (pixfrac) or the output pixel size makes the PSF more peaked

PhotProject: effect on PSF



PACS photometer PSF is not unique: it is a function of the scan speed, of the projection parameters like the pixel resampling factor and output pixel size

PhotProject: effect on PSF

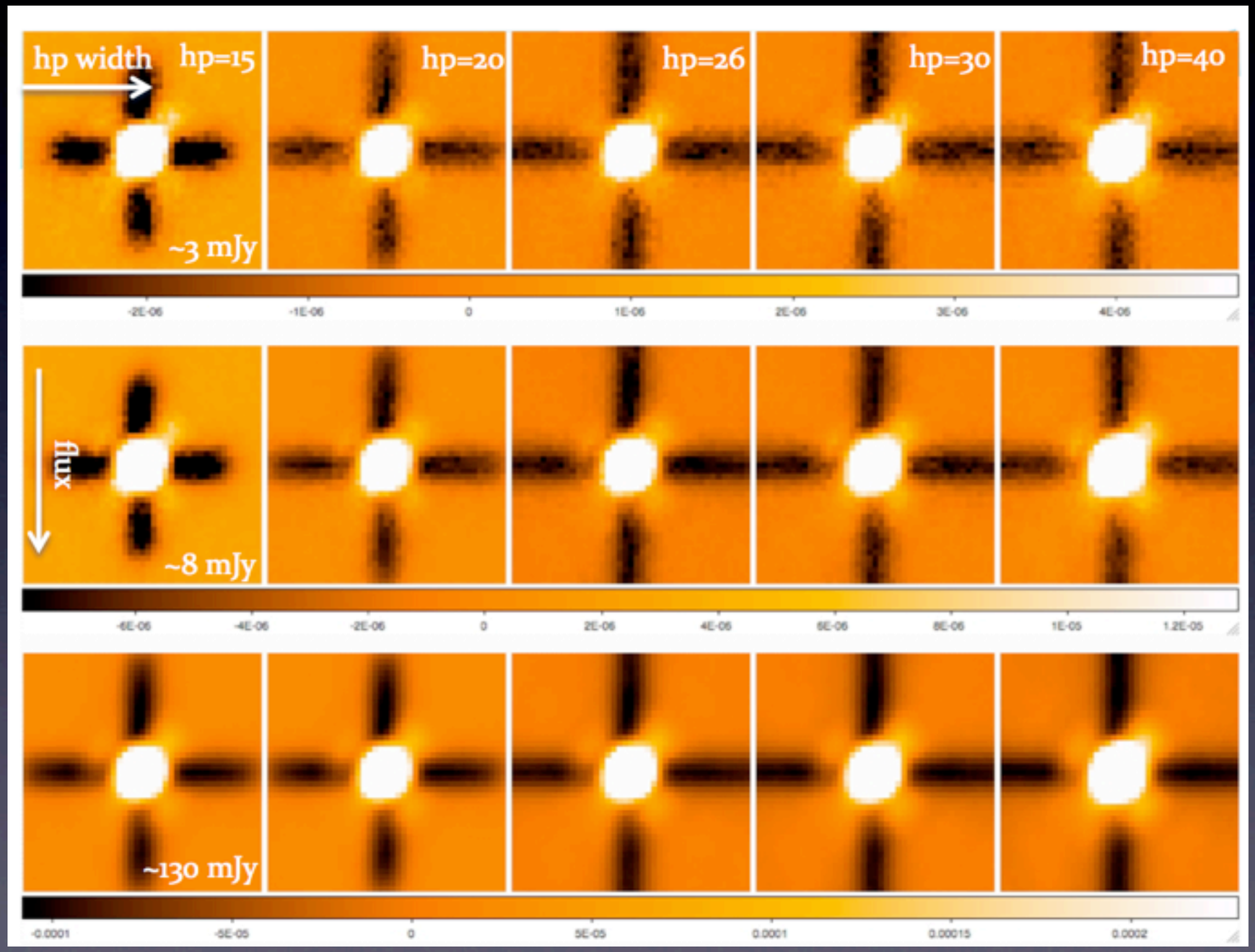


During the projection onto the new grid defined by the pixel fraction and the output pixel size, the flux gets redistributed within the wings of the PSF.
SPG pipeline uses output pixel size of 6.4 @160µm and 3.2 @70-100µm

Highpass filtering

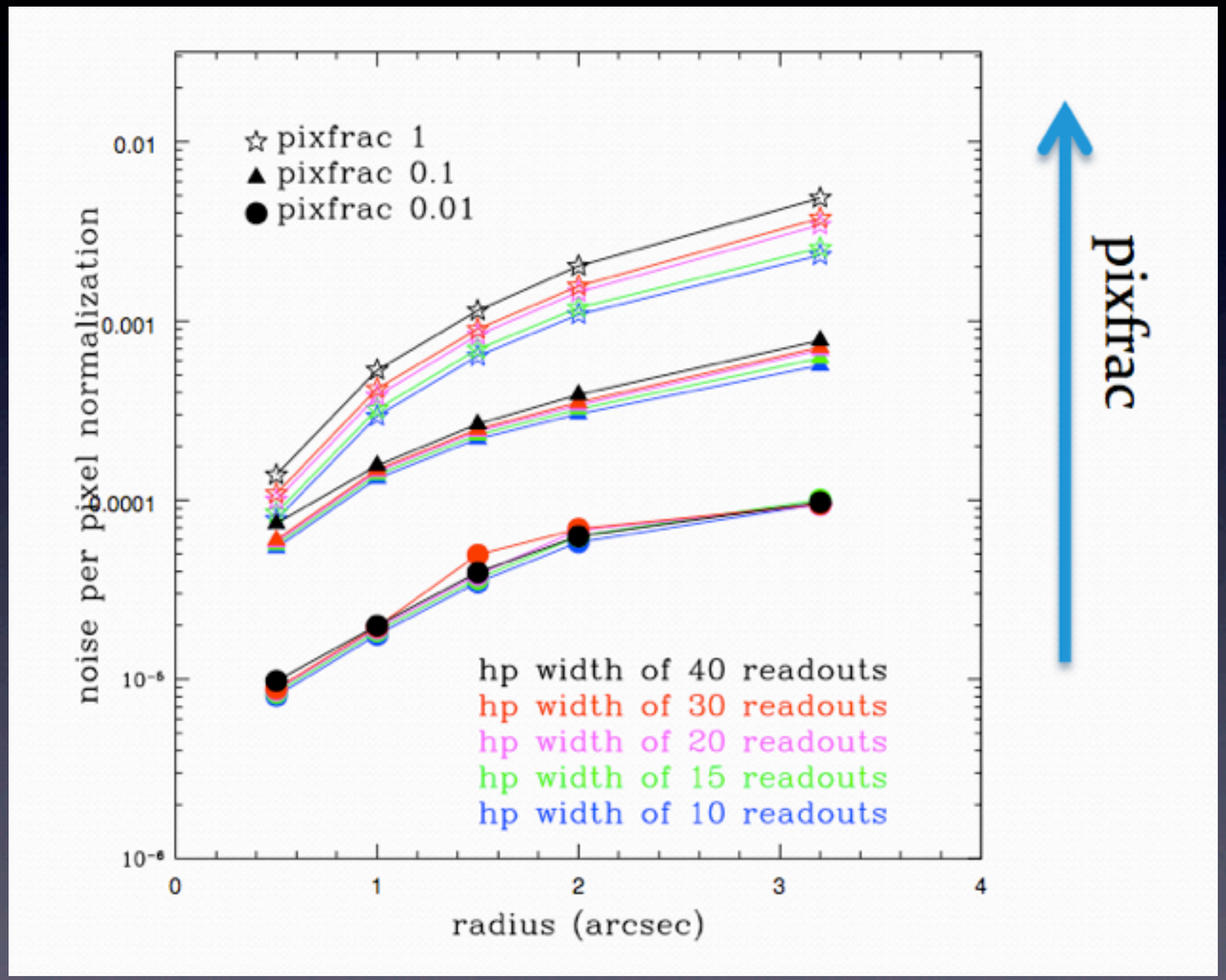
- Principle of the highpass filtering of PACS data - baseline
  - boxcar mean/median filtering of the timeline signal
    - filtered signal is subtracted from original timeline
- influence of the HP filter on the data
  - PSF
  - Noise

HPF and PSF



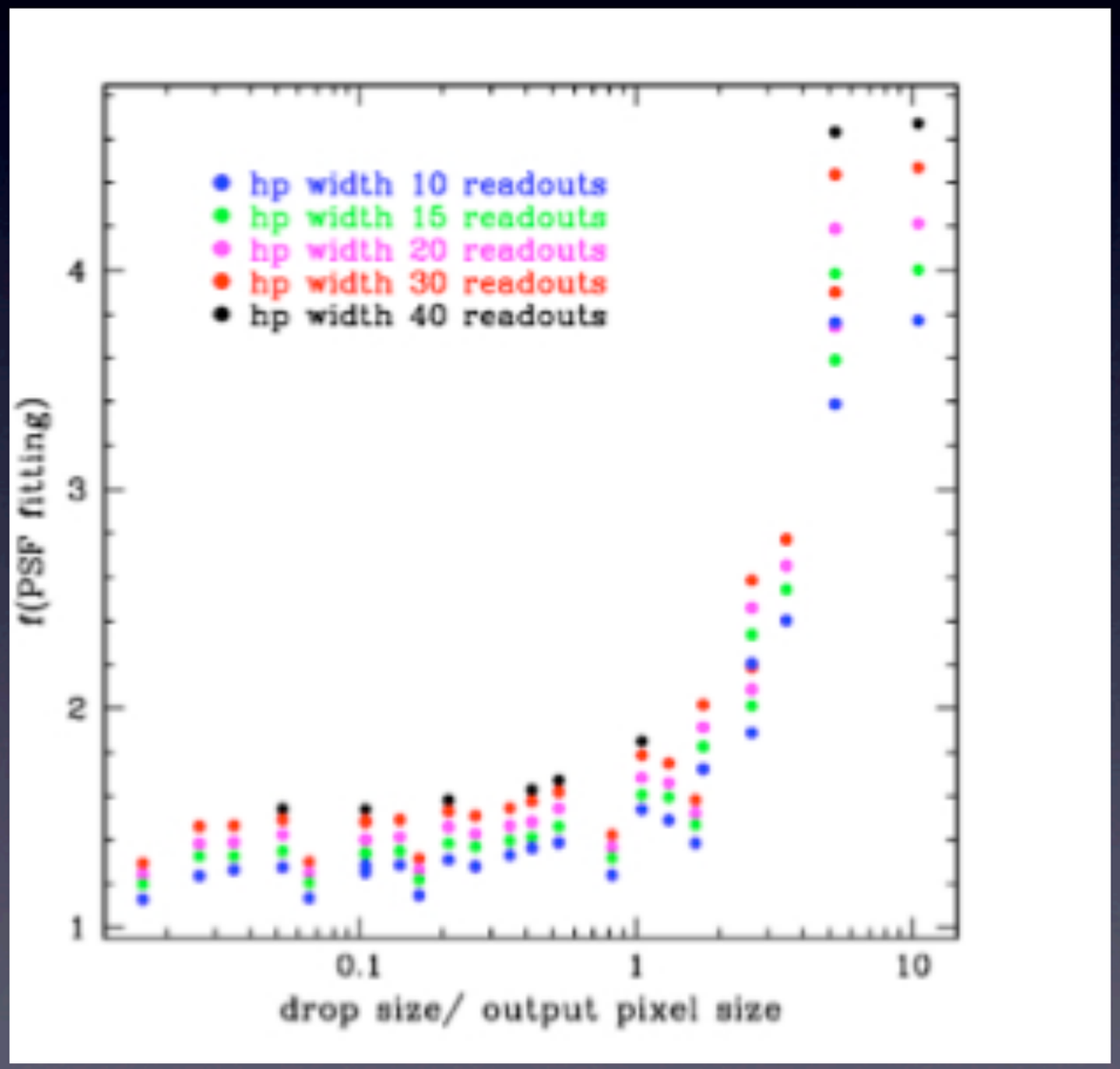
Increasing the HPF width causes a fuzzing of the PSF: i.e. a redistribution of the flux towards the wings

HPF vs. noise



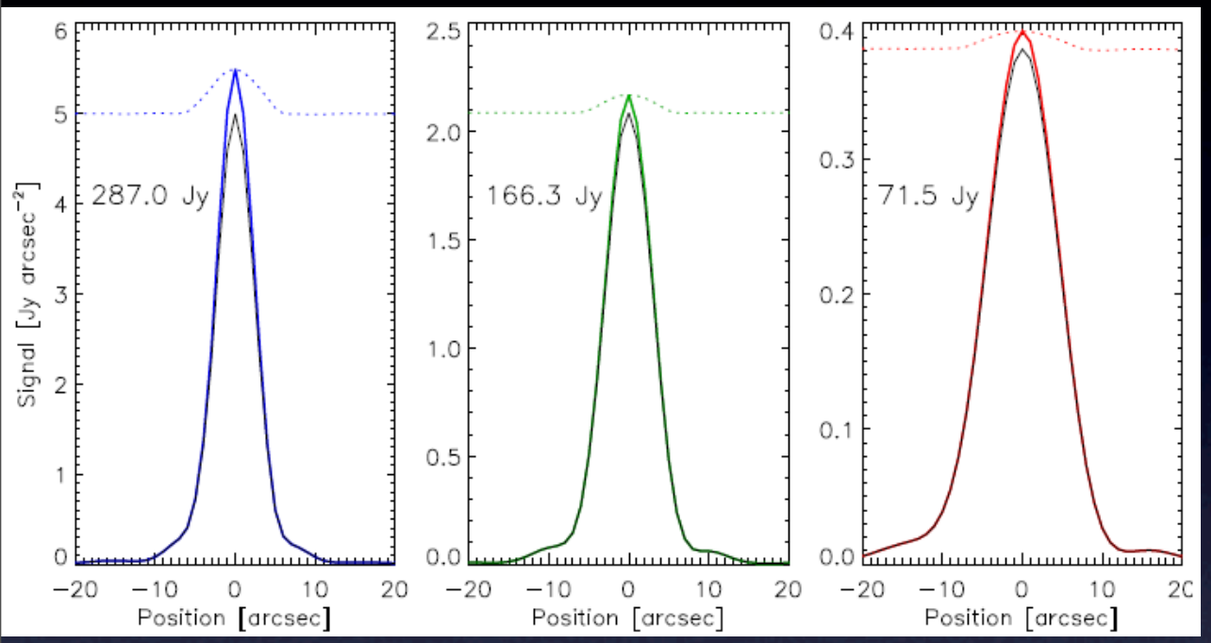
HPF width has little effect on the un-correlated noise distribution. Using a smaller pixfrac allows to reduce significantly the noise

Noise

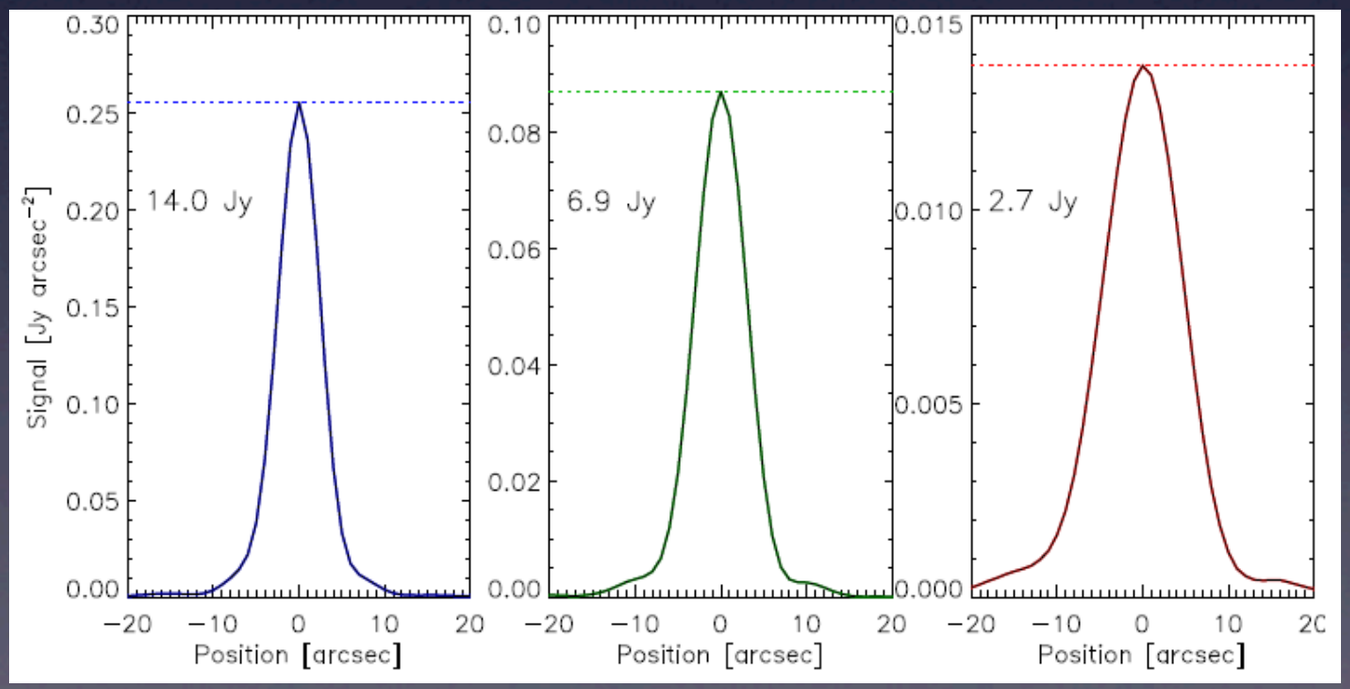


The effect on the cross-correlated noise of both the HPF and the pixfrac is compensated by the decreasing of the output pixel size

PSF vs Non Linearity



Ceres



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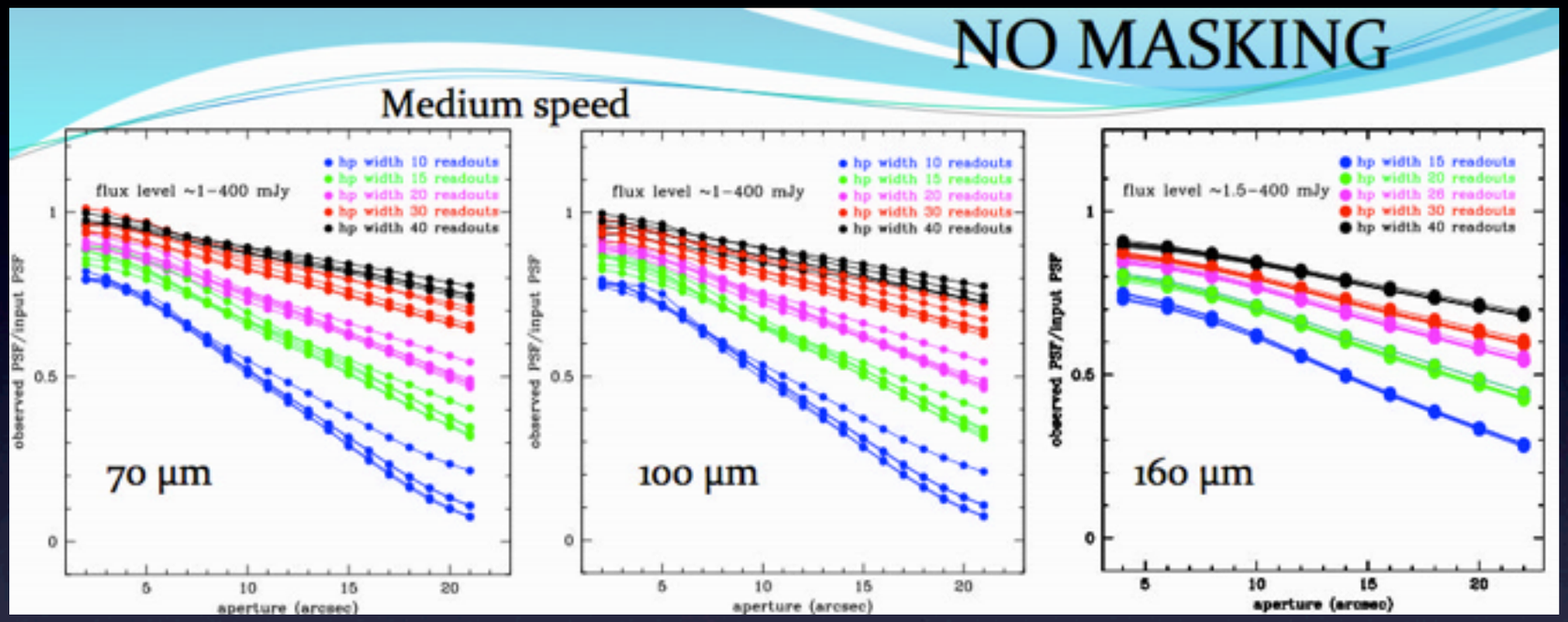
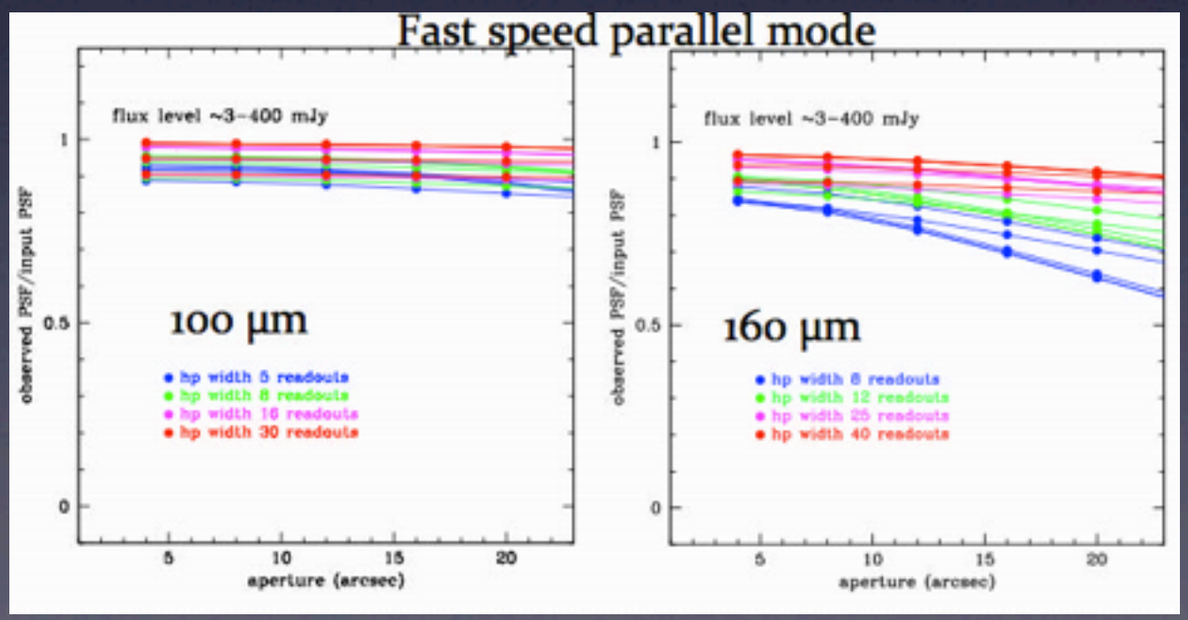
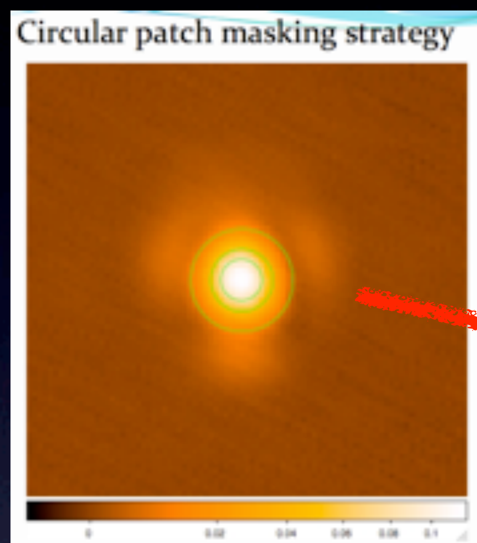
PSF vs HPF: No Masking

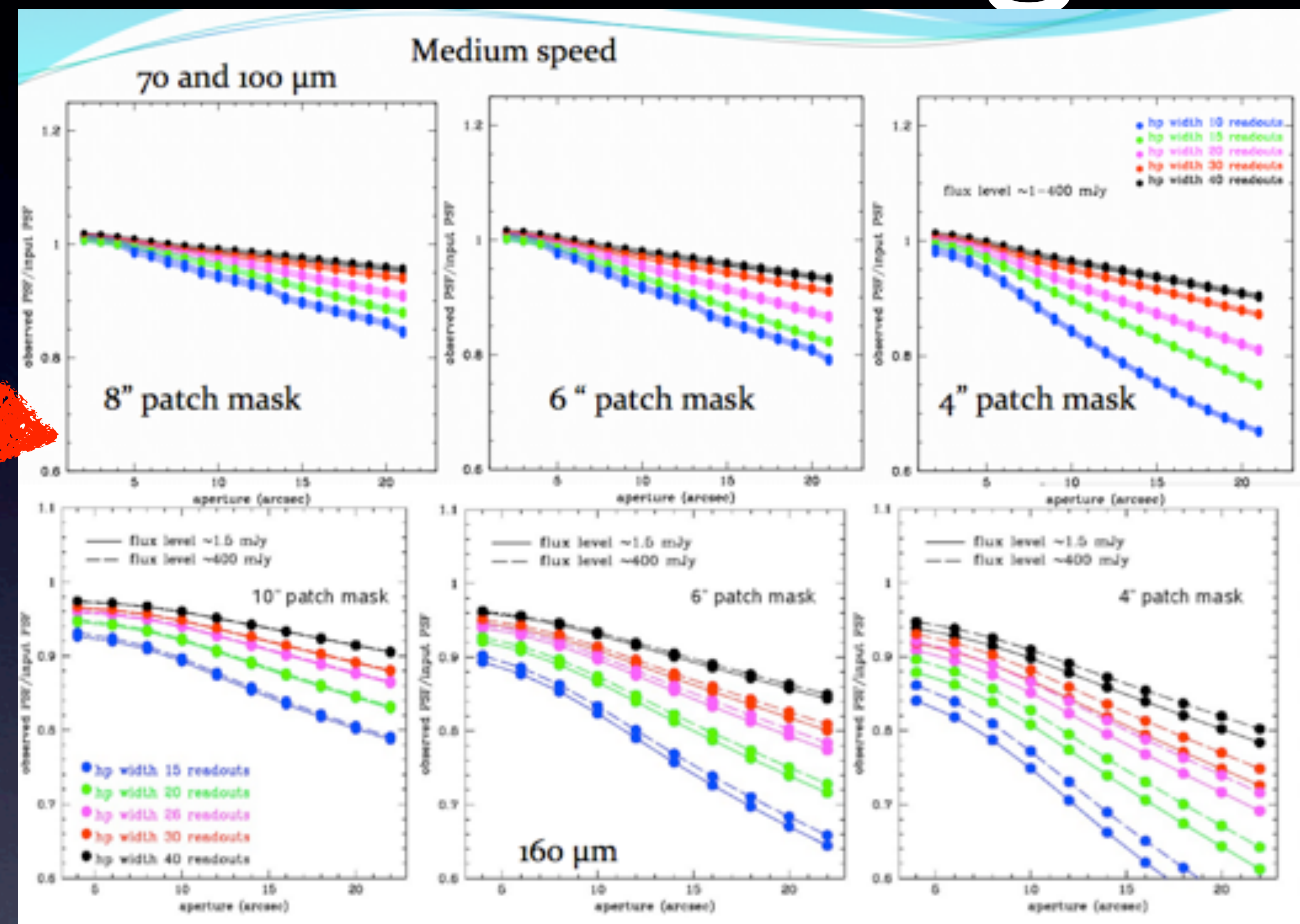


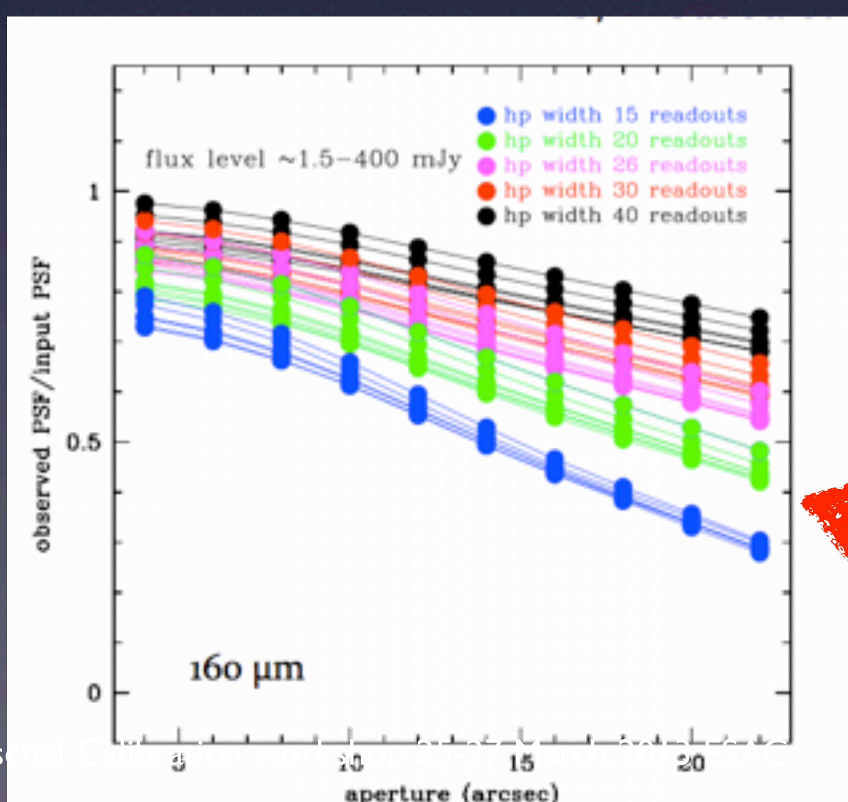
Flux losses due to the HPF are mostly flux independent at all wavelength



PSF vs HPF: Masking







SN based masking: HP filtering becomes more flux dependent