Brainstorming

Part 1: general open questions in RDI

Part 2: RDI to detect pole-on disks

Open questions in the field of RDI ?

- What is the optimal size of a library ?
- What is the best trade-off between the library size and the aggressiveness of the algorithm ?
- How to down-select the best reference frames ? Is the correlation the best metrics ?

- Shall we optimize the library per frame or per target ?
- Can we do better than PCA or DIsNMF ? other image combination scheme ?
- How critical is the image registration ?
- Is RDI better with respect to the false positive fraction ?

Influence of the size of the library
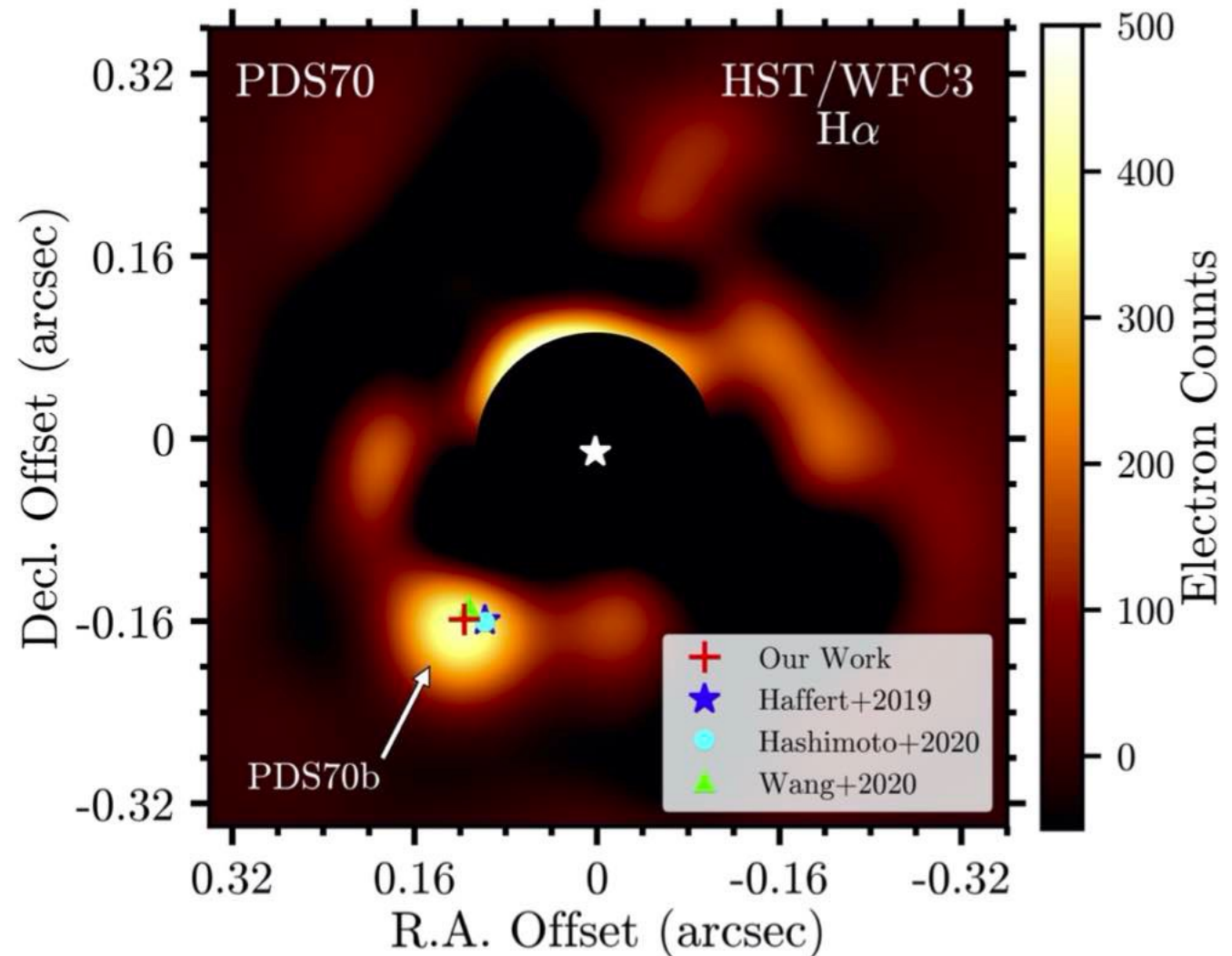
From Sanghi et al. 2021

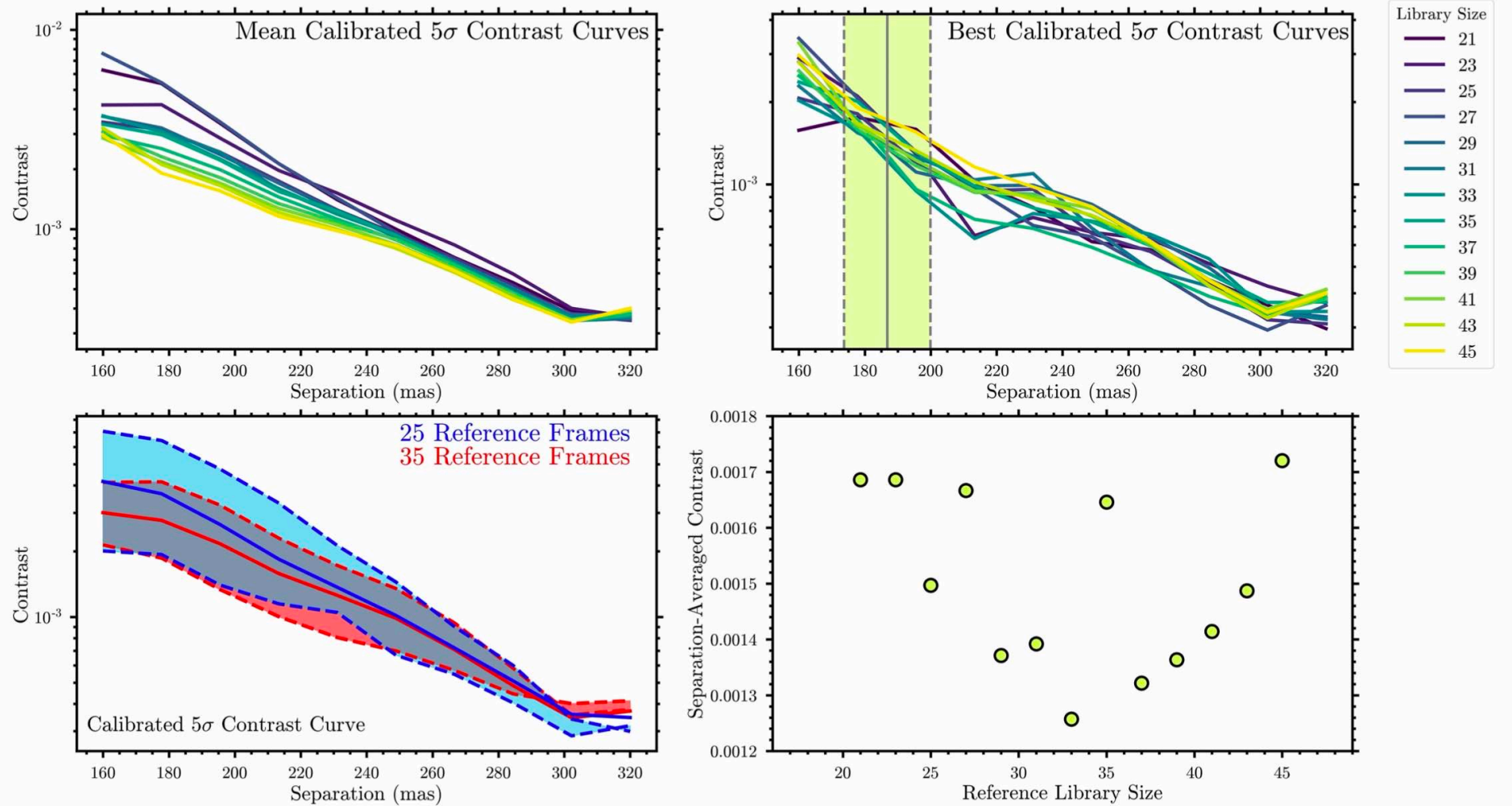HST / WFC3 data set on PDS 70 in H alpha (656nm)

162 images with a total integration time of 3240 s

S/N on PDS 70b
7.9 in ADI (Zhou et al. 2021)
5.3 in RDI (Sanghi et al. 2021)

Figure 9. Assessment of the optimal size of the WFC3 reference star library for RDI reduction. *Top left:* Mean of the 50 5σ contrast curves generated for each library size depicted in the legend at the right. Brighter colors correspond to larger reference libraries. *Top right:* Similar to the top left panel but presenting the best of the 50 5σ contrast curves generated for each library size depicted in the legend. The green shaded area represents the 1σ separation interval for our detection of PDS 70 b. 1σ limits are illustrated by dashed gray lines and the solid line marks the center of the separation interval. *Bottom left:* Example distributions of the 50 5σ contrast curves generated for libraries of size 25 and 35. The solid lines represent the mean contrast curve, the dashed lines represent the best and the worst contrast curves for the given library size. Shaded regions highlight the spread in the contrast curve distribution from the mean. *Bottom right:* Separation-averaged 5σ contrast requirement in the shaded green region for each library size, derived using the curves in the top right panel. No correlation is found between library size and the separation-averaged 5σ contrast requirement.

False positives in RDI

- Unpublished results from RDI star-hopping suggests 6 times more false positives in RDI compared to ADI below 300 mas)

- The noise is less Gaussian after RDI compared to ADI → the use of a 5 sigma threshold is not best to compare RDI and ADI performance. Full ROC curves or real FPF should be used
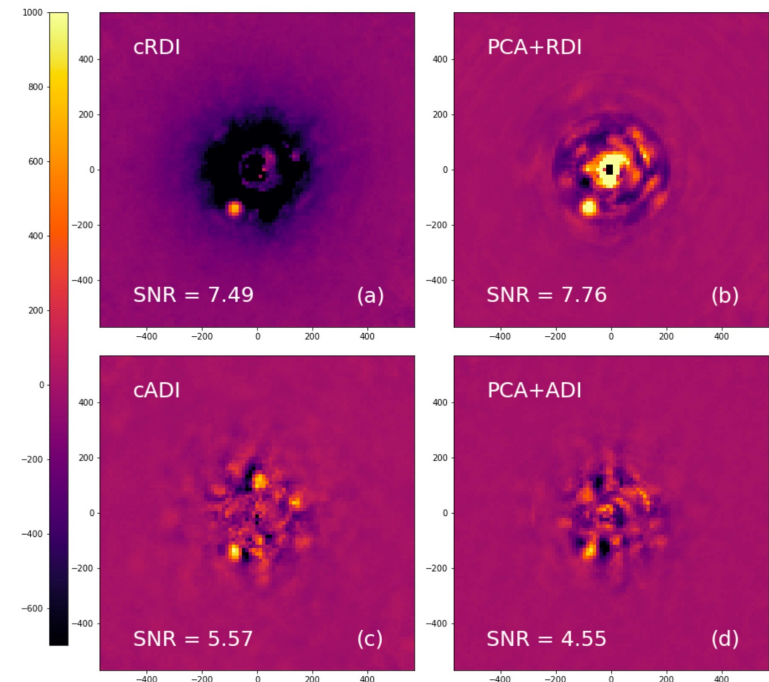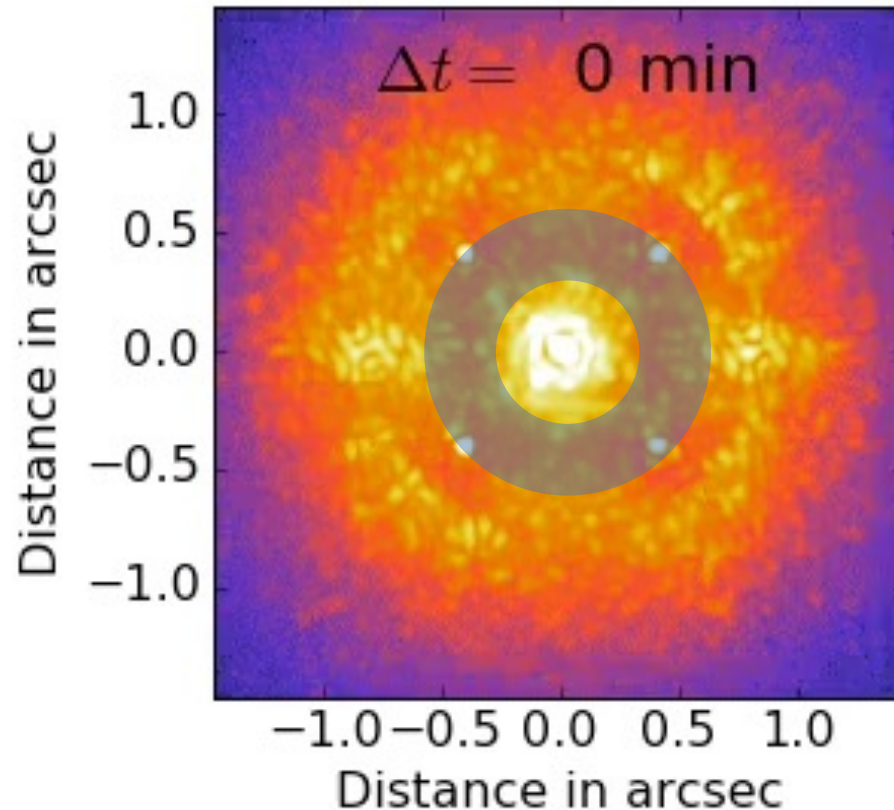
Part 2: resolving pole-on disks in RDI

- How to distinguish a pole-on disk in a coronagraphic, centrally symmetric image ?
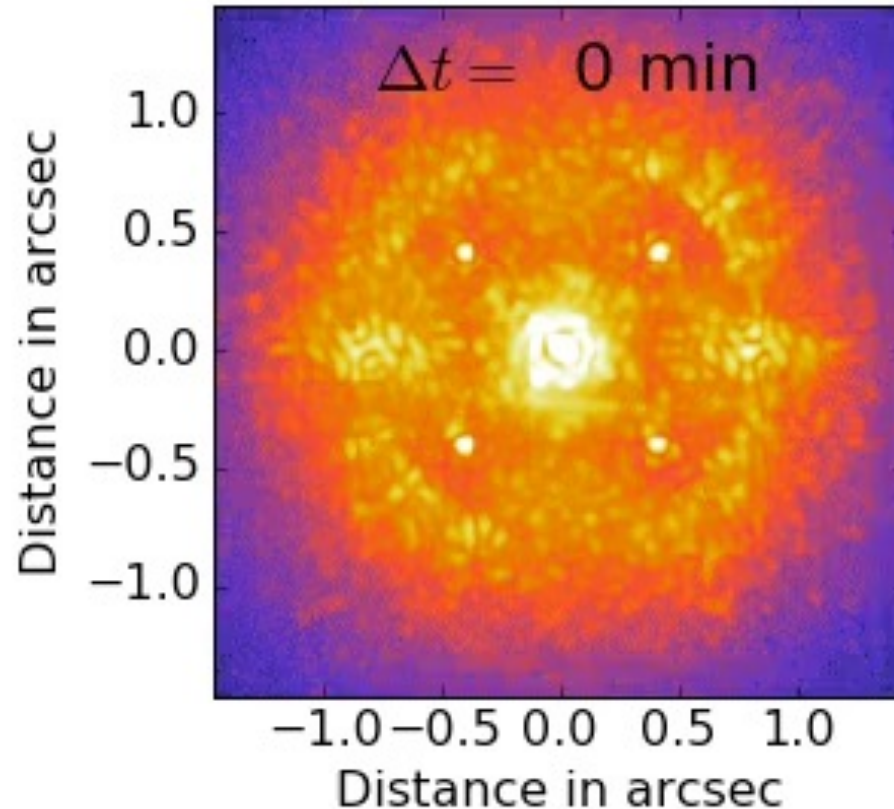
Part 2: resolving pole-on disks in RDI

- How to distinguish a pole-on disk in a coronagraphic, centrally symmetric image ?

How to distinguish wind-driven halo from disks ?