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SHINE survey & Motivation

SpHERE INfrared Survey for Exoplanets (SHINE, Desidera et al. 2021)



SPHERE instrument at VLT, using SAXO extreme AO & Lyot Coronagraph



IRDIS narrowband filters: H2-H3, with 9" diameter field of view
Science observations: ADI image sequence

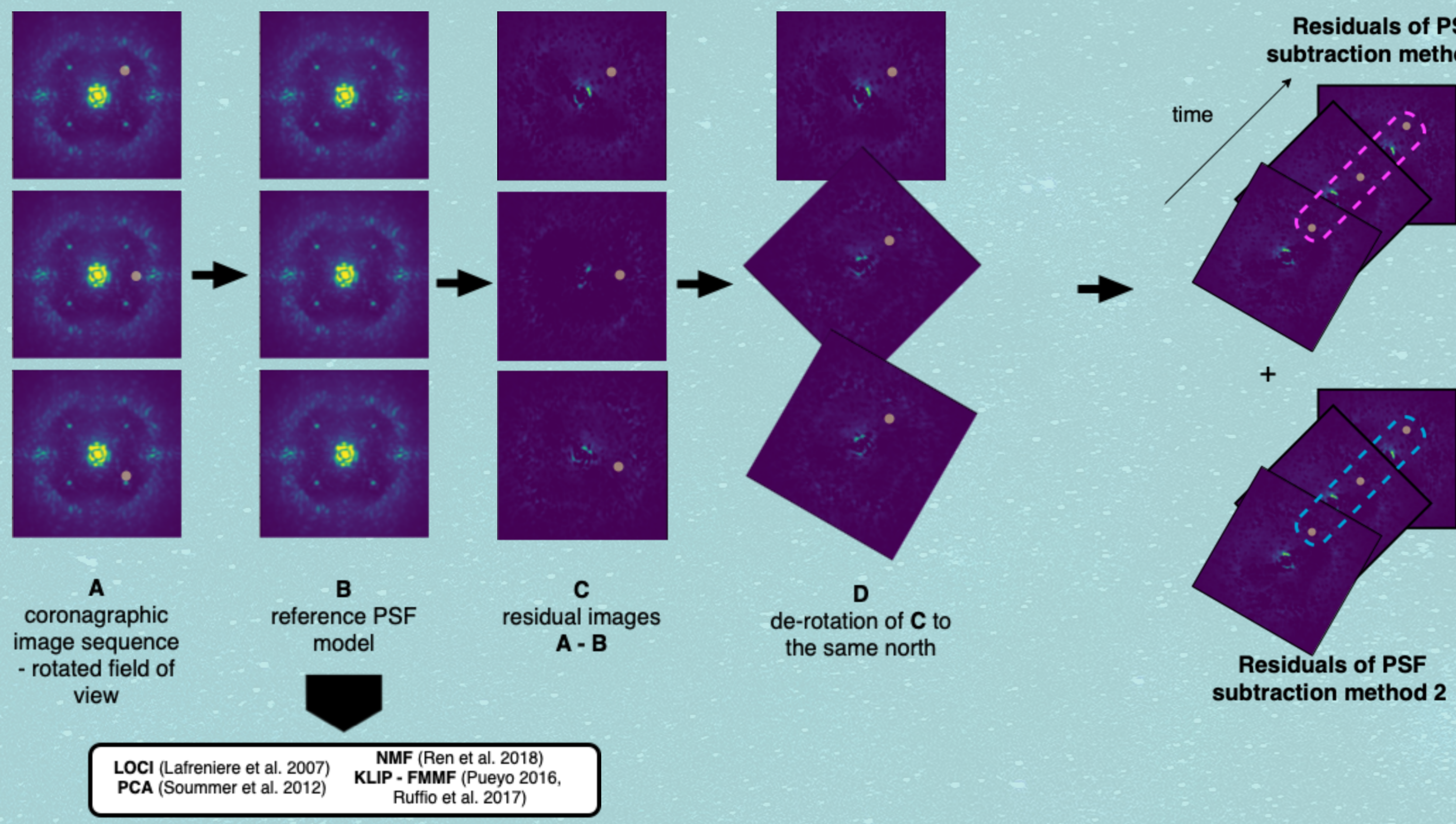


F150 sample: 53 BA stars, 77 FGK, 20 M stars

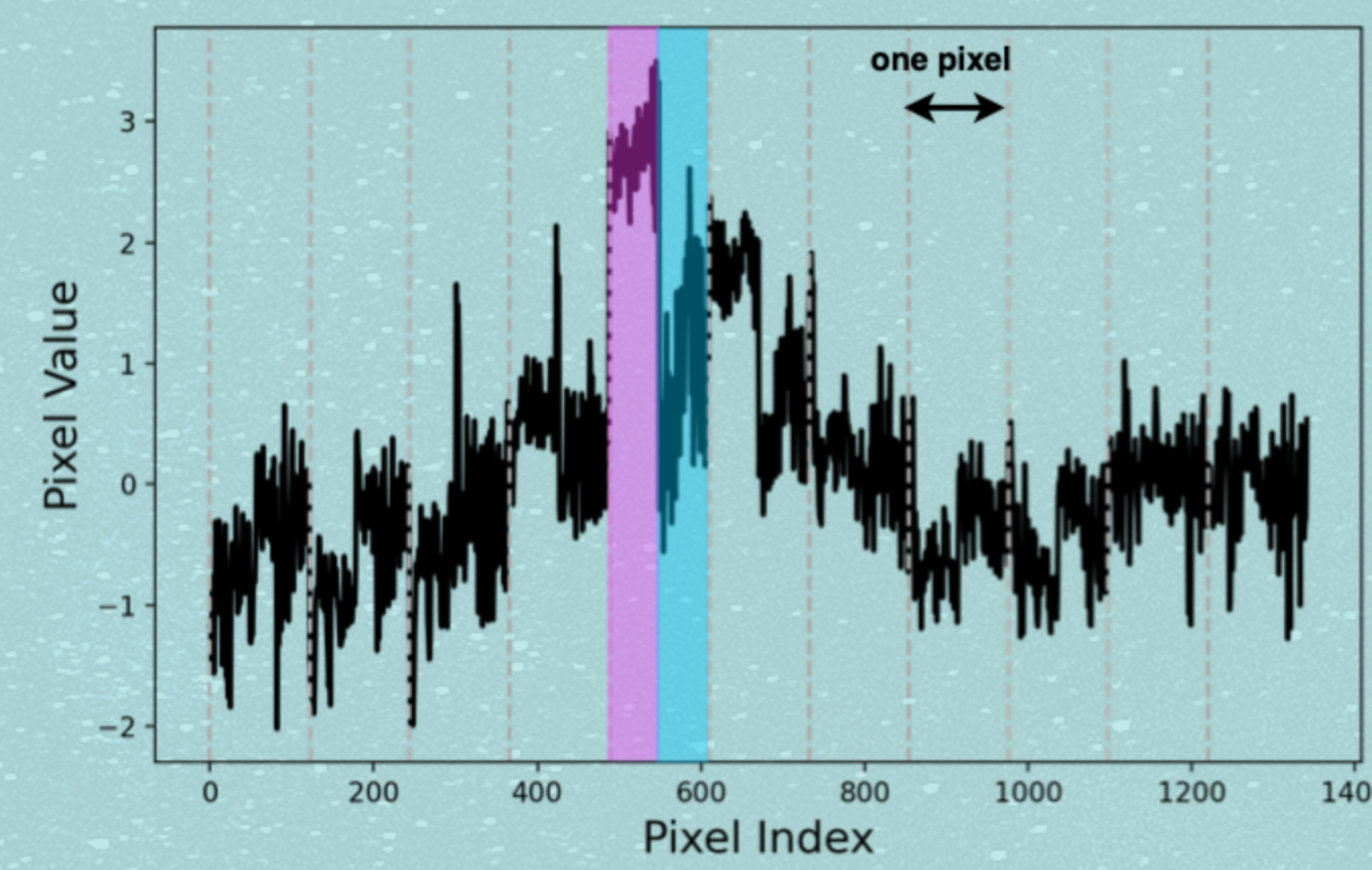
In this poster, we revisit the complete F150 SHINE sample using RSM, an advanced post-processing algorithm. We observe notable improvements in the detection limits compared to standard post-processing algorithms, leading to the identification of new exoplanet candidates that are currently under analysis.

Advanced post-processing algorithm !

Angular Differential Imaging (ADI, Marois et al. 2006)

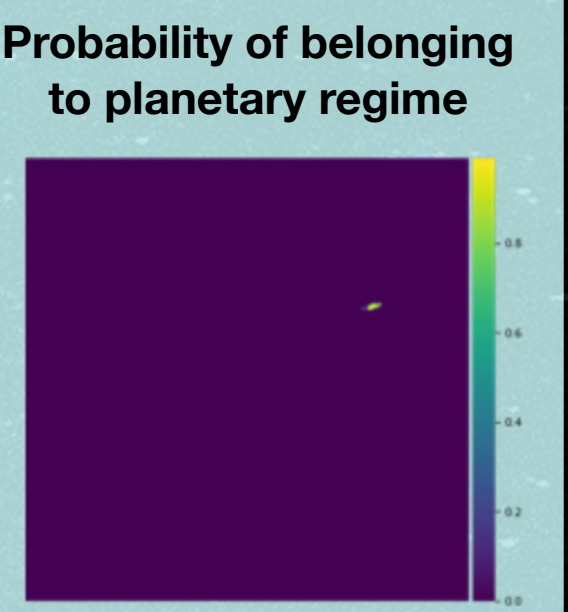


Regime Switching Model (RSM, Dahlqvist et al. 2021)



Regime Switching Model

- Noise Regime: noise statistics
- Planetary Regime: noise statistics + planetary model

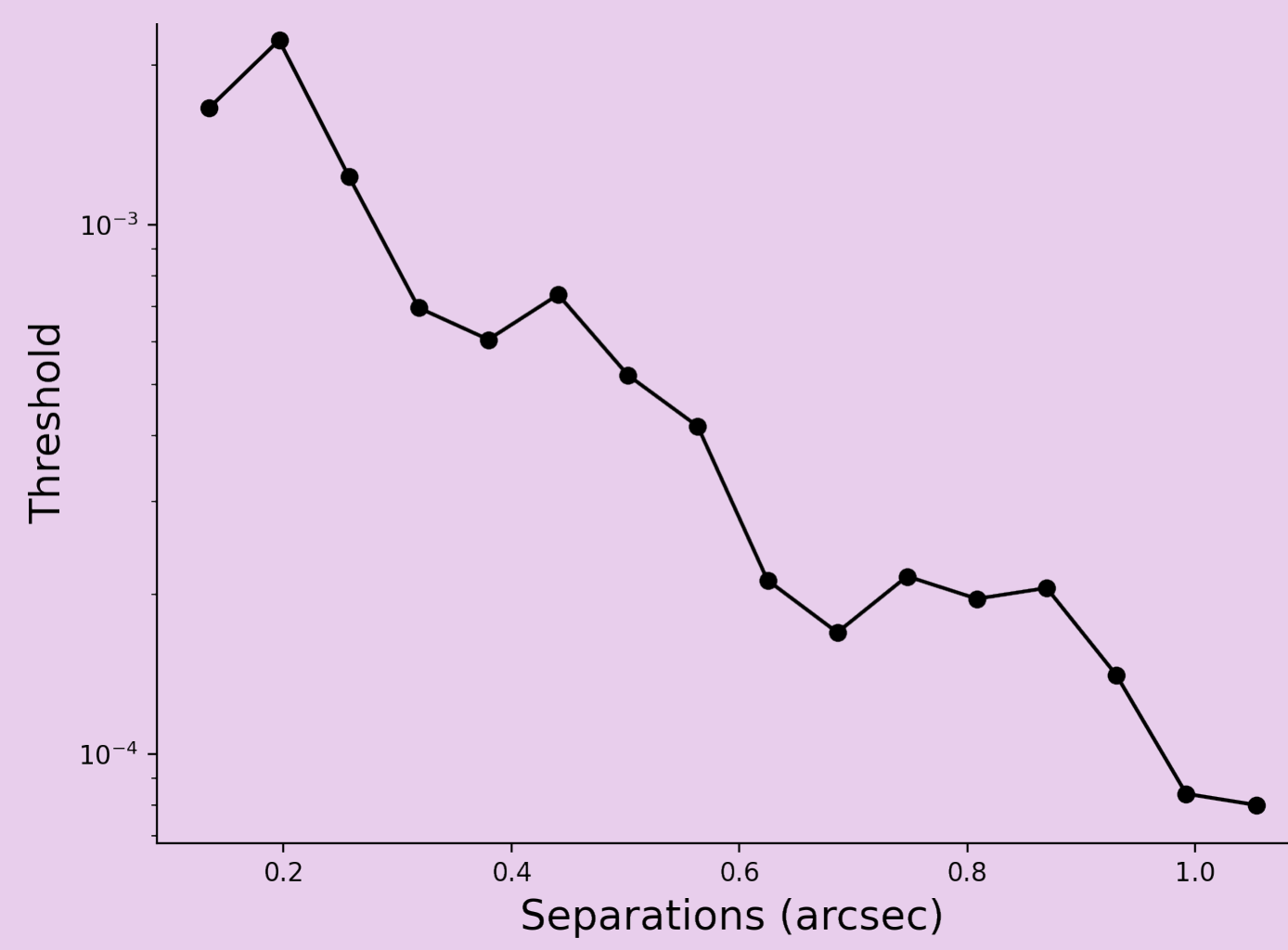
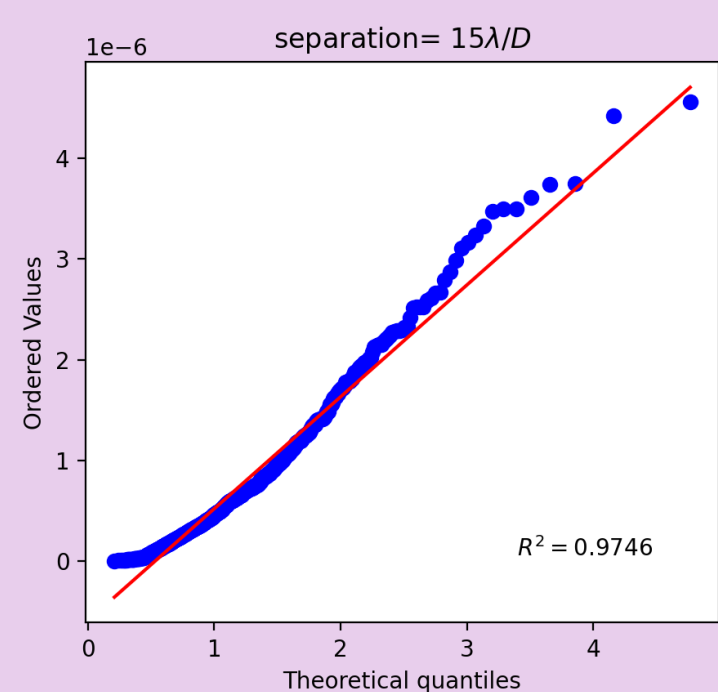


Time series are built from the pixel values of de-rotated residuals frames using one PSF subtraction method or more, at one separation

The RSM search for any change in the behaviour of the time series by adapting statistical models to describe the two regimes and translates that into a probability of belonging to each regime

Detection threshold under log-norm assumption

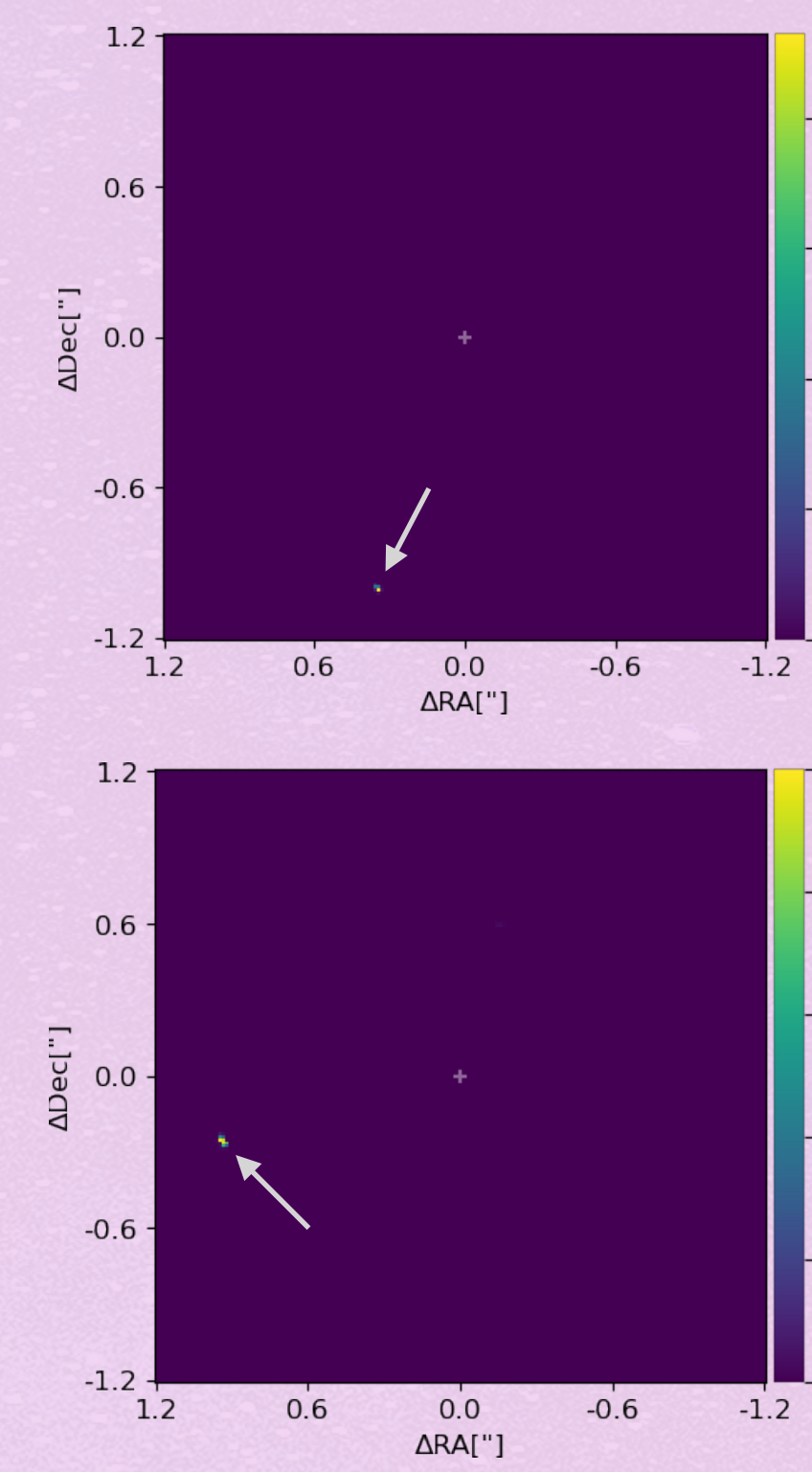
Noise in probability maps following a log-norm distribution



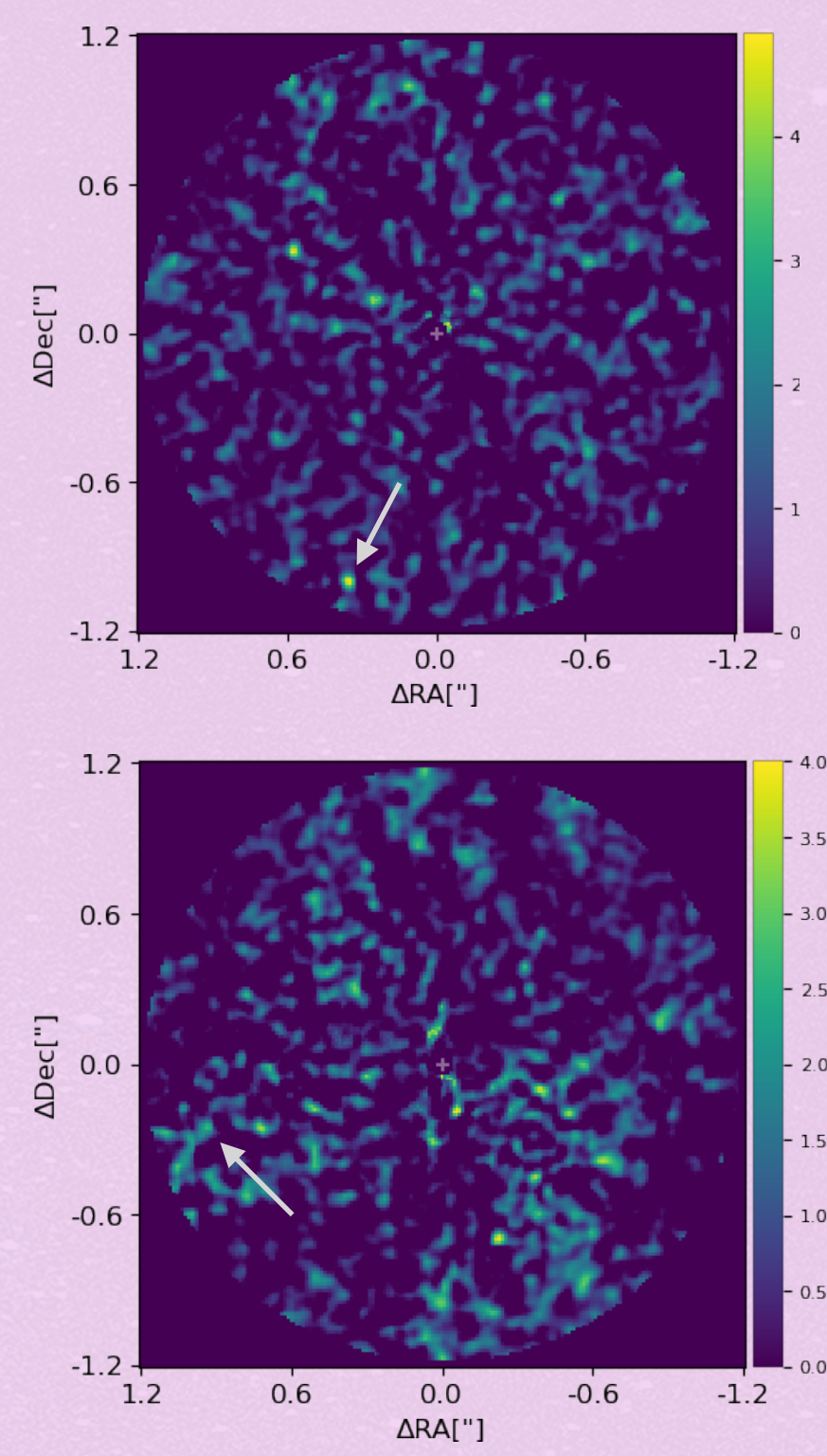
Using datasets sharing similar environmental conditions, independent realisations at each separation fitted a log norm distribution. The detection threshold is assumed at 3×10^{-7} false alarm probability. The contrast curve based on this detection threshold and 50% completeness is equivalent to the 5 sigma contrast under the assumption of gaussian noise.

New point sources in SHINE survey!

RSM probability map



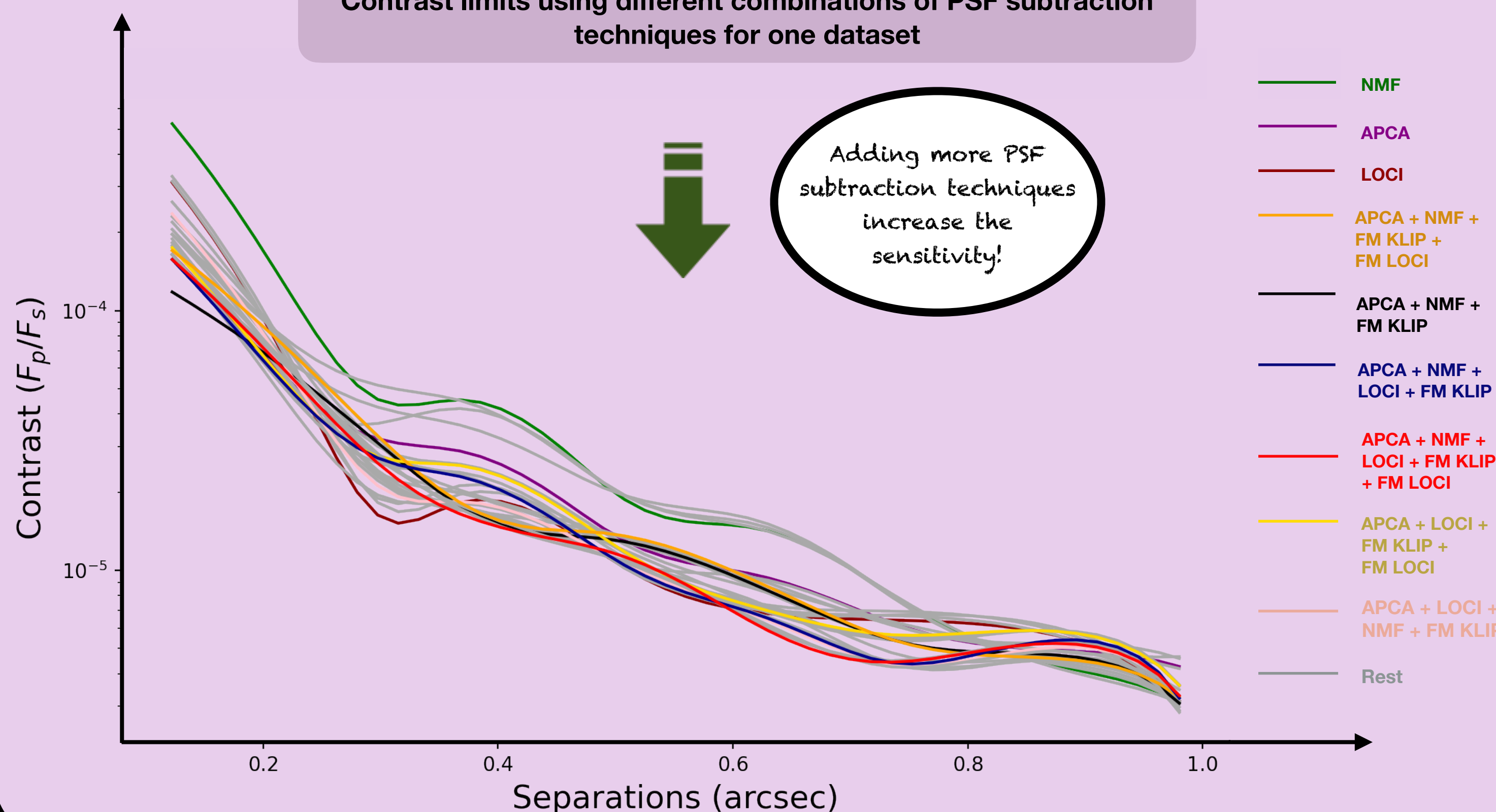
PCA SNR map



Numerous Candidates are under analysis..

Detection limits using different PSF subtraction methods

Contrast limits using different combinations of PSF subtraction techniques for one dataset



New detection limits in SHINE !

Median contrast limits using the combination of APCA - NMF - LOCI - FM KLIP - FM LOCI on the full F150 SHINE sample

