

# Quality of correction ? - 1

$$S = \frac{I_{\text{post AO}}[0, 0]}{I_{\text{perfect}}[0, 0]}$$

where  $I[0,0]$  is the intensity of the PSF at the optical center of the field (K. Strehl, Zeit. Instrumentkde 22, 213 (1902)).

$$S \simeq \exp\{-\sigma_{\text{post AO}}^2\}$$

in the framework of the Maréchal's approximation, where the variance (in radians<sup>2</sup>) is supposed to be small enough...

→ see also page 3 of Carbillet et al., MNRAS (2017)

# Quality of correction ? - 1+

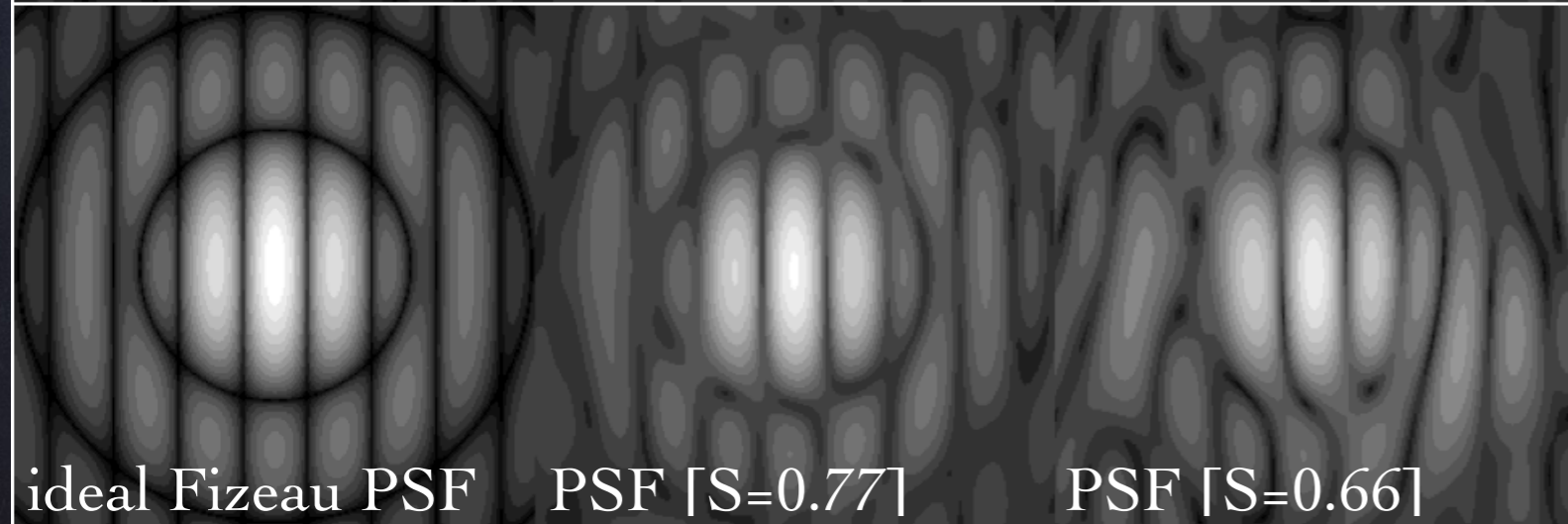
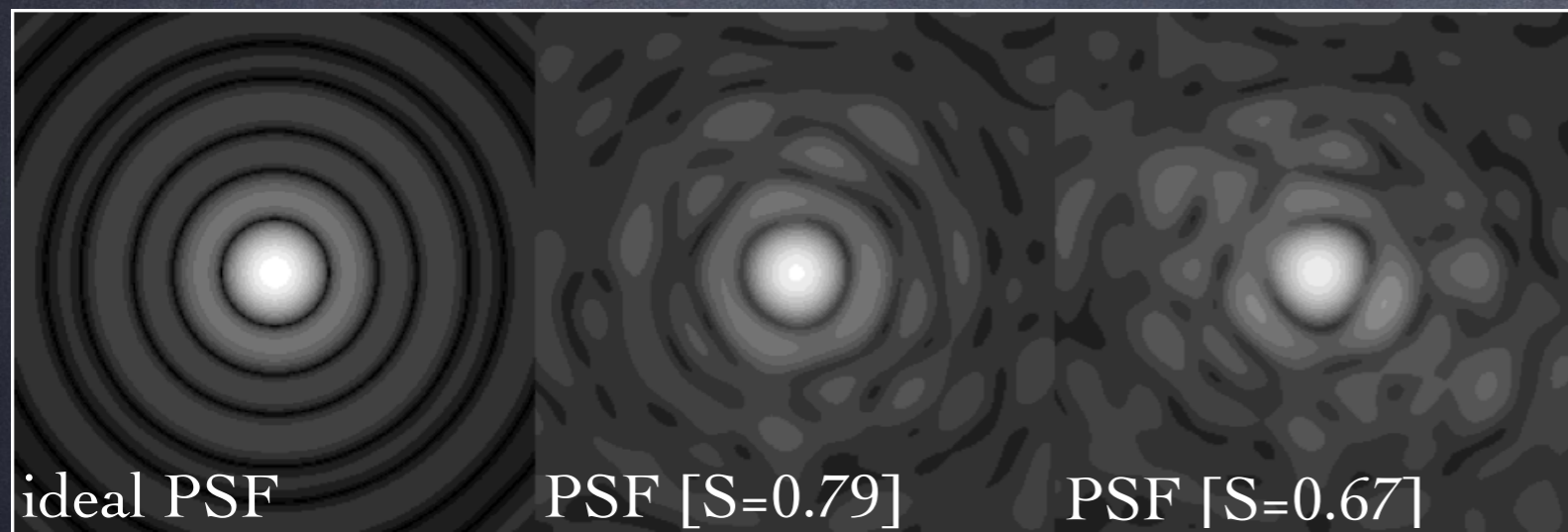
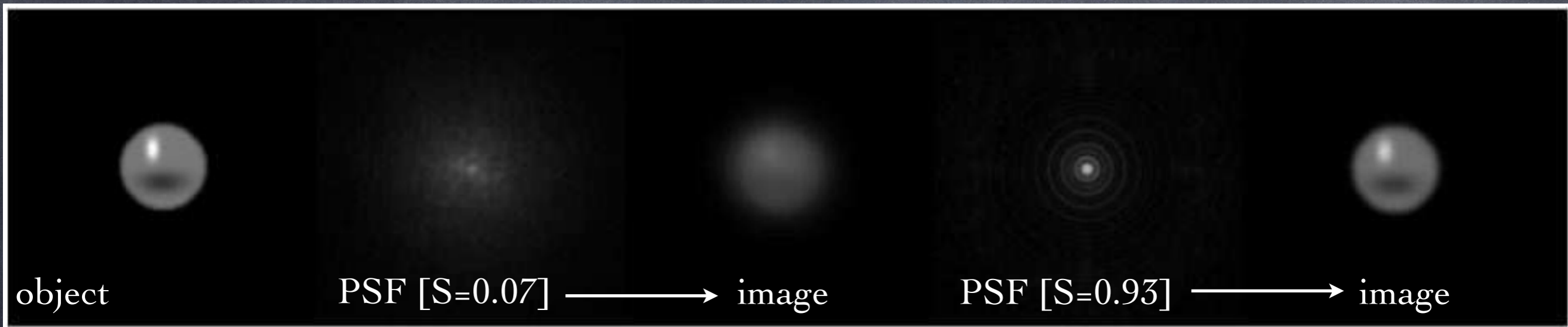
Approximation qui néglige le tip-tilt : rapport des maxima

rapport des valeurs au centre de l'image  $\approx$  rapport des FTO  
(voir par exemple article de Roberts et al.)

From Tokovinin, PASP (2002):

$$S = \frac{I_{max}}{I_{tot}} \frac{4}{\pi} \left( \frac{\lambda_{CCD}}{D \Delta x} \right)^2$$

# Quality of correction ? - 2



# Quality of correction ? - 3



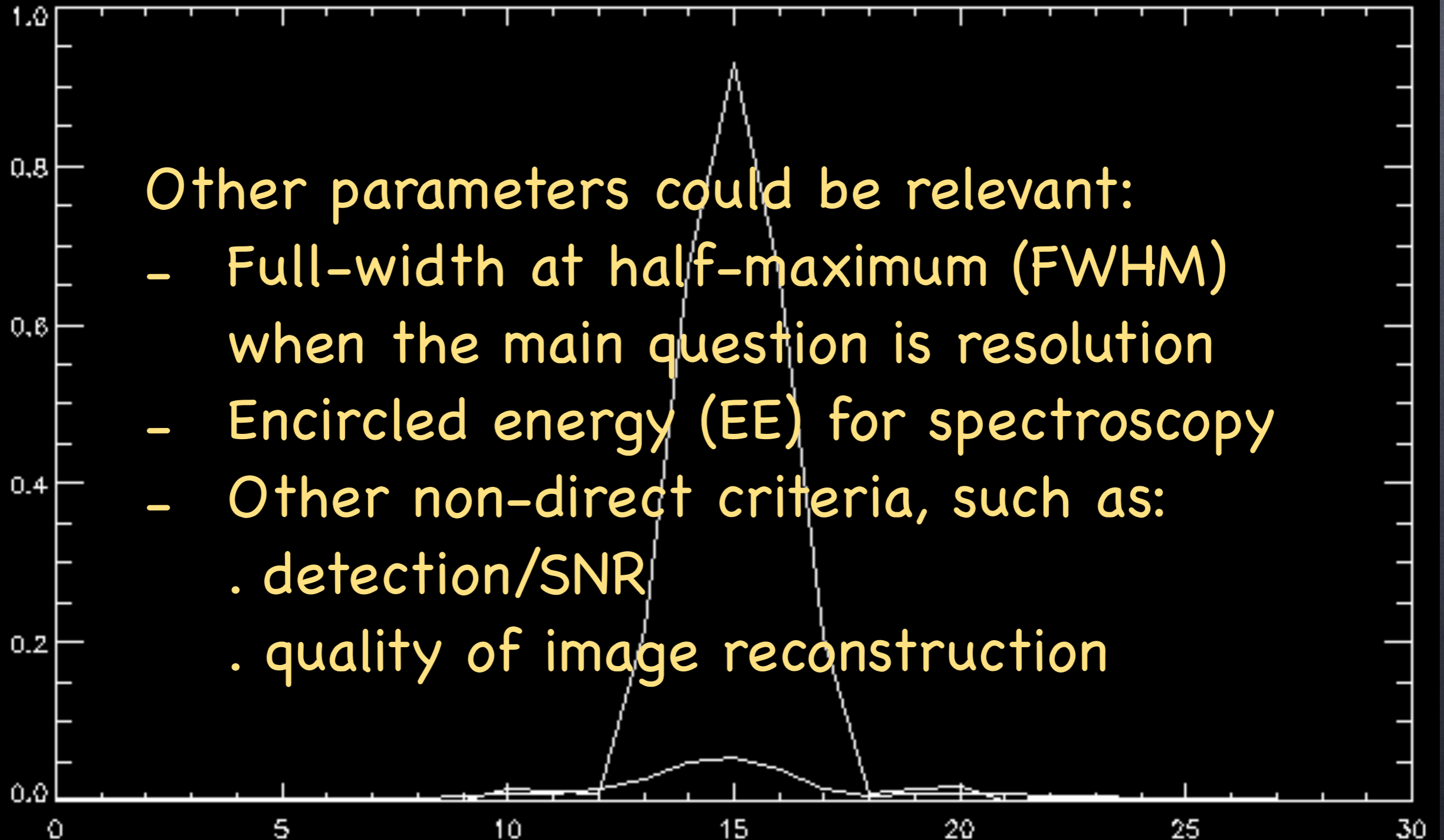
**Strehl ~7%**

**Strehl ~93%**

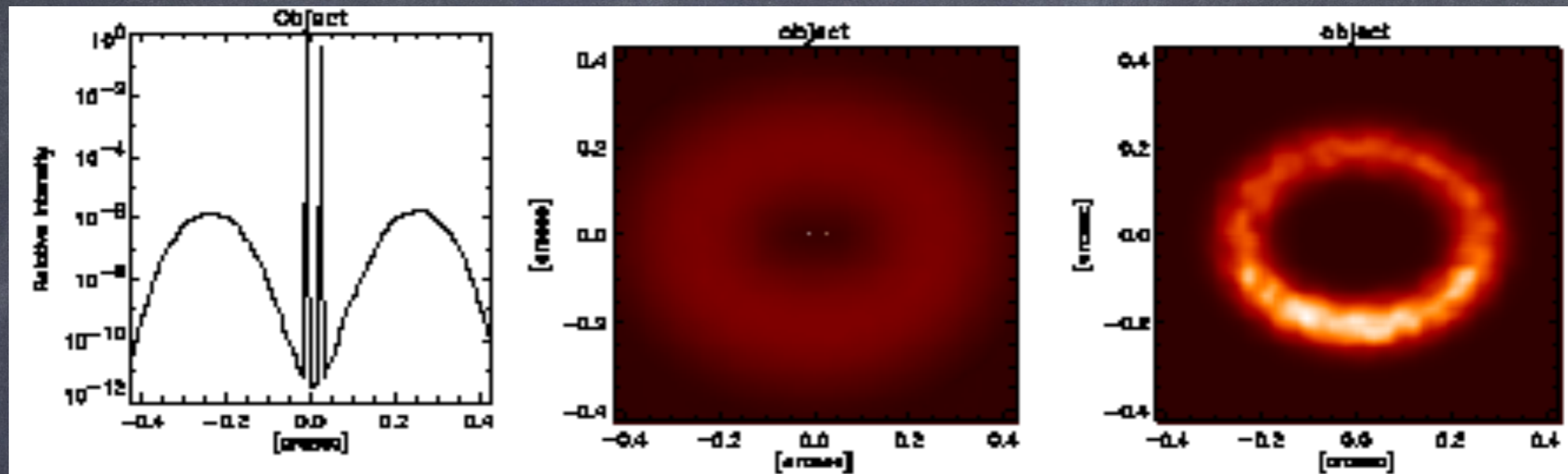
# Quality of correction ? - 4

Other parameters could be relevant:

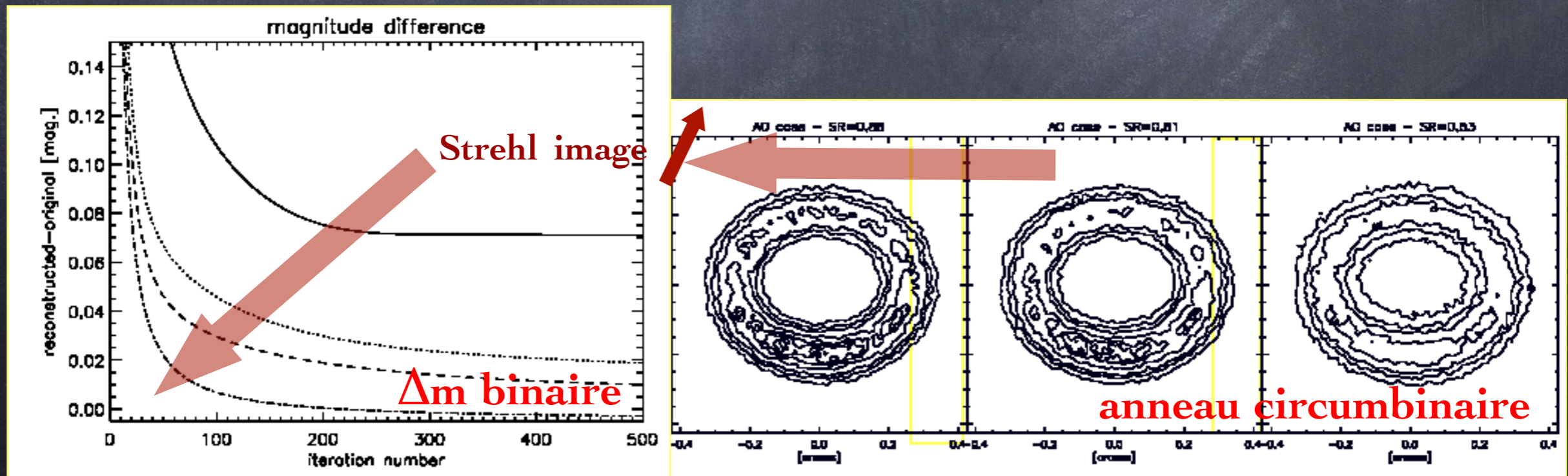
- Full-width at half-maximum (FWHM) when the main question is resolution
- Encircled energy (EE) for spectroscopy
- Other non-direct criteria, such as:
  - . detection/SNR
  - . quality of image reconstruction



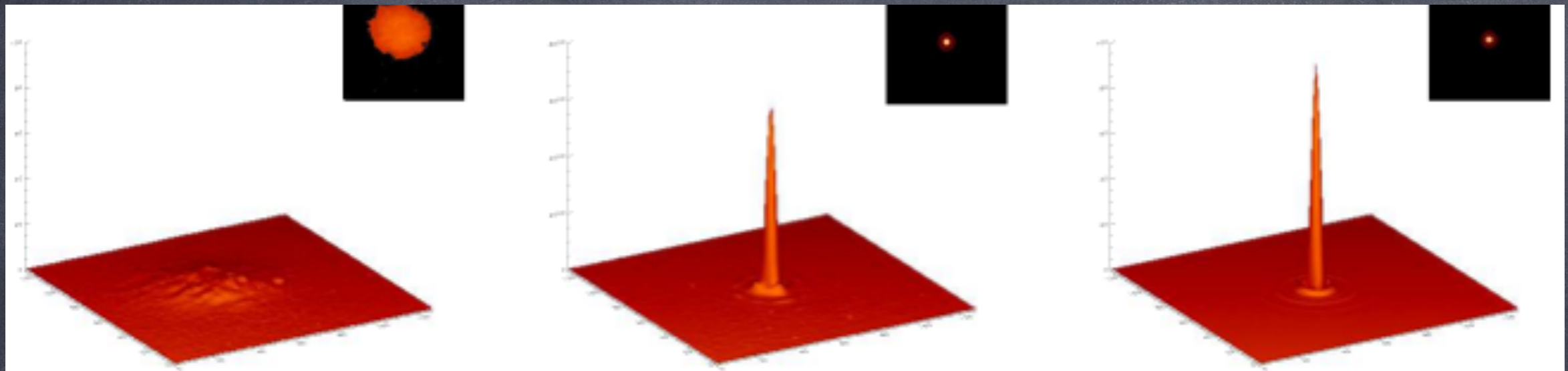
# Quality of correction ? - 5



GGTau-type object: central binary + circumbinary ring



# Post-AO PSF morphology - 1



**no correction**

**corrected ( $SR = 64\%$ )**

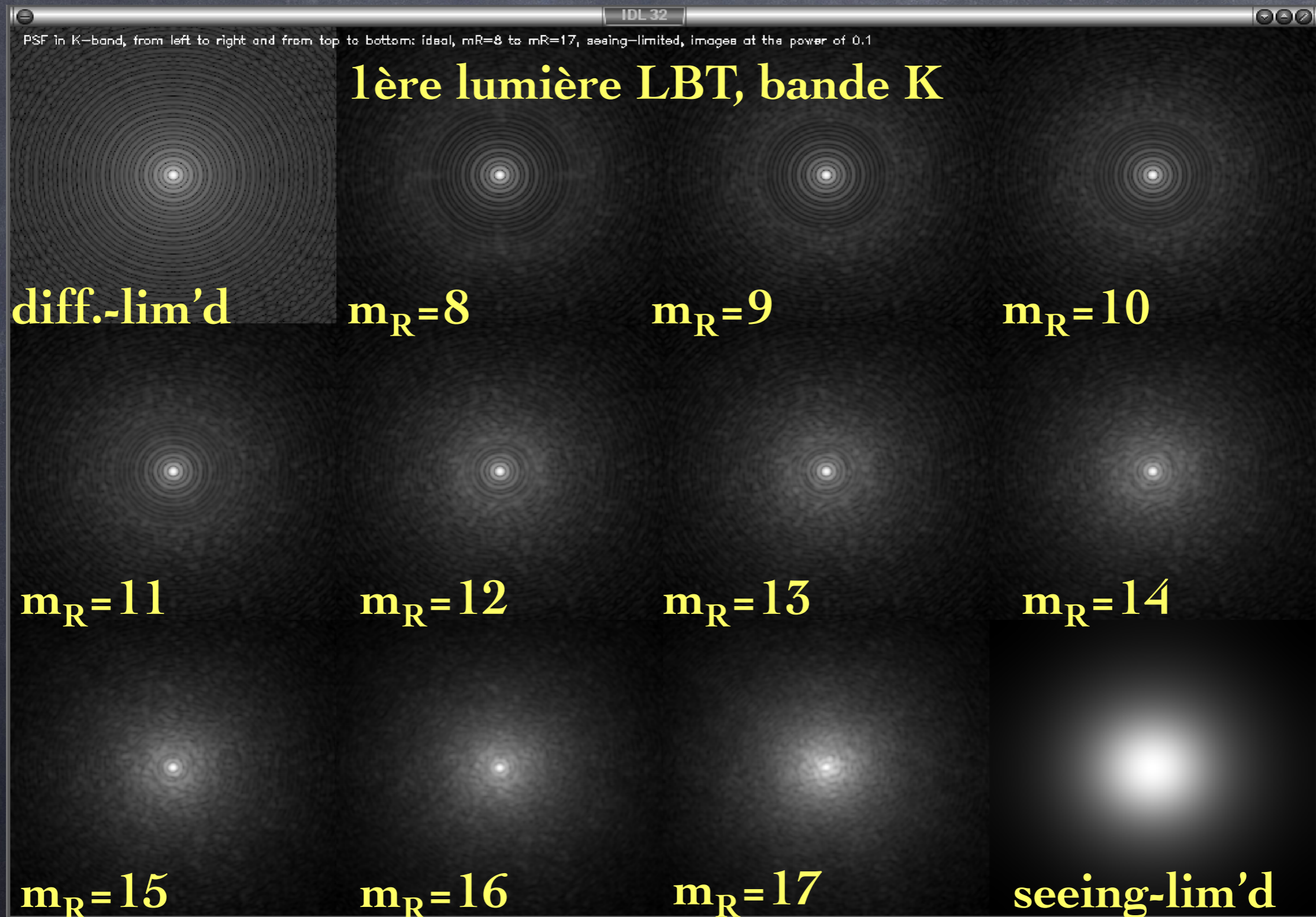
**Airy pattern**

**Imaging wavelength :  $2.2\mu m$**

**Turbulence :  $r_o = 1m$  à  $2.2\mu m$ , wind speed =  $10m/s$ , telescope :  $D = 8m$**

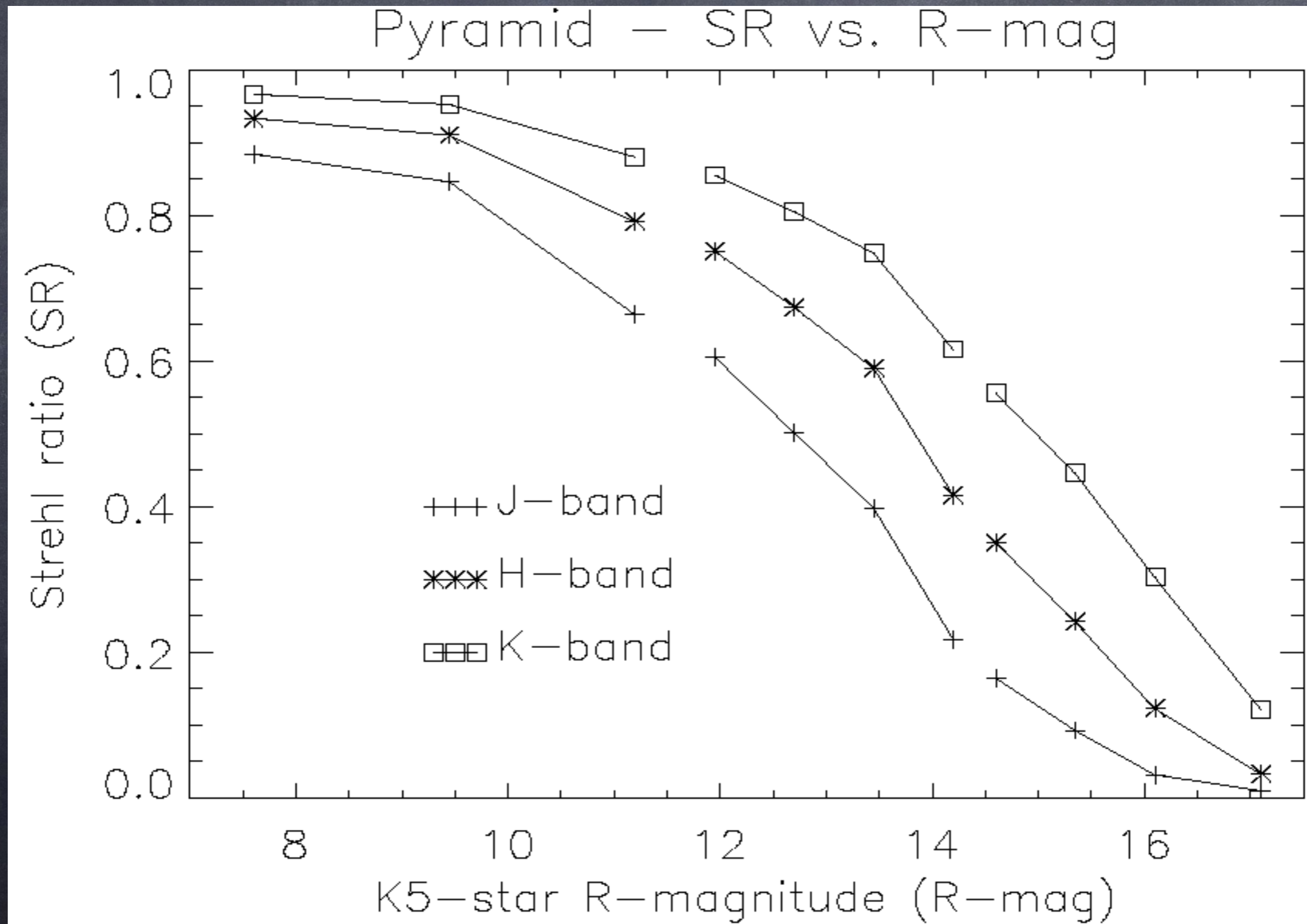
**System (NAOS) : 144 sub-aperture, 185 actuators,  $500Hz$  temporal sampling frequency**

# Post-AO PSF morphology - 2

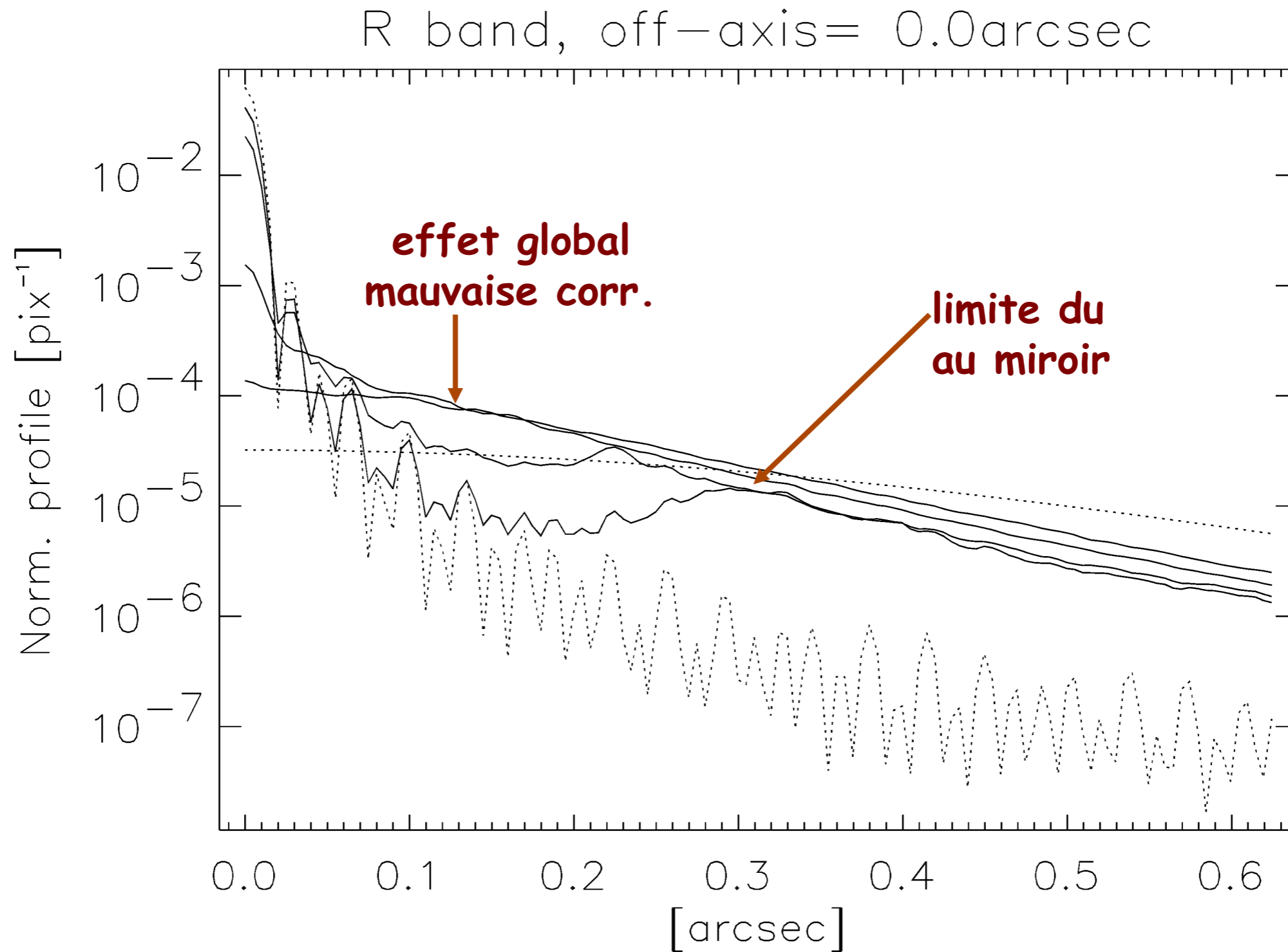




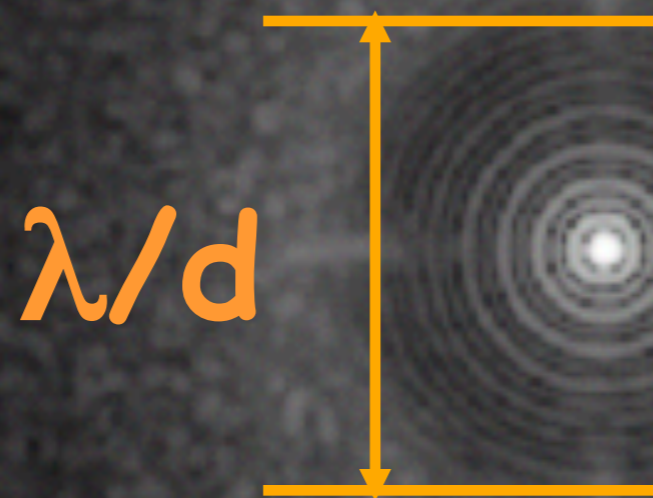
# Post-AO PSF morphology - 3



# Post-AO PSF morphology - 4



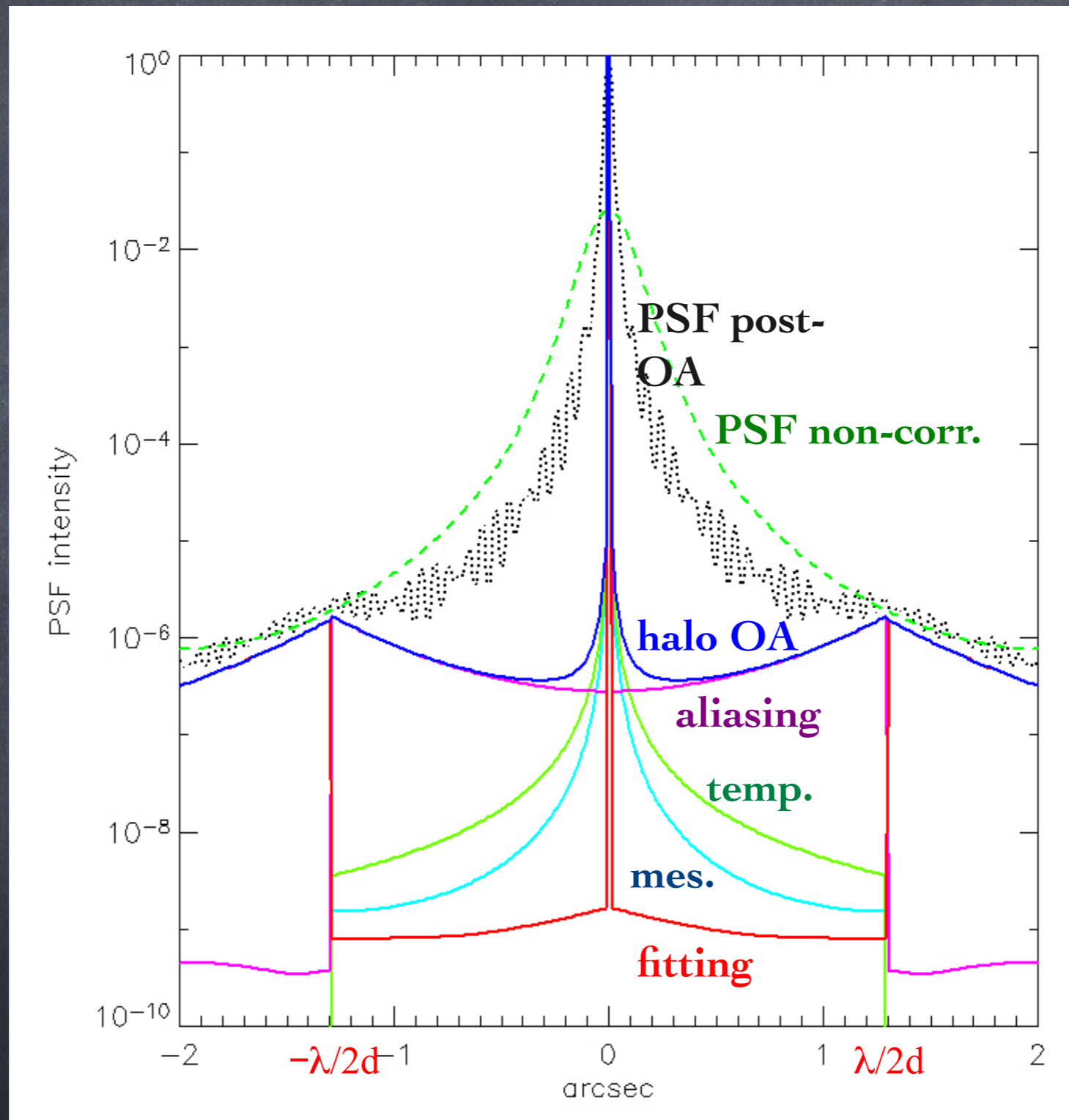
# Post-AO PSF morphology - 5



( $d$ =distance inter-actuateur)

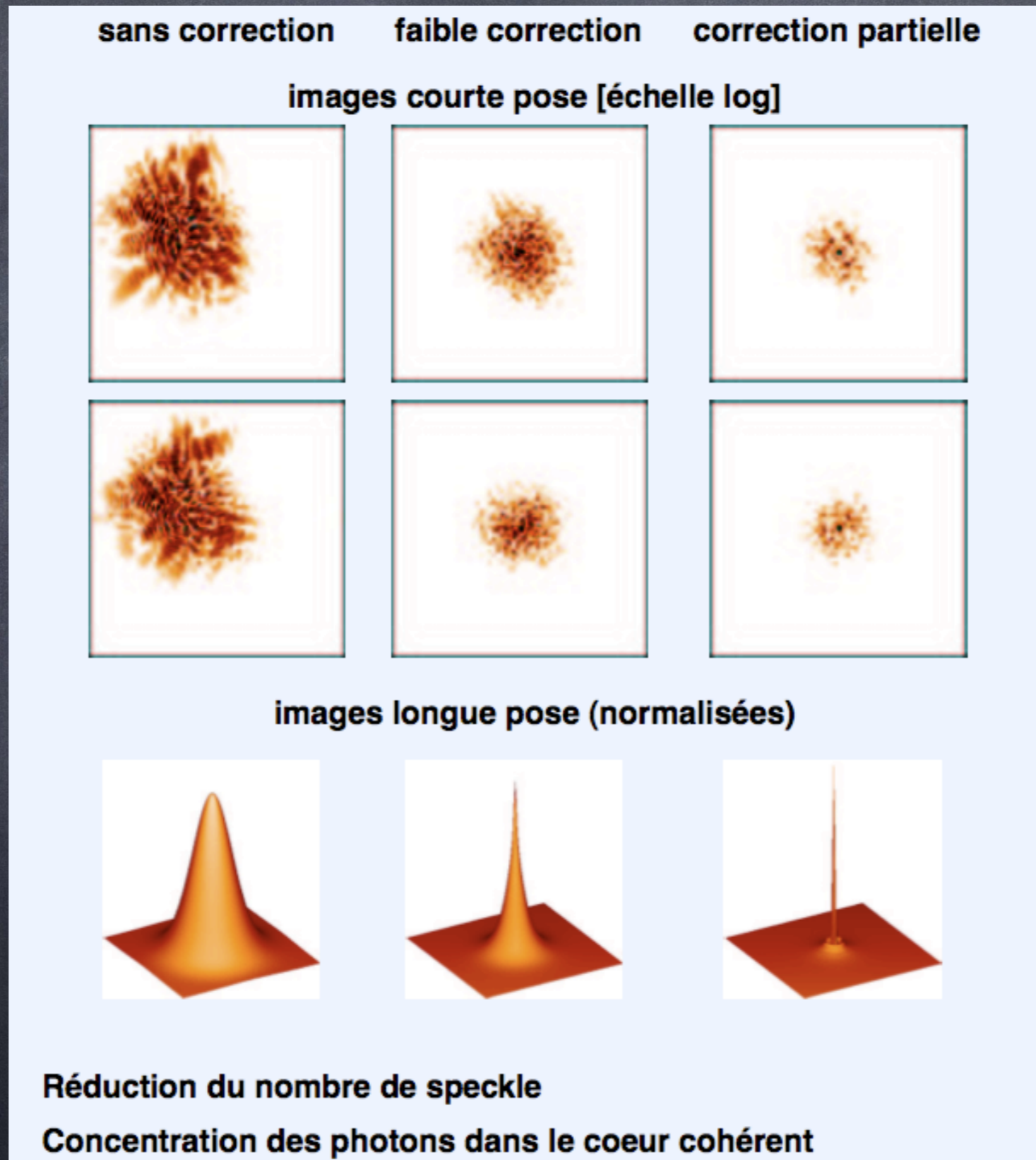
LBT672 - bande V - Strehl=0.68

# Post-AO PSF morphology - 6



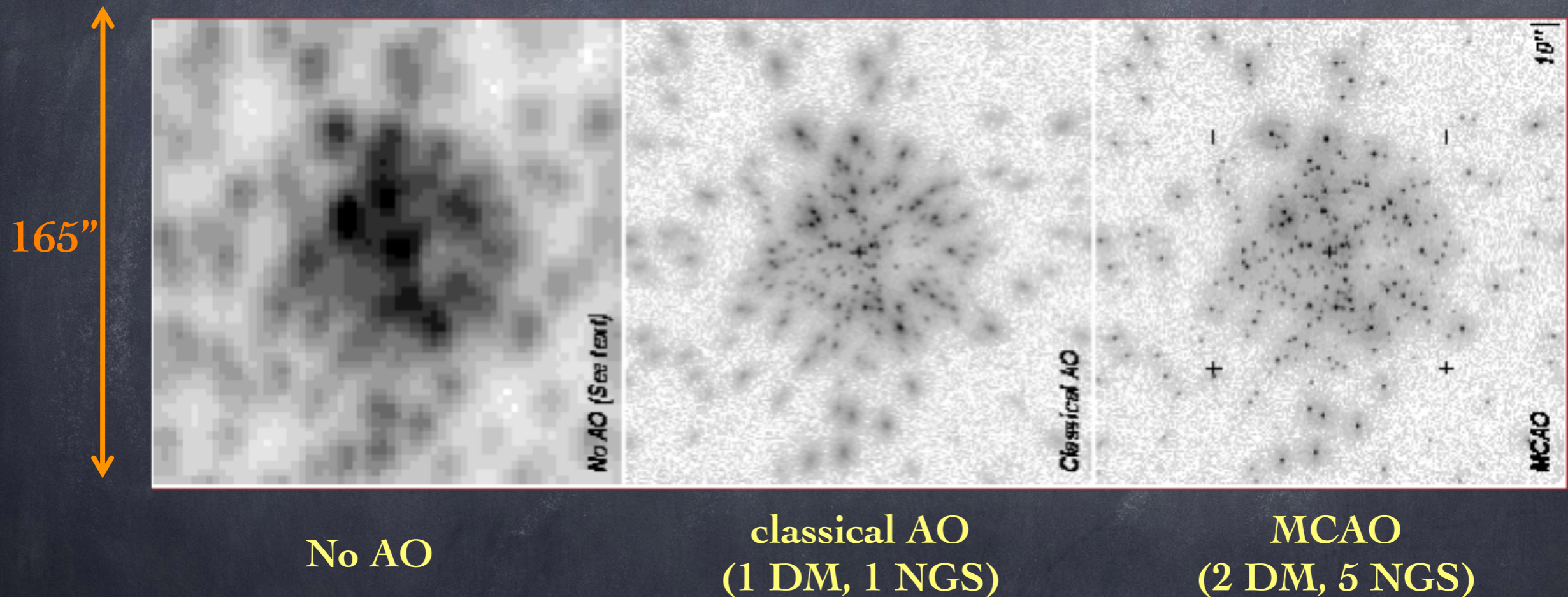
See also Jolissaint et al. (JOSAA, 2006) and Jolissaint (JEOS, 2010)

# Post-AO PSF morphology - 7

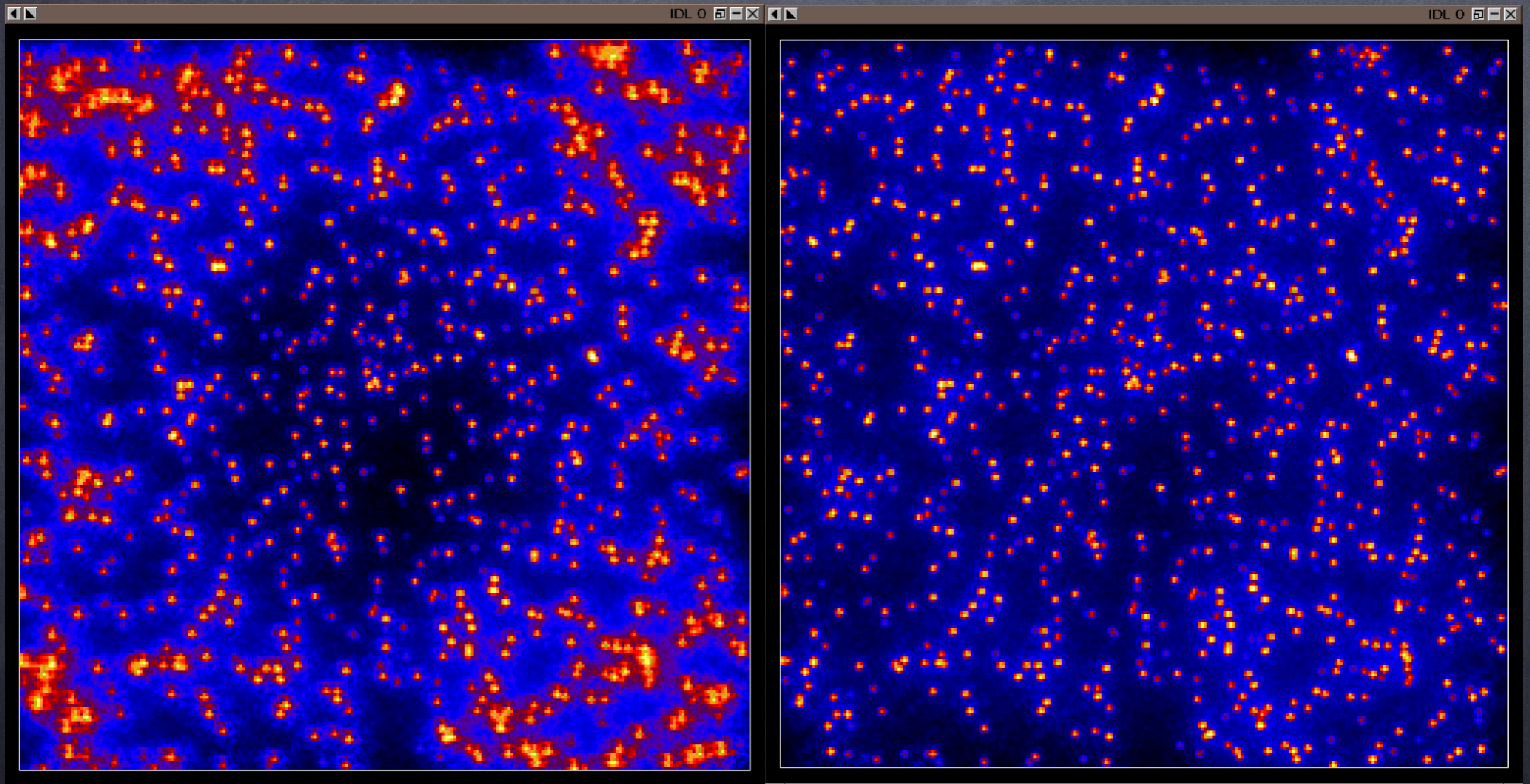


# Post-AO PSF morphology - 8

Wide-field AO case: anisoplanatism...



# Post-AO PSF morphology - 9



(bande J, champ de 1', simu. B.Ellerbroek, Gemini Obs.)

# Post-AO PSF morphology - 10

