

Is the HD 15115 inner disk really asymmetrical?



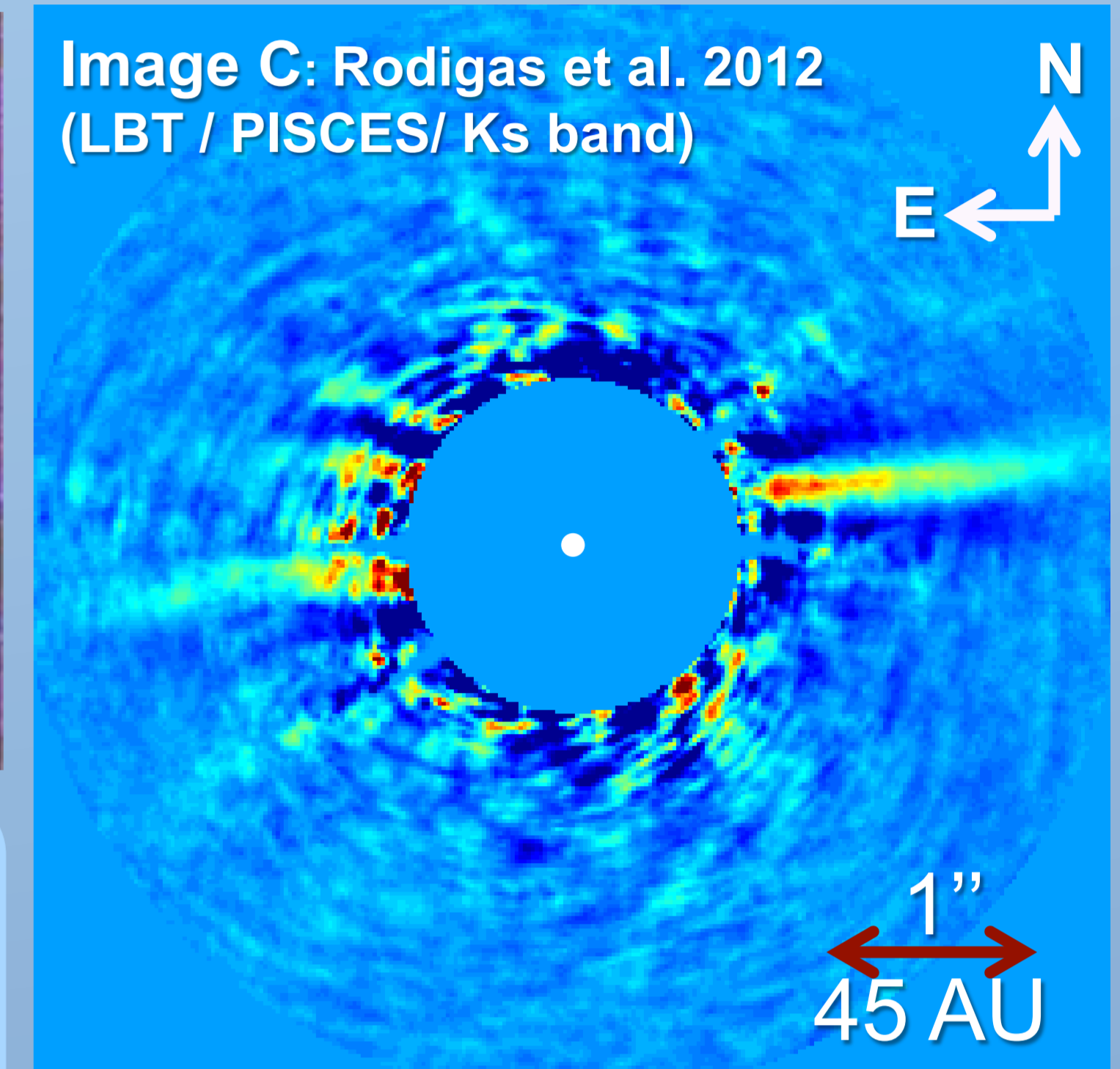
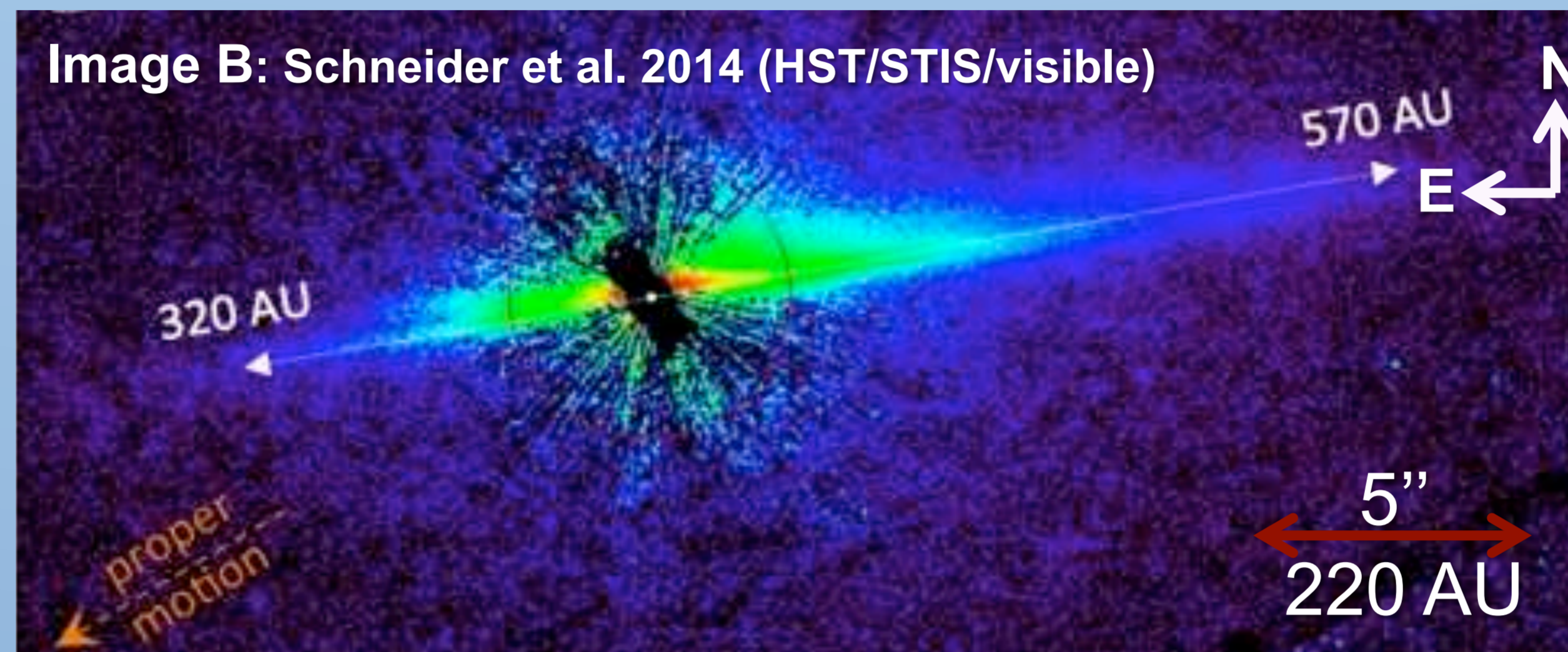
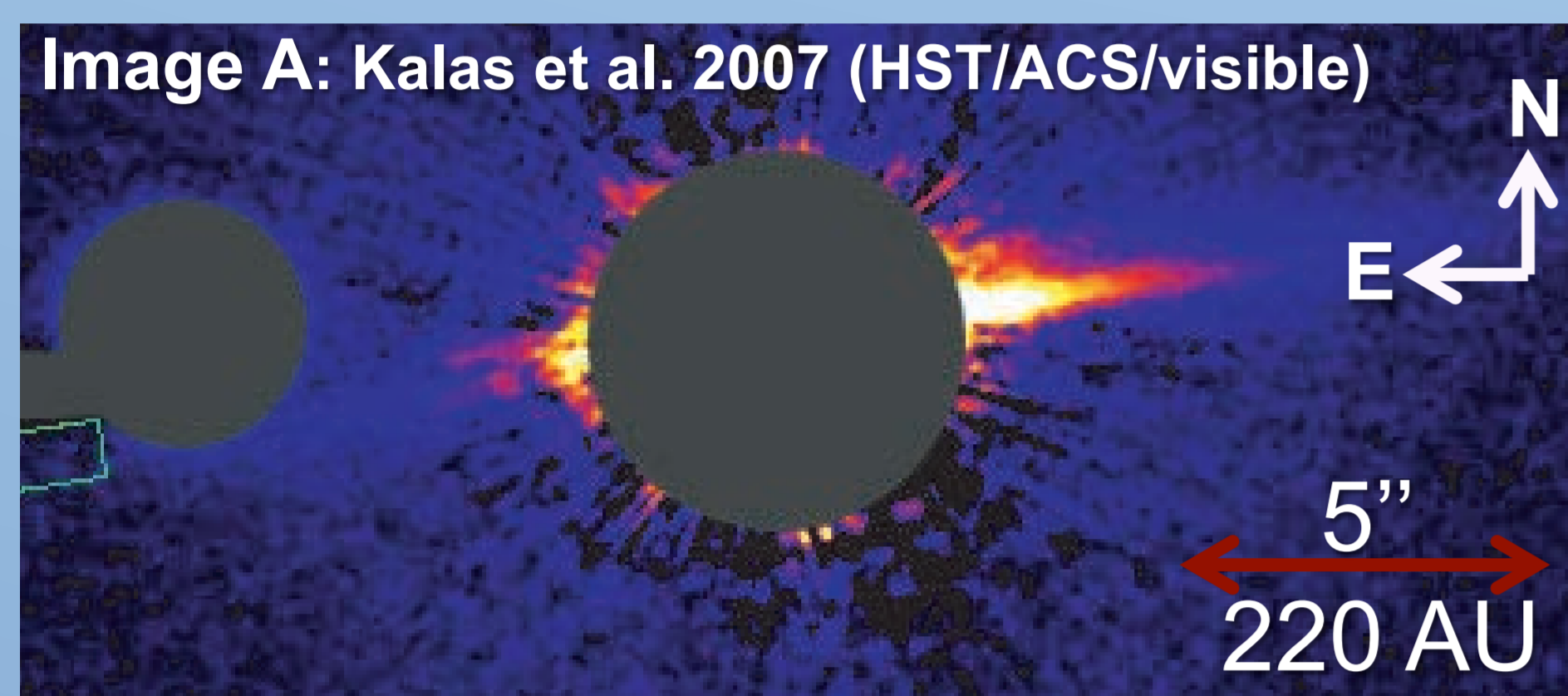
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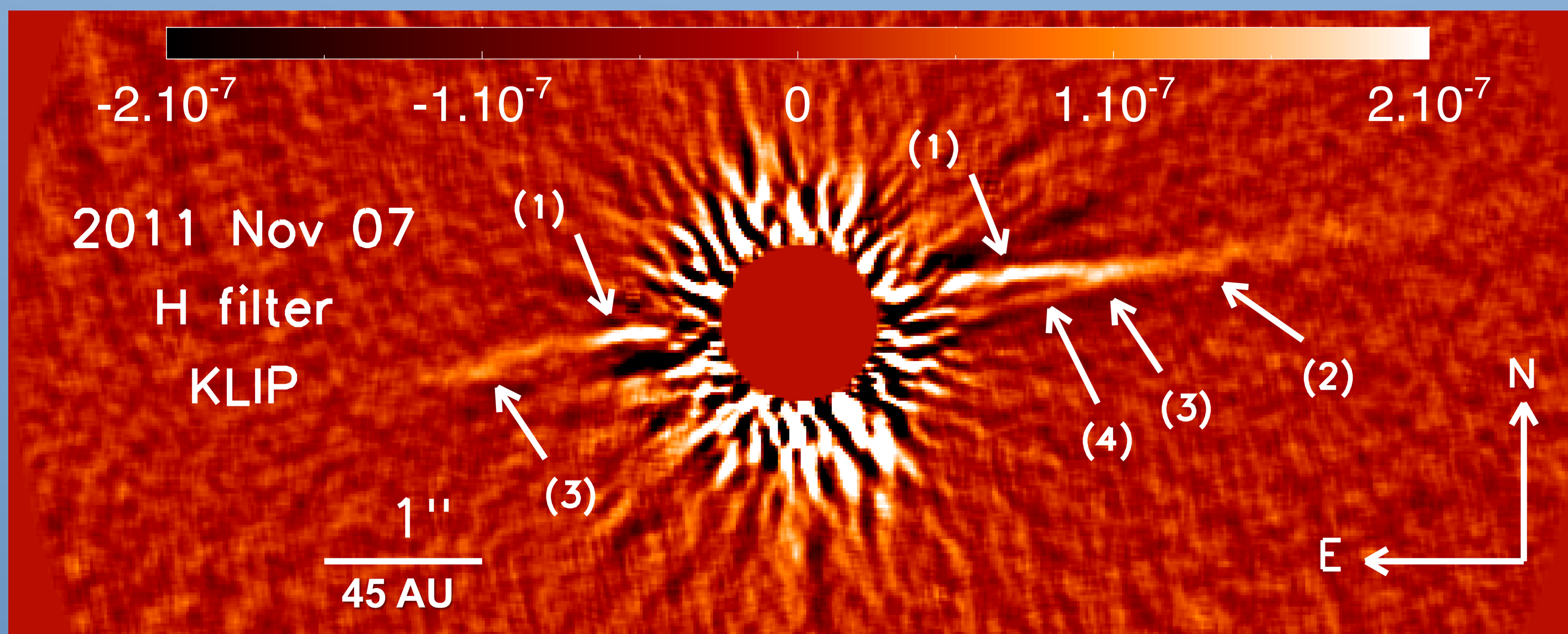
Similarly to β -pictoris, HD 15115 is a young and nearby (45.2 pc) star hosting a debris disk. The so called « blue needle » was first imaged in 2007 (Kalas et al., 2007) in visible using HST and in H band using the Keck observatory. The disk appears edge-on and shows an asymmetry between its west and east parts. HD 15115 was later observed in J band using HST / Nicmos data (Debes et al., 2008) and in Ks and L' using LBT (Rodigas et al. 2012). These observations confirmed the asymmetric nature of HD 15115 debris disk. We present here the analysis of data from the Gemini / NICI archival system from 2009 and 2011 in H and K bands. We were able to detect clearly the bow-like shape of the disk suspected from other observations. However, these new NICI images suggest the presence of a highly inclined ring-like disk of which we see the brighter side and the ansae located at 90 AU symmetrically about the star, contrasting with the brightness asymmetry. The inner part is likely depleted of dust. The fainter side of the disk is suspected but not firmly detected, which also indicates a large anisotropic scattering factor.

PREVIOUS DATA



- Extreme east-west asymmetry in the outer region (images A and B) confirmed in the inner region (image C)
- Bow like northern part – invisible southern part (images A B and C)
- Possible bifurcation on the east part at $\sim 3''$ (image B)

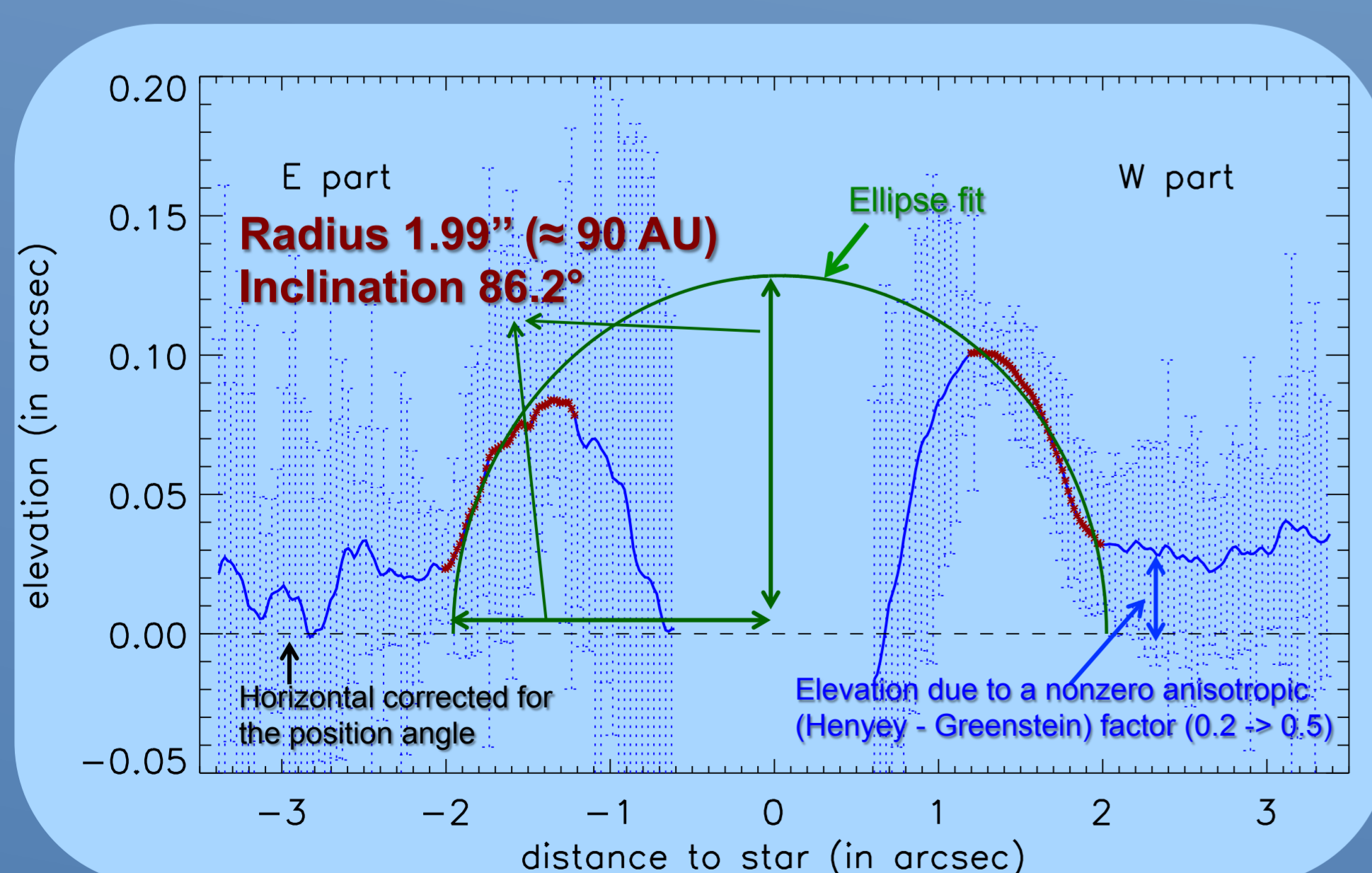
DATA FROM NICI @GEMINI SOUTH (2009 December 4, 2011 November 7, 2011 November 22 analysed in ADI, KLIP and LOCI)



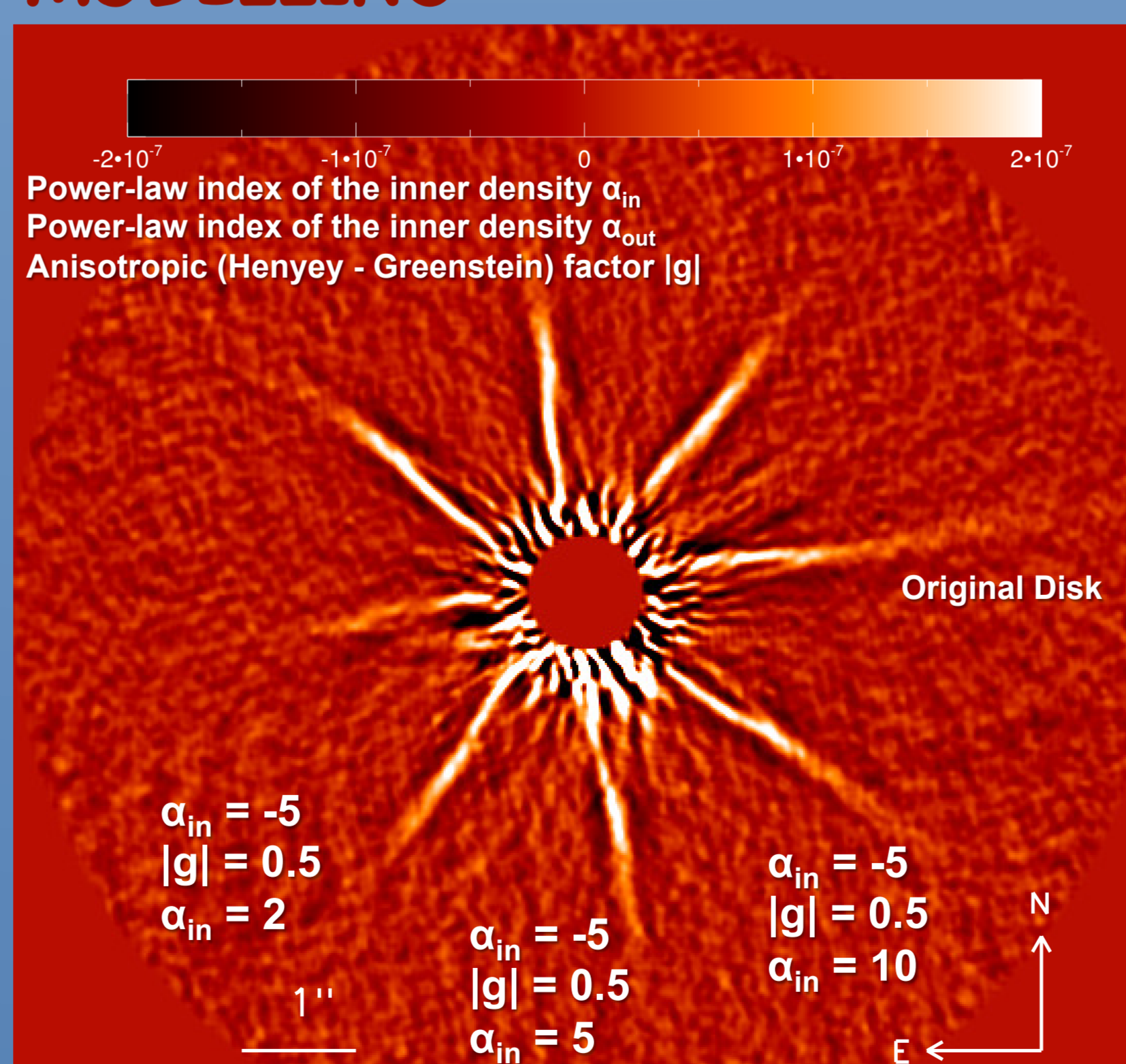
- (1) Northern bow-like inner part of the disk
- (2) Outer part of the disk (used to measure position angle : $98.8^\circ \pm 0.4^\circ$)
- (3) Ansaes of the disk
- (4) Possible southern part of the disk

TRACE OF THE DISK

(measured using images of 3 epochs, 2 filters, 2 angular differential imaging processings)

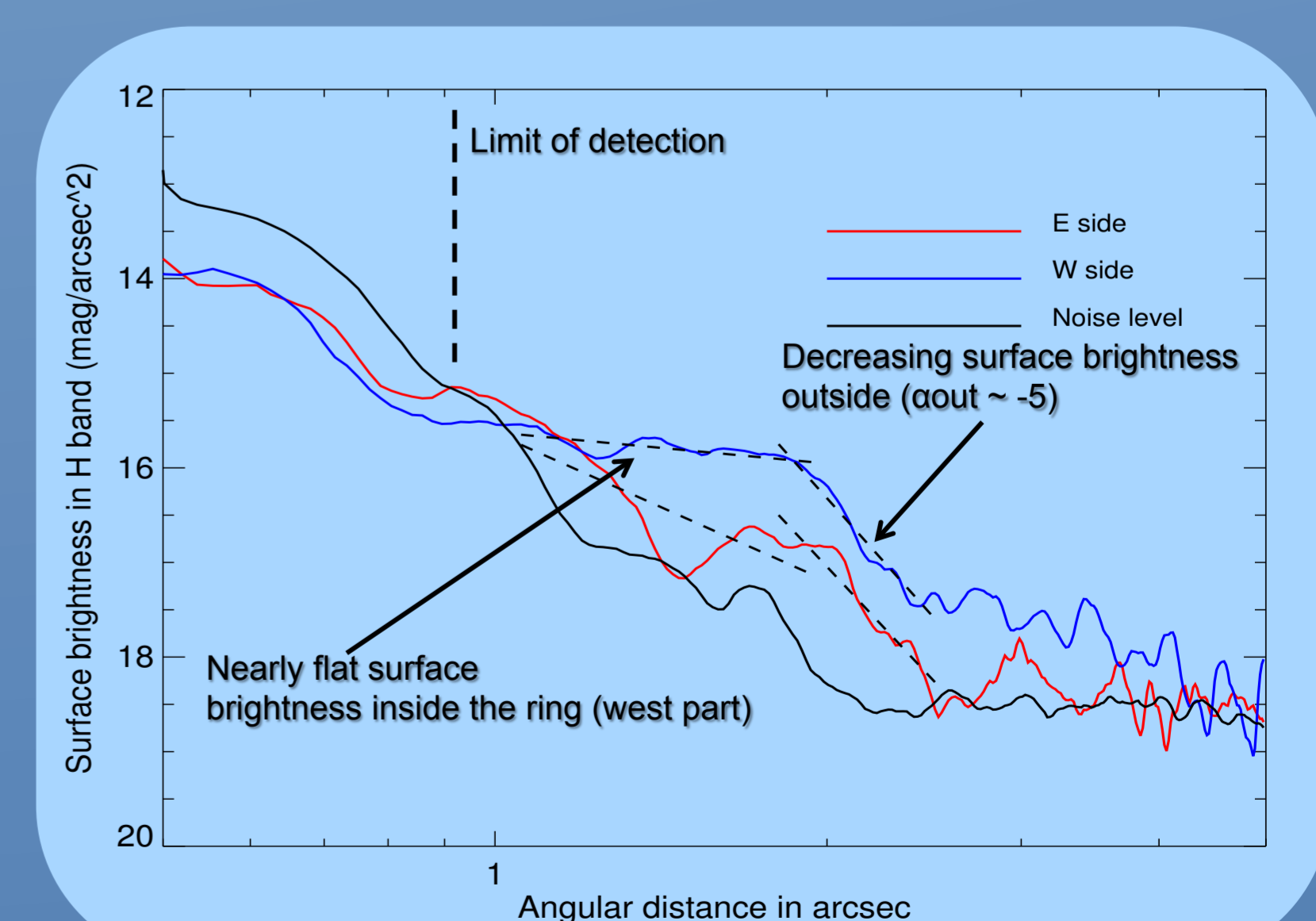


MODELLING



PHOTOMETRY

(corrected for bias introduced by KLIP)



CONCLUSION

Kalas et al. 2007 ApJ, 661: L85-L88
Debes et al. 2008 ApJ, 684: L41-L44
Rodigas et al. 2012, ApJ, 652:57
Schneider et al. 2014, arXiv:1406.7303v2

- Confirmation of the detection in all bands and epochs of the nearly edge-on disk.
- Observation of the brightness asymmetry and of the bow-like shape.
- Possible detection of the southern (lower) half (not in all data set).
- Data are consistent with a symmetrical ring like inner cavity with a radius of 90 AU. In our analysis we were able to put constraints on the disk parameters.
- A variation of the grains size and/or property distribution may explain the brightness asymmetry