

Determining the Narrow Line Region Geometry of Mrk 3 with Gemini/NIFS

Crystal L Gnilka

AGN Winds on the Georgia Coast
Jekyll Island – June 28th, 2017

Mrk 3 (Seyfert 2)

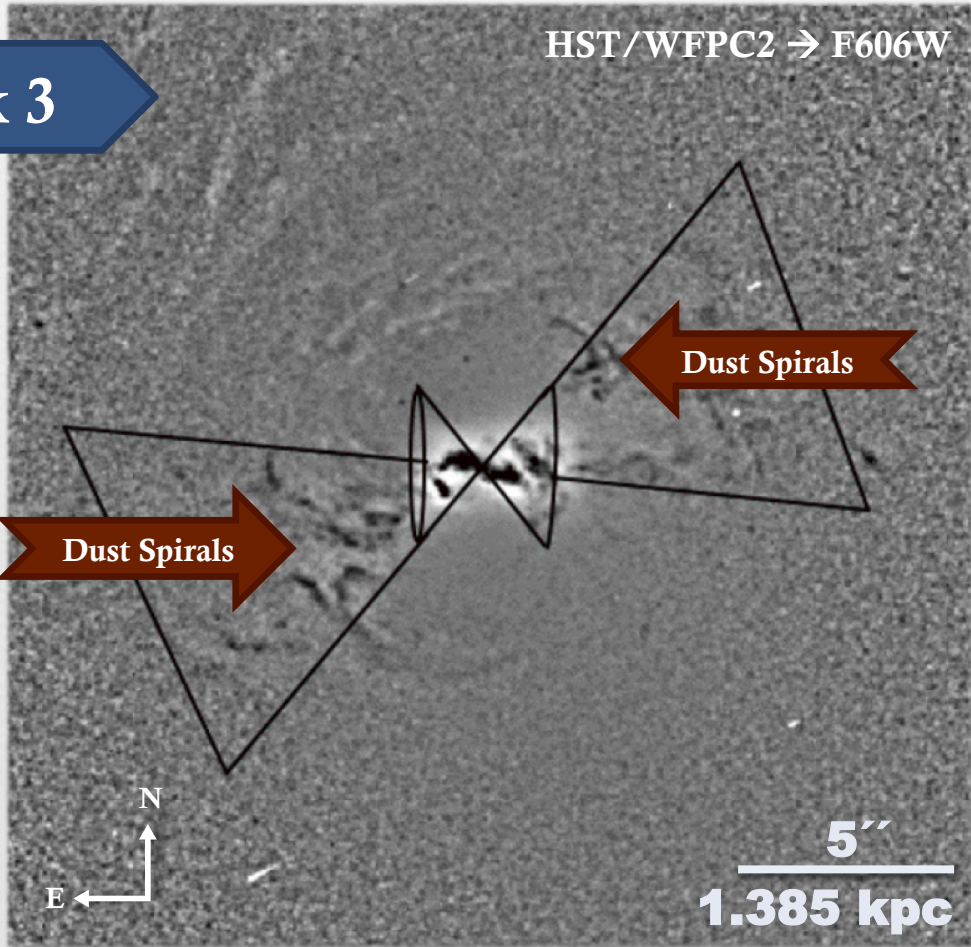


- ☞ S0 galaxy
- ☞ $z = 0.013509$
- ☞ $D = 57.2$ Mpc
- ☞ $d \sim 30$ kpc
- ☞ Scale = 277.3 pc/''

(Crenshaw+ 2010)

Mrk 3 (Seyfert 2)

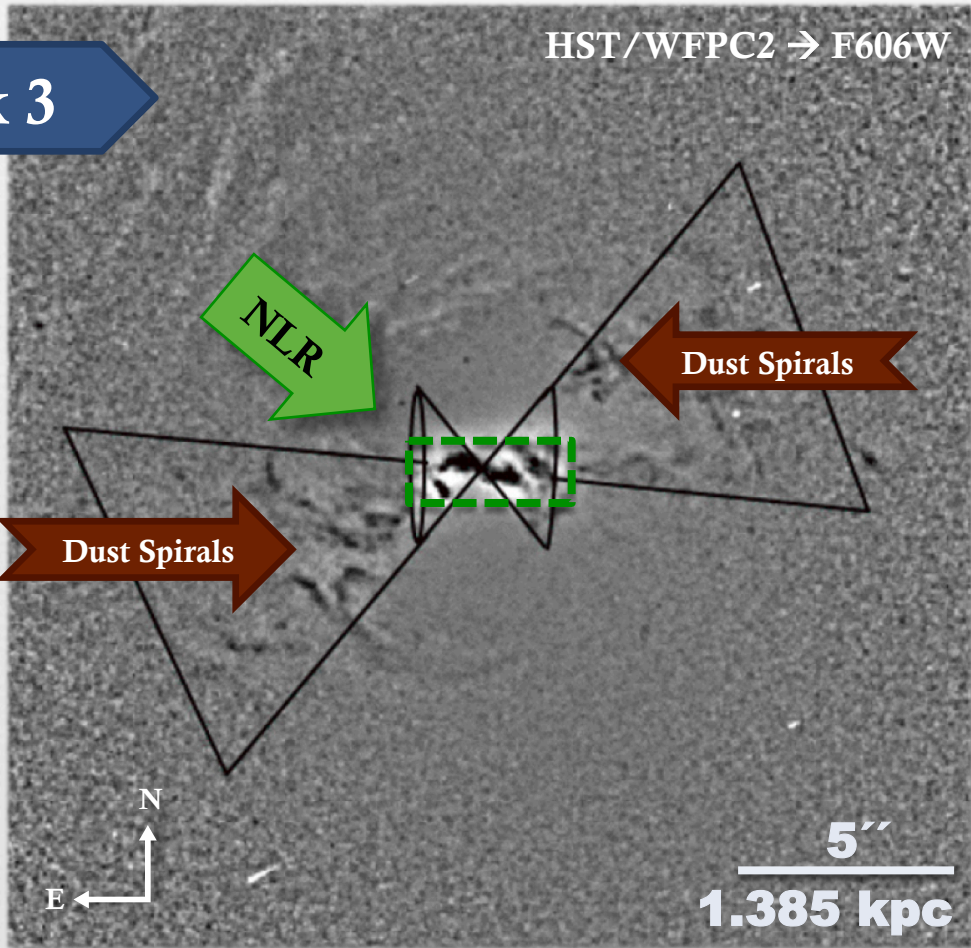
Mrk 3



(Crenshaw+ 2010)

Mrk 3 (Seyfert 2)

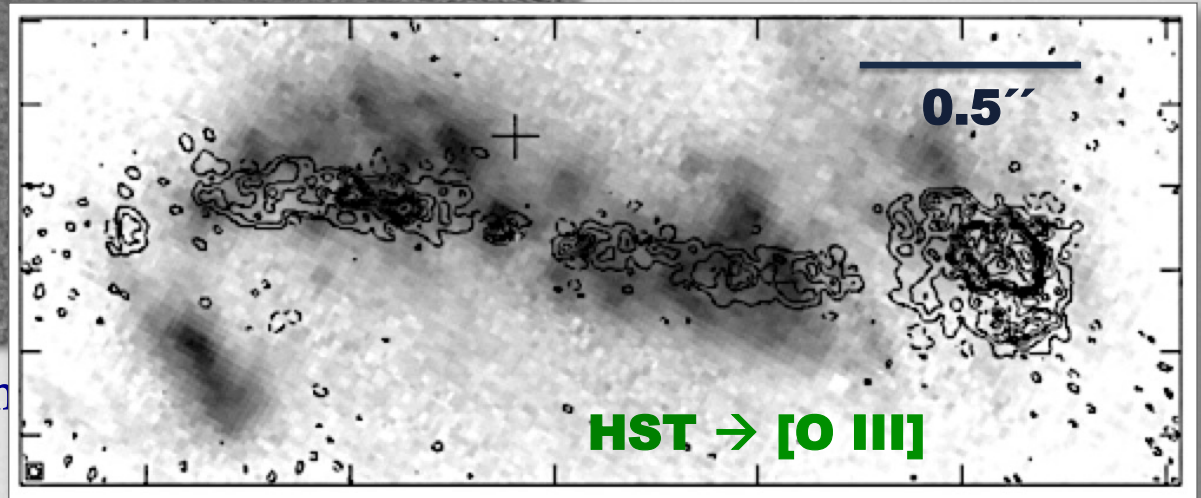
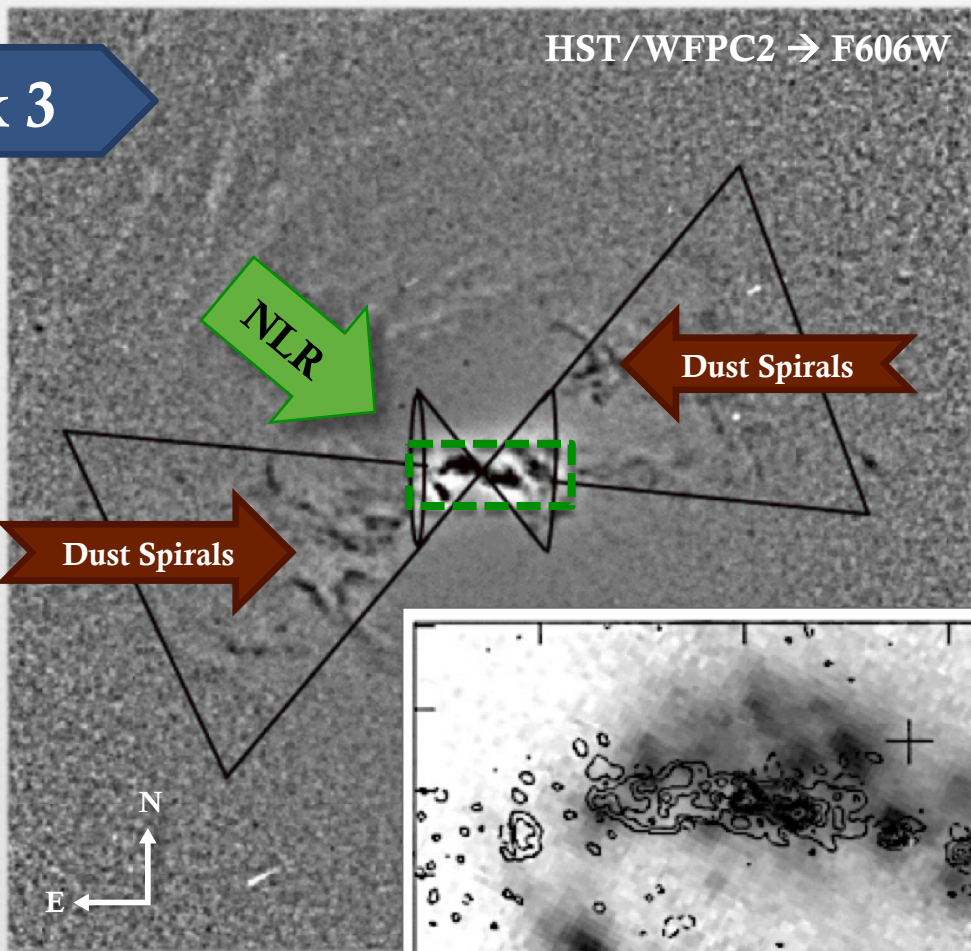
Mrk 3



(Crenshaw+ 2010)

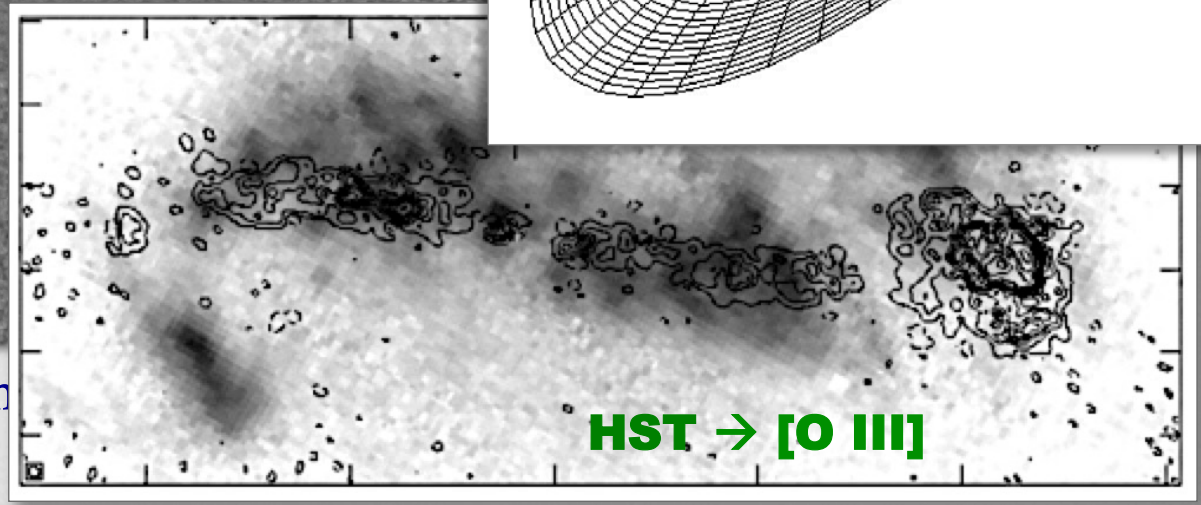
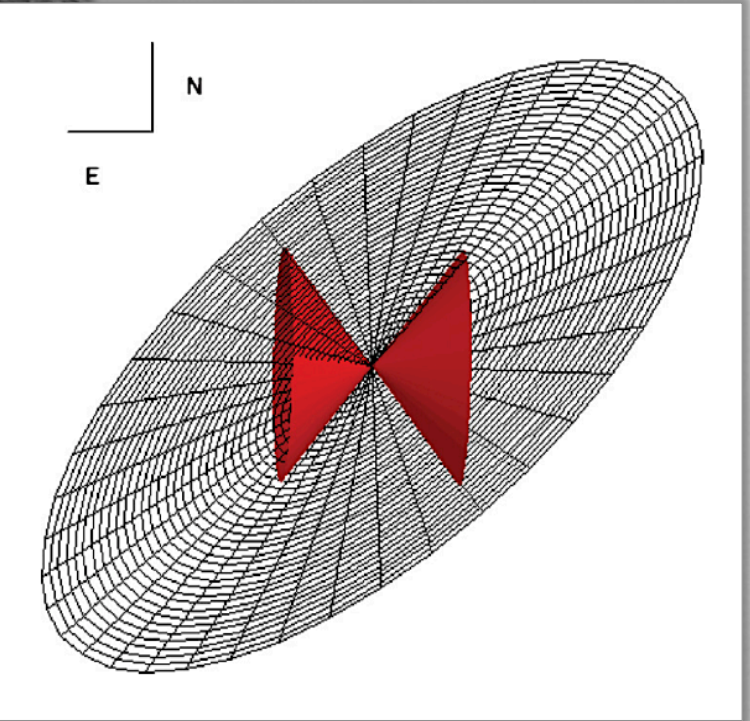
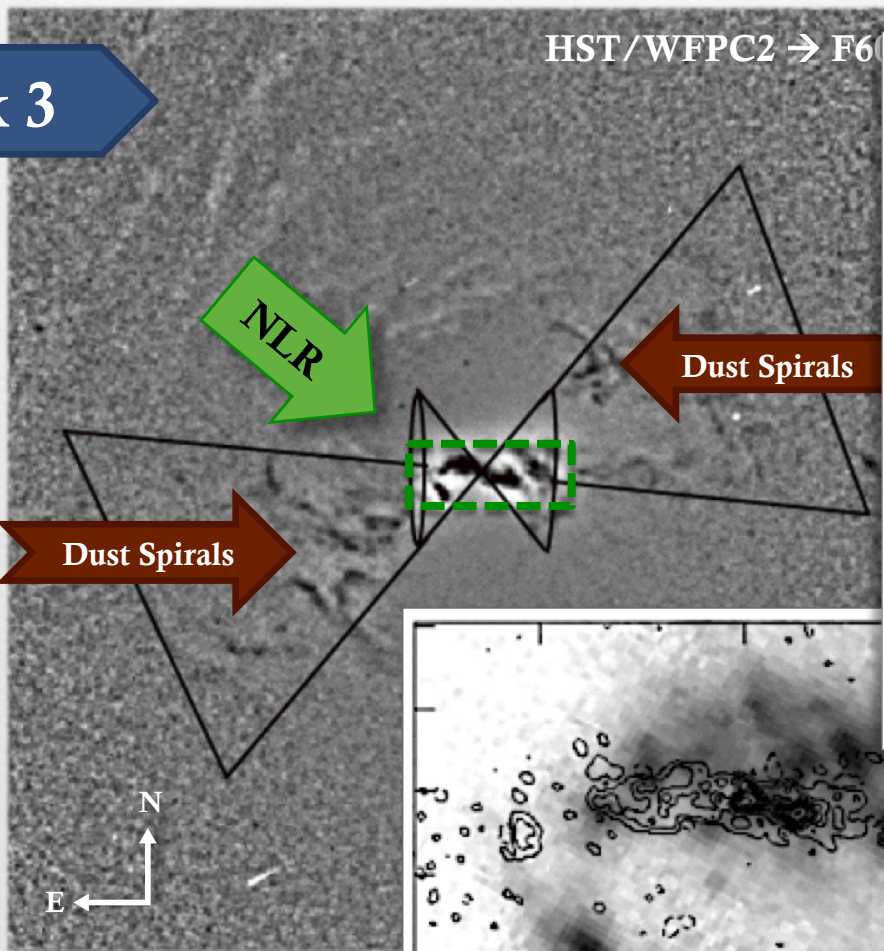
Mrk 3 with HST/STIS

Mrk 3



Mrk 3 with HST/STIS

Mrk 3



Data Treatment Procedure

A treatment procedure for Gemini North/NIFS data cubes: application to NGC 4151

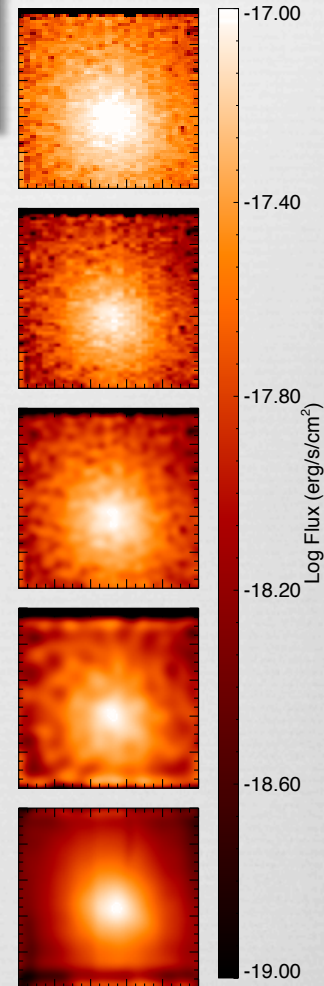
R. B. Menezes,^{1*} J. E. Steiner¹ and T. V. Ricci¹

¹Instituto de Astronomia Geofísica e Ciências Atmosféricas, Universidade de São Paulo, Rua do Matão 1226, Cidade Universitária, São Paulo, SP CEP 05508-090, Brazil

Menezes 2014 →

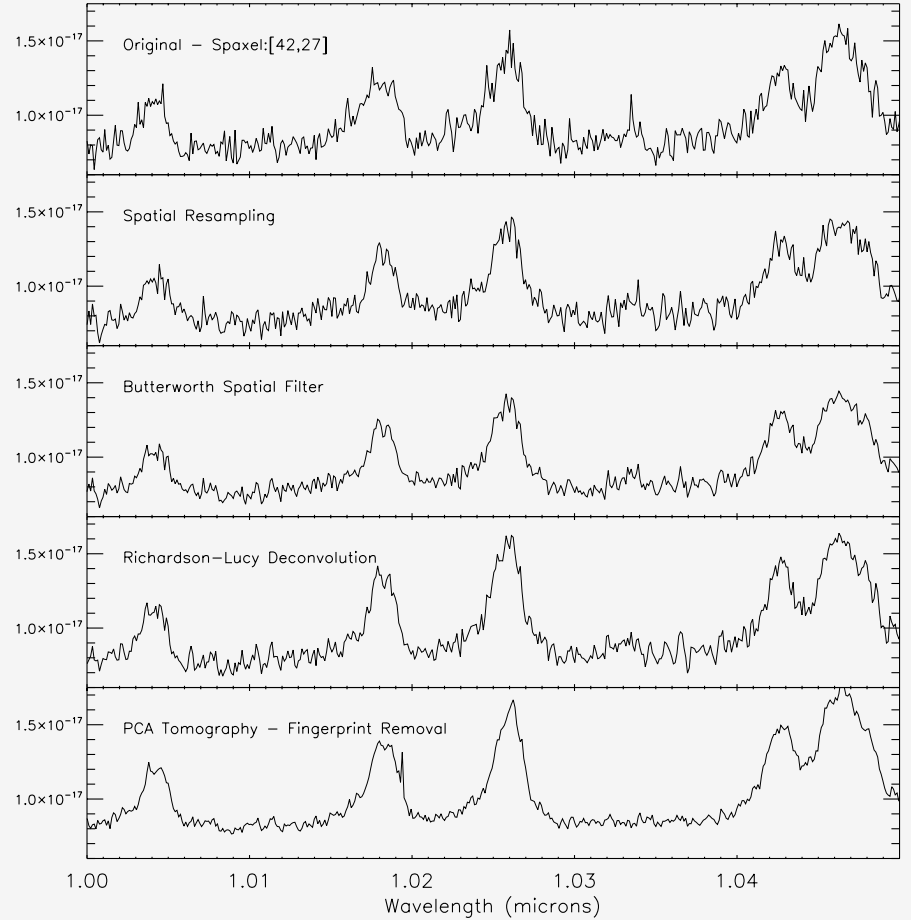
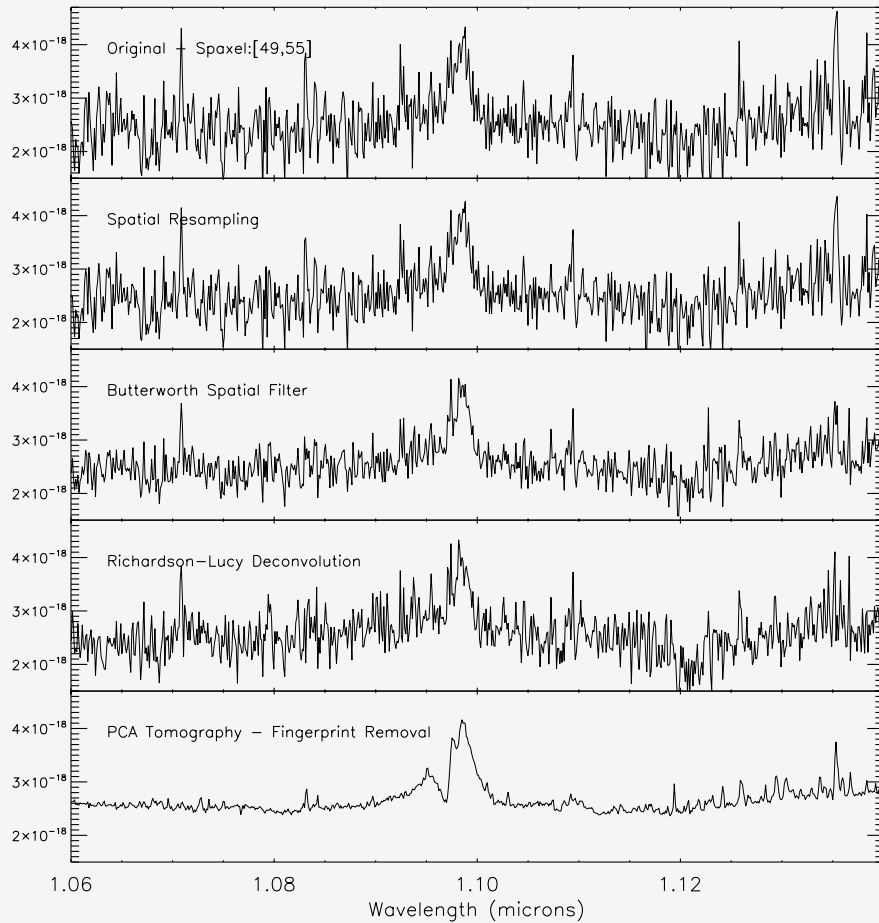
- ↻ Multistep data treatment aims to reduce noise and help distinguish structures in gas. Designed for NIFS datacubes.
- ↻ Correction of the Differential Atmospheric Refraction Effect
- ↻ Spatial Resampling
- ↻ Butterworth Spatial Filtering
- ↻ Richardson-Lucy Deconvolution
- ↻ Principal Component Analysis Tomography – Fingerprint Removal

Mrk 3

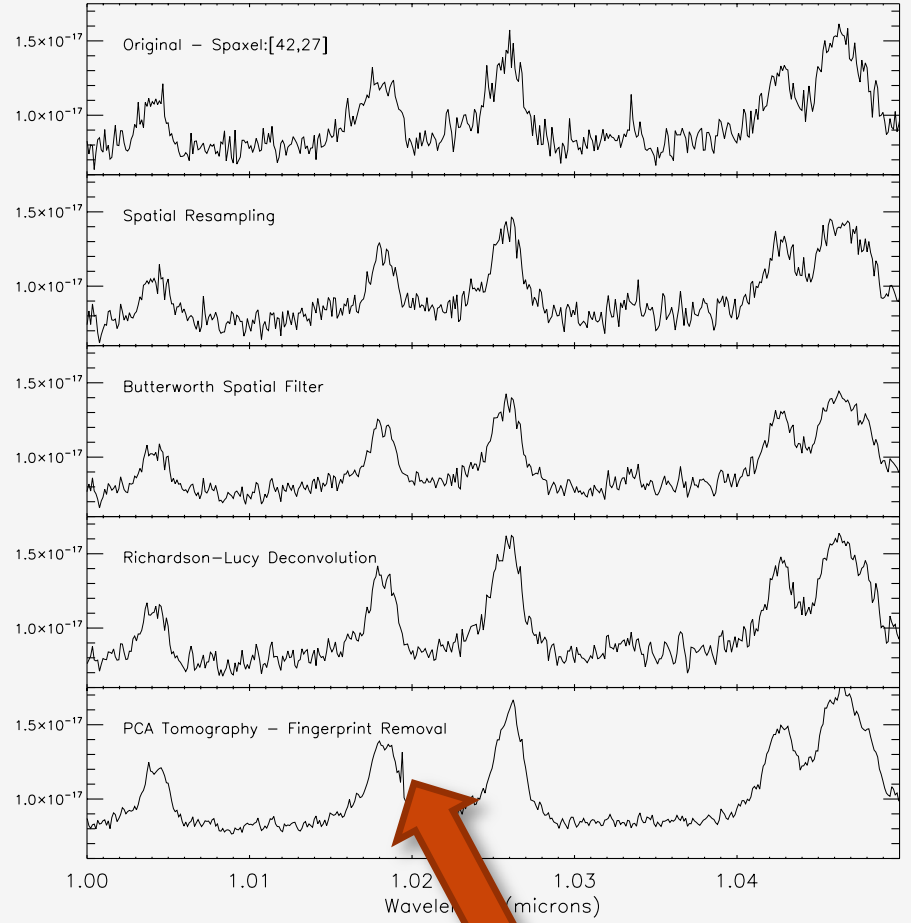
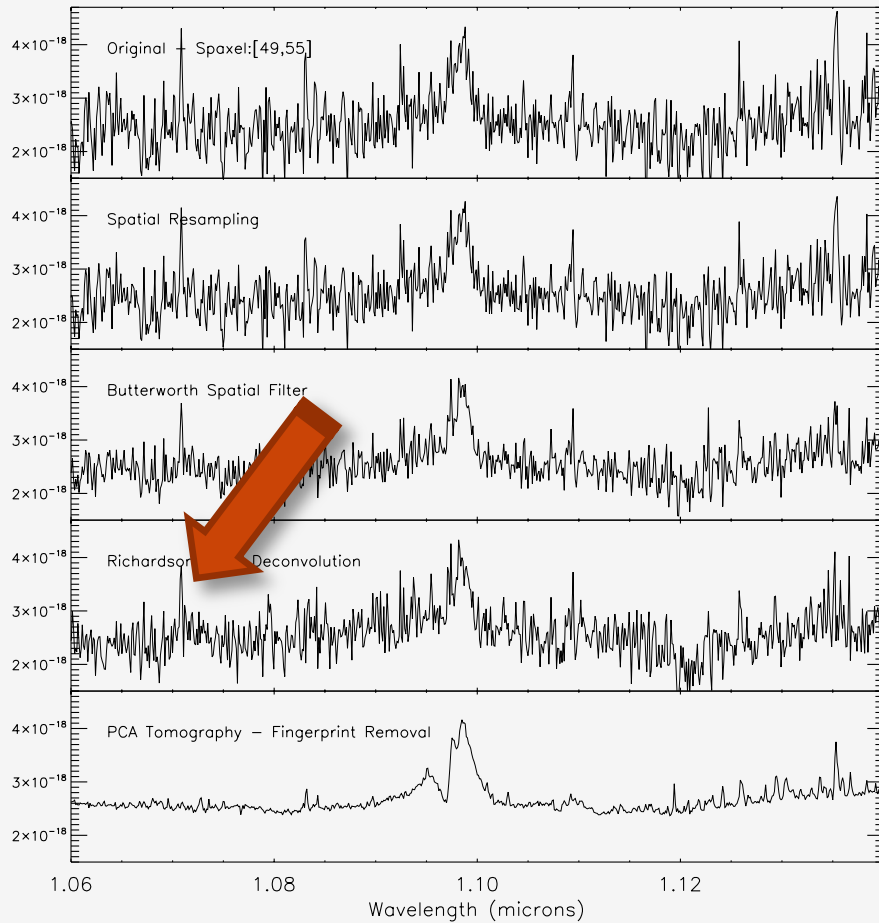


$\lambda = 0.9814 \mu\text{m}$

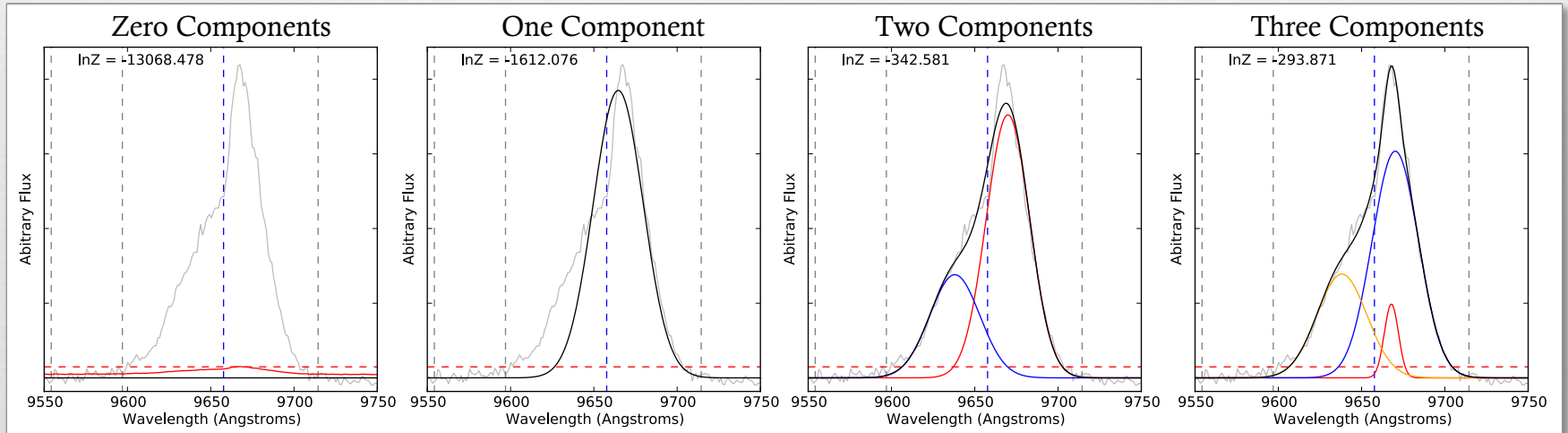
Data Treatment Procedure



Data Treatment Procedure

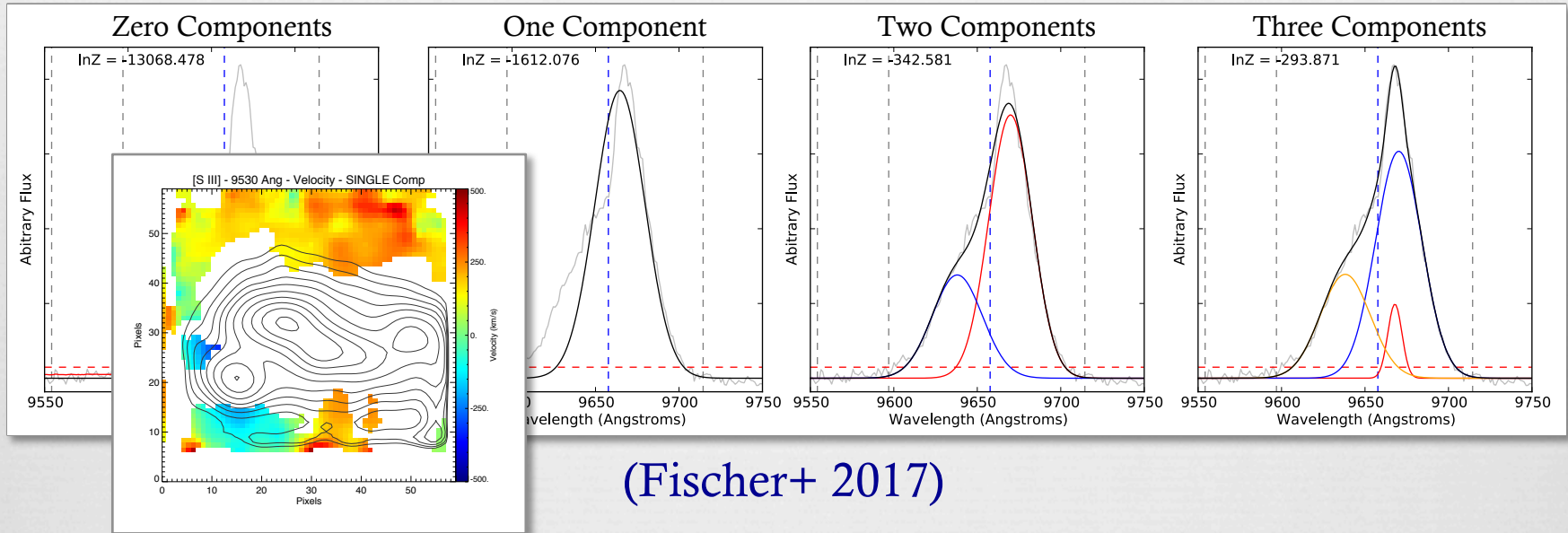


Multi-Component Fitting Routine

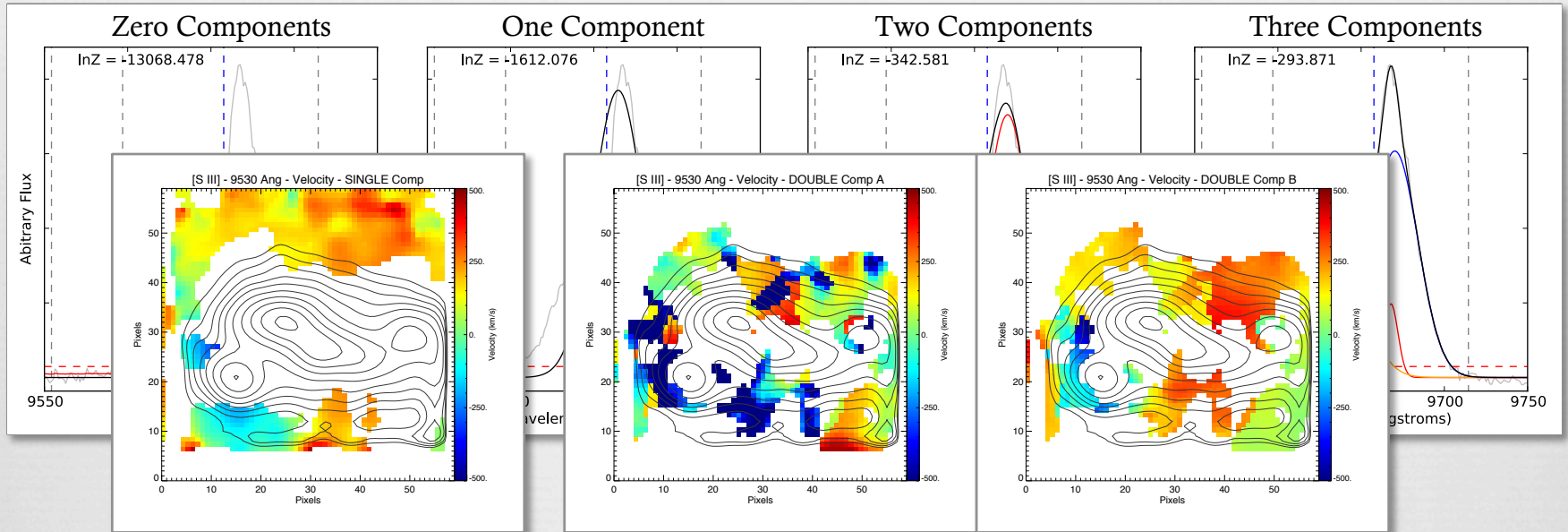


(Fischer+ 2017)

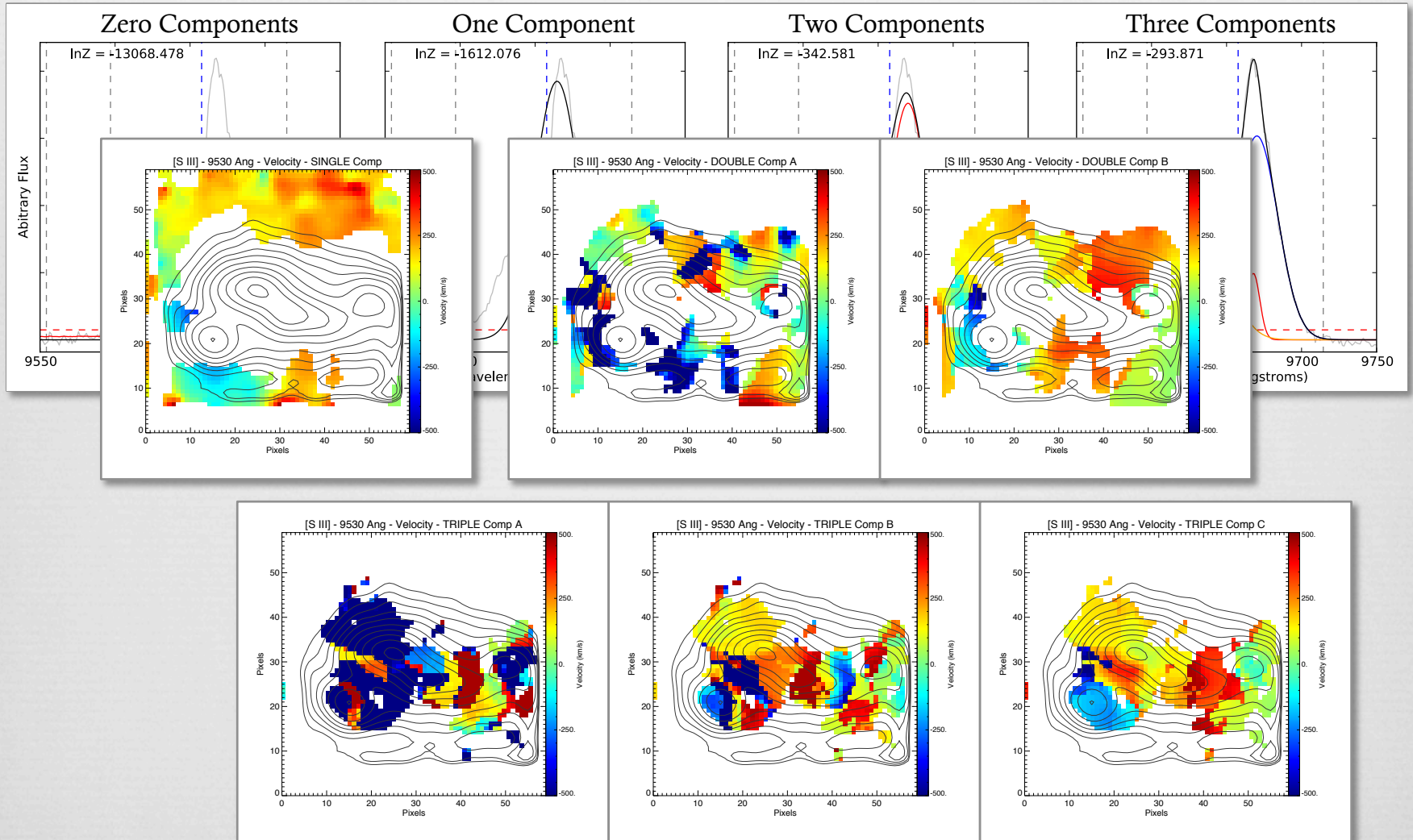
Multi-Component Fitting Routine



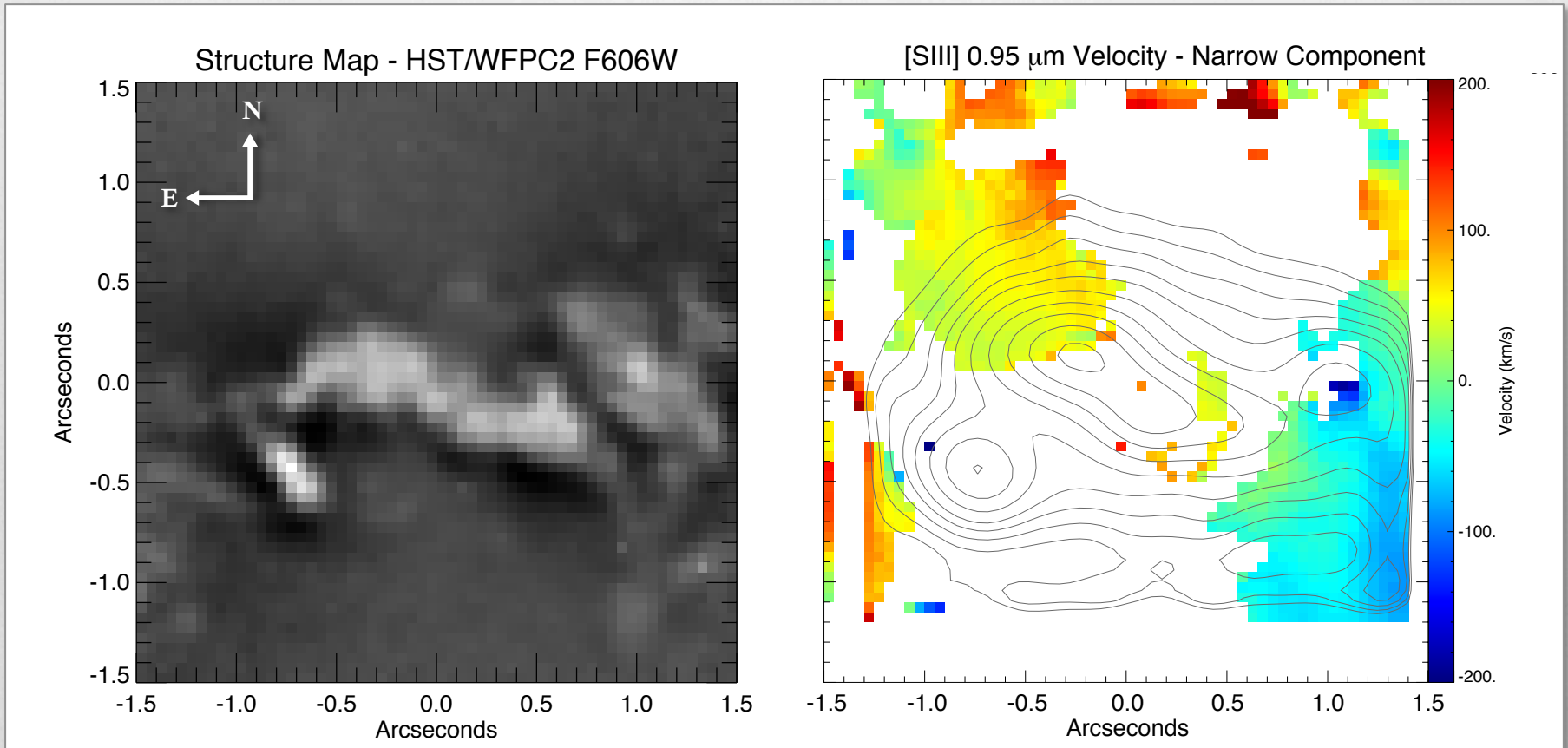
Multi-Component Fitting Routine



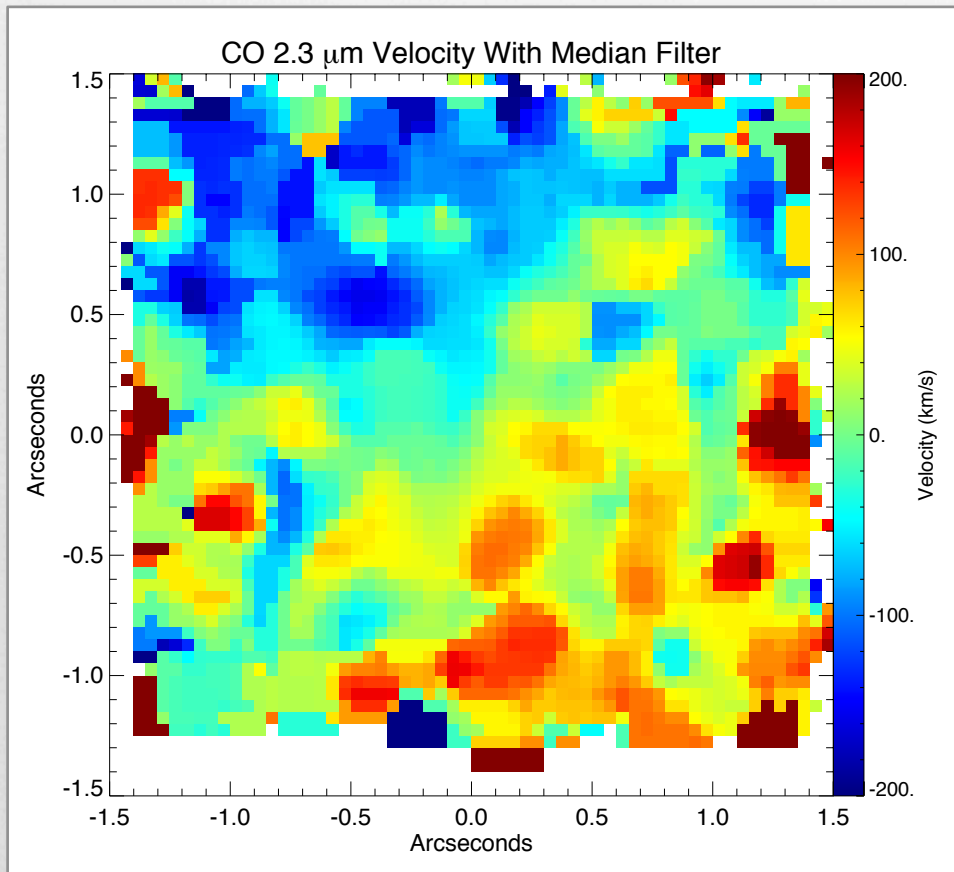
Multi-Component Fitting Routine



NLR Gas Kinematics



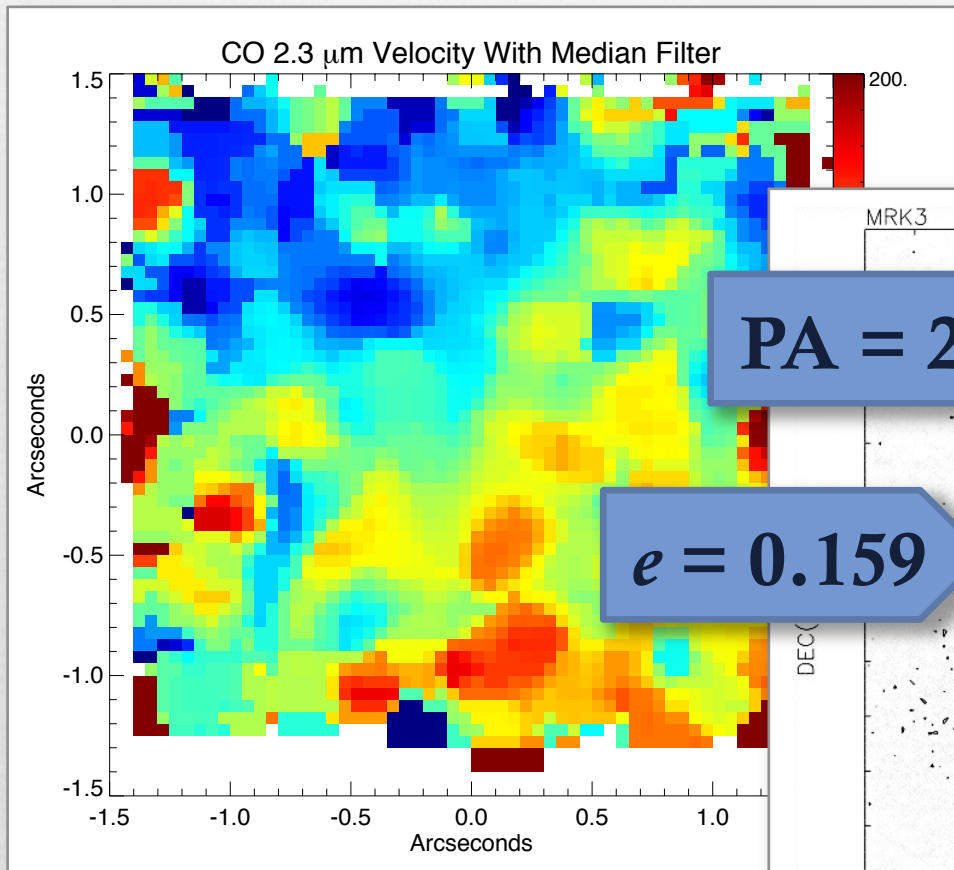
Stellar Kinematics - pPXF - DiskFIT



pPXF: (Cappellari & Emsellem 2004)

DiskFIT: (Sellwood & Spekkens 2015, Reese+ 2007)

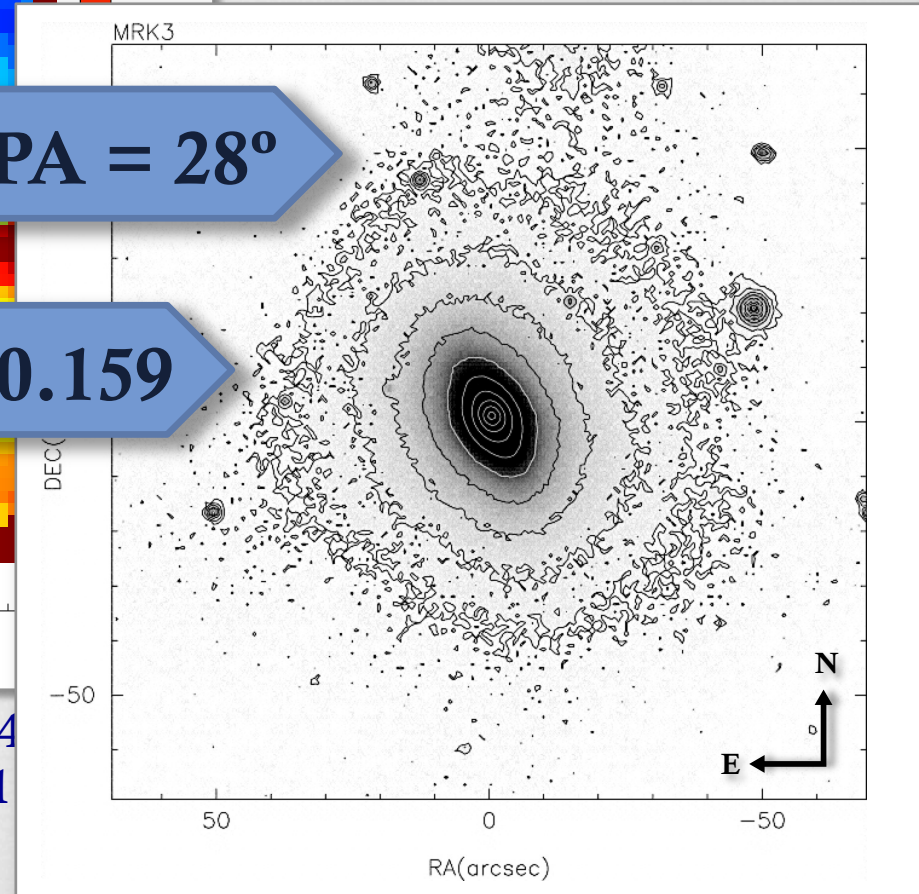
Stellar Kinematics - pPXF - DiskFIT



(Schmitt+ 2000)

PA = 28°

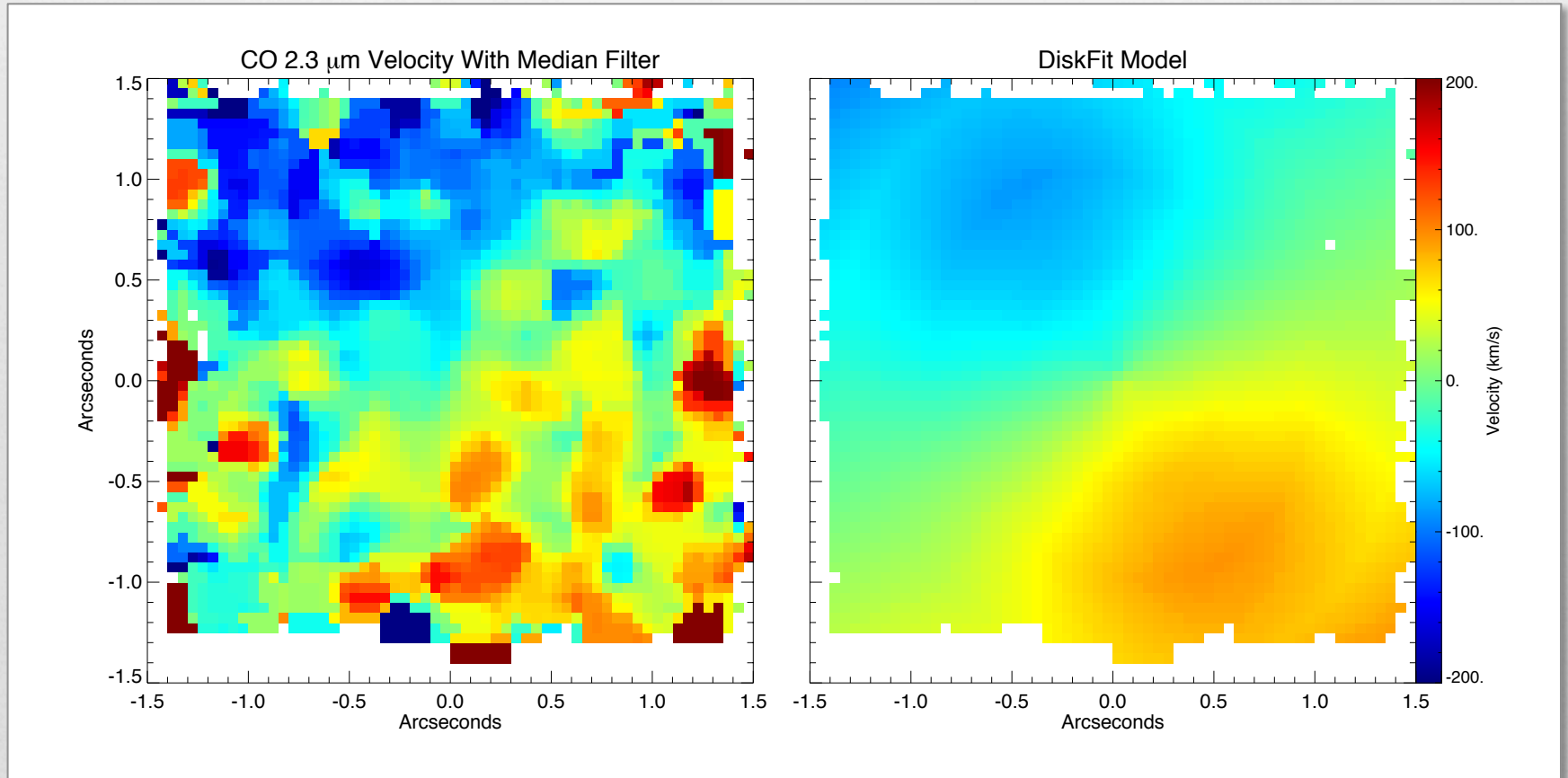
$e = 0.159$

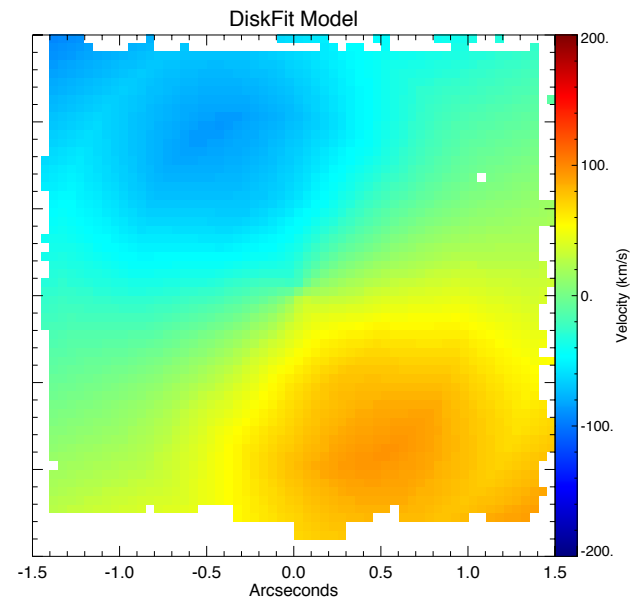
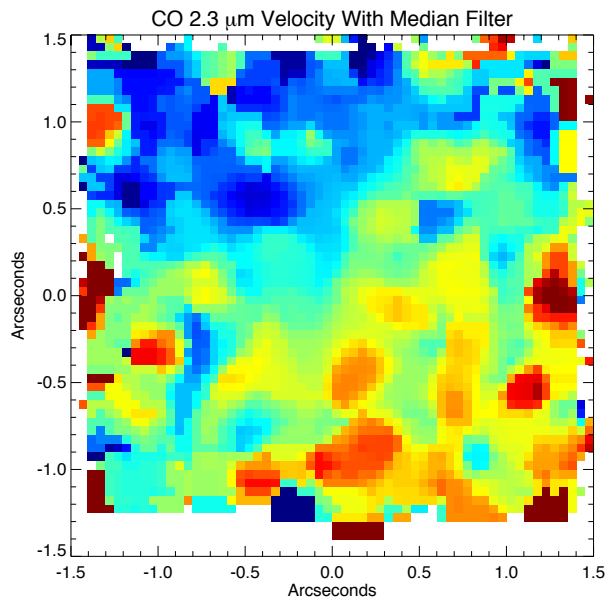
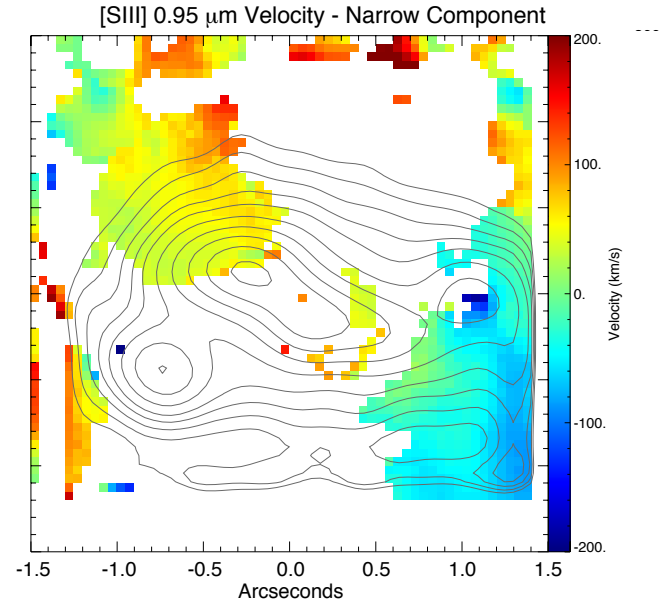
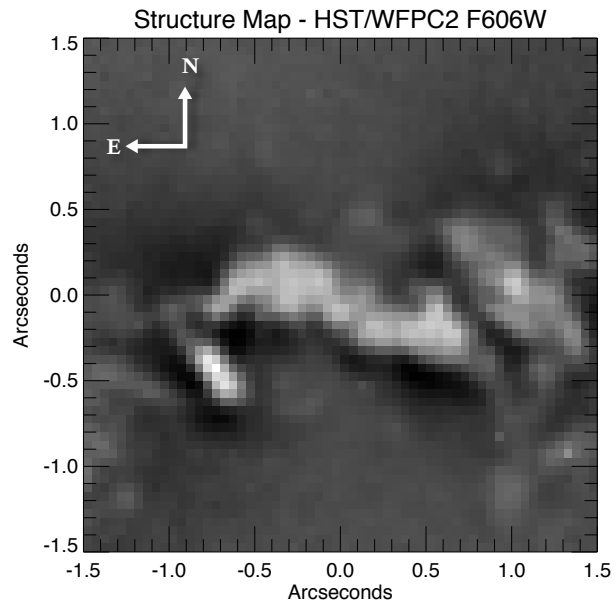


pPXF: (Cappellari & Emsellem 2004)
DiskFIT: (Sellwood & Spekkens 201

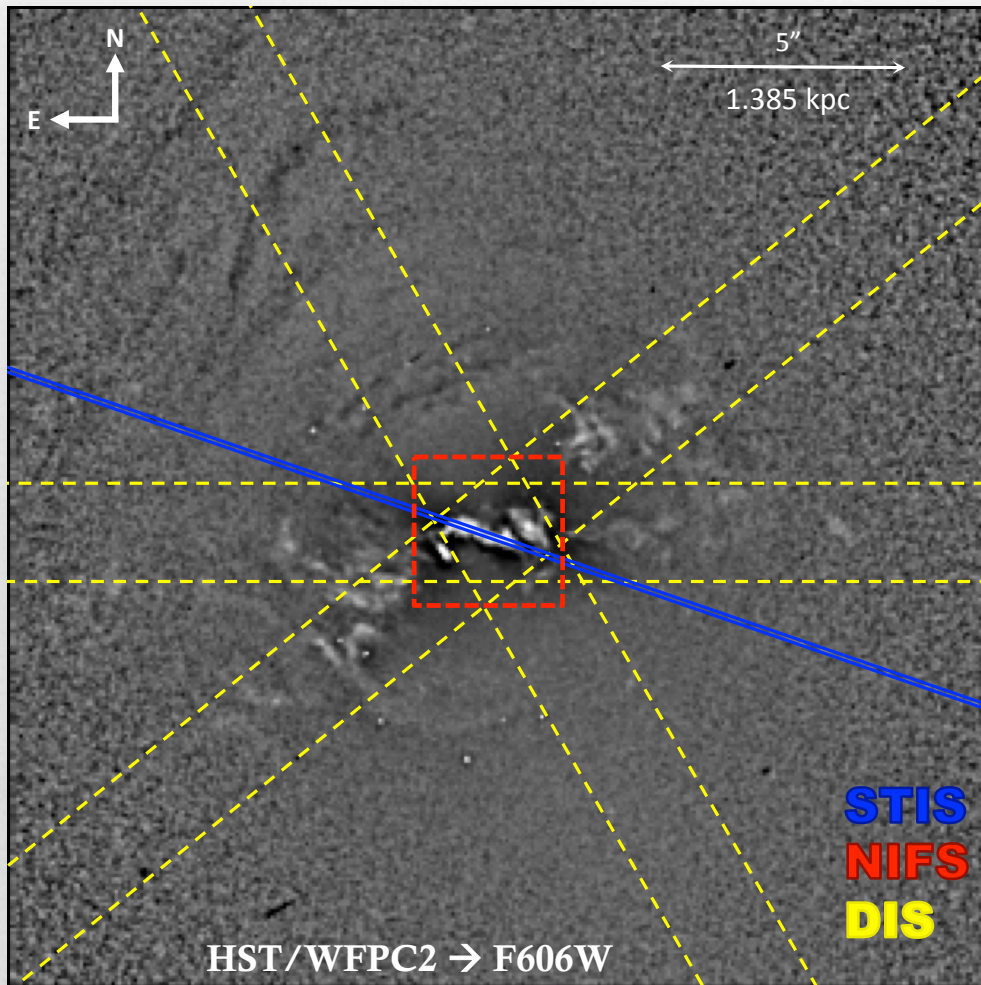
KPNO/0.9m \rightarrow Broad I-Band

Stellar Kinematics - pPXF - DiskFIT

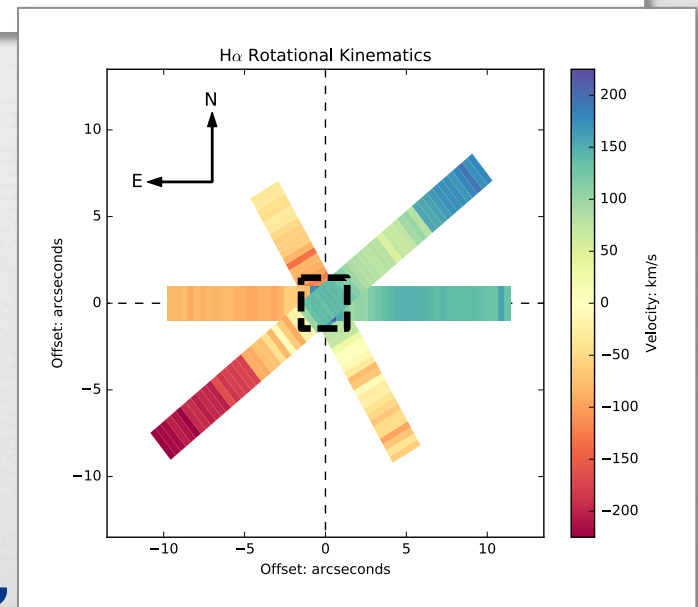
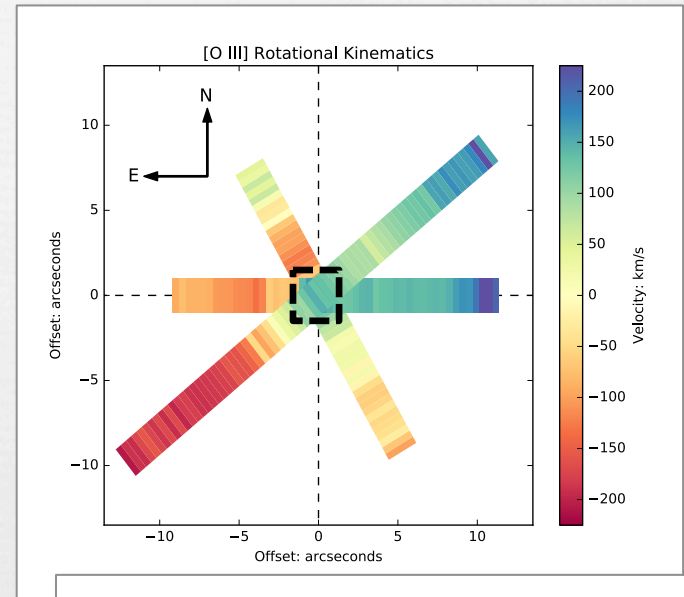
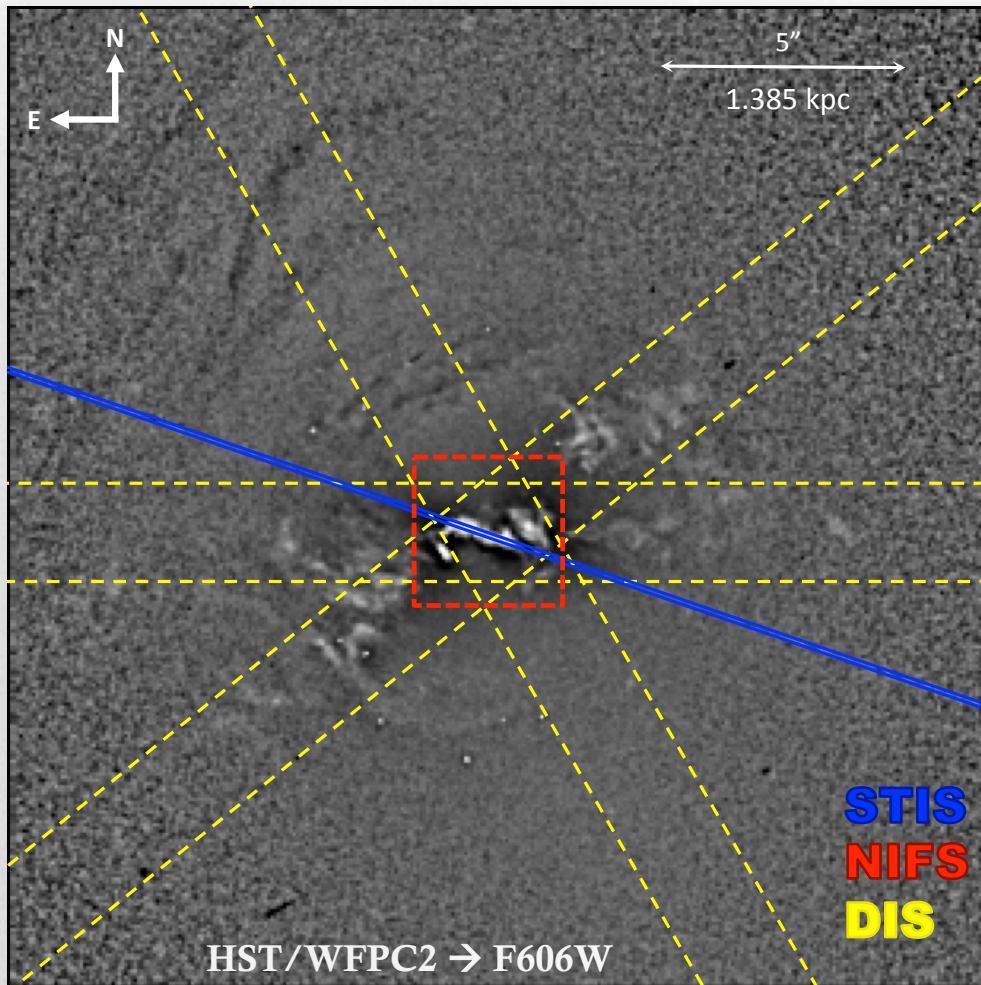




What about on the large scale?



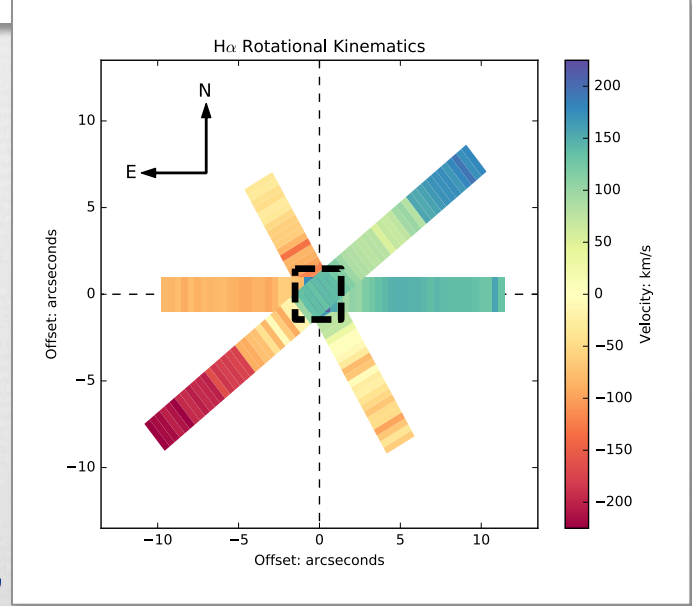
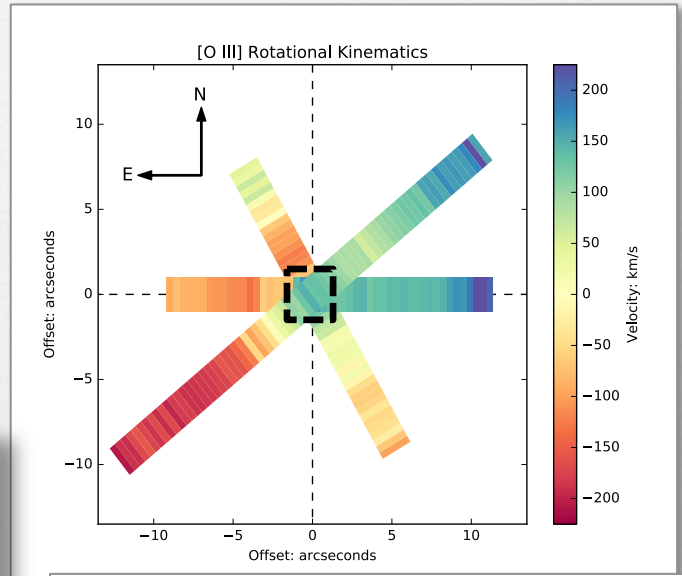
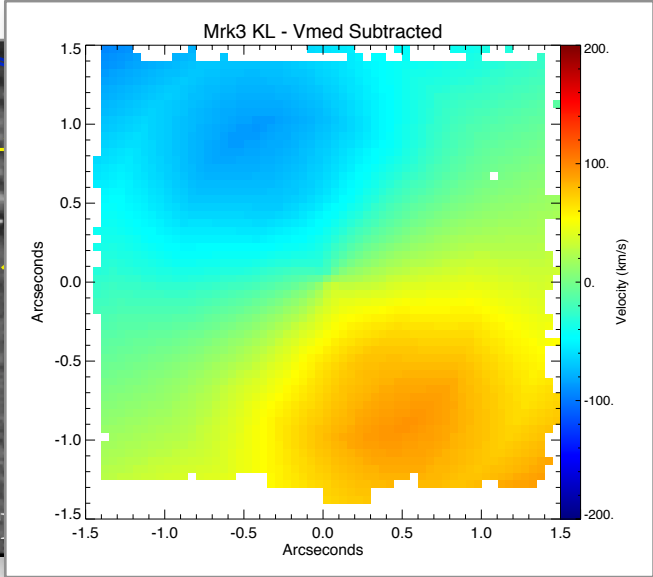
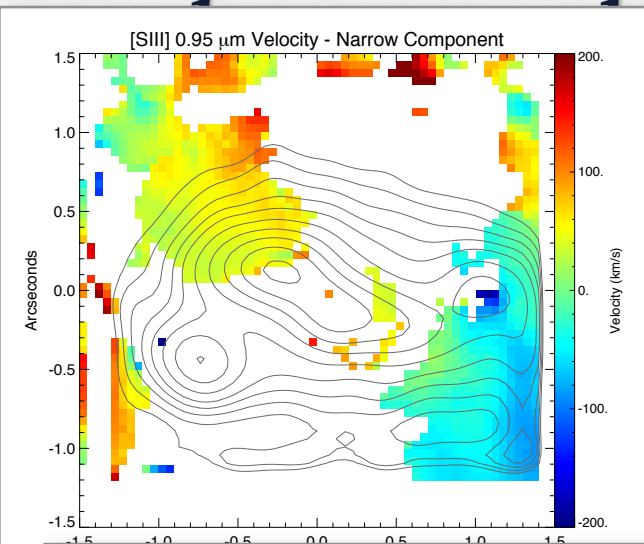
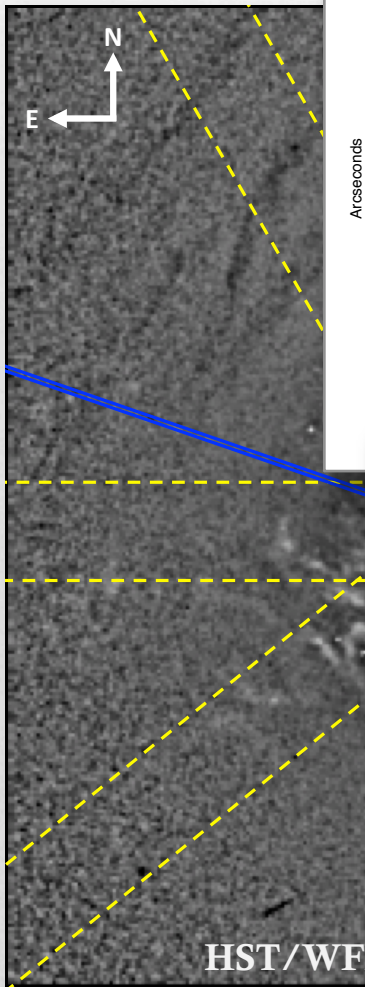
What about on the large scale?



Machuca → Poster #18

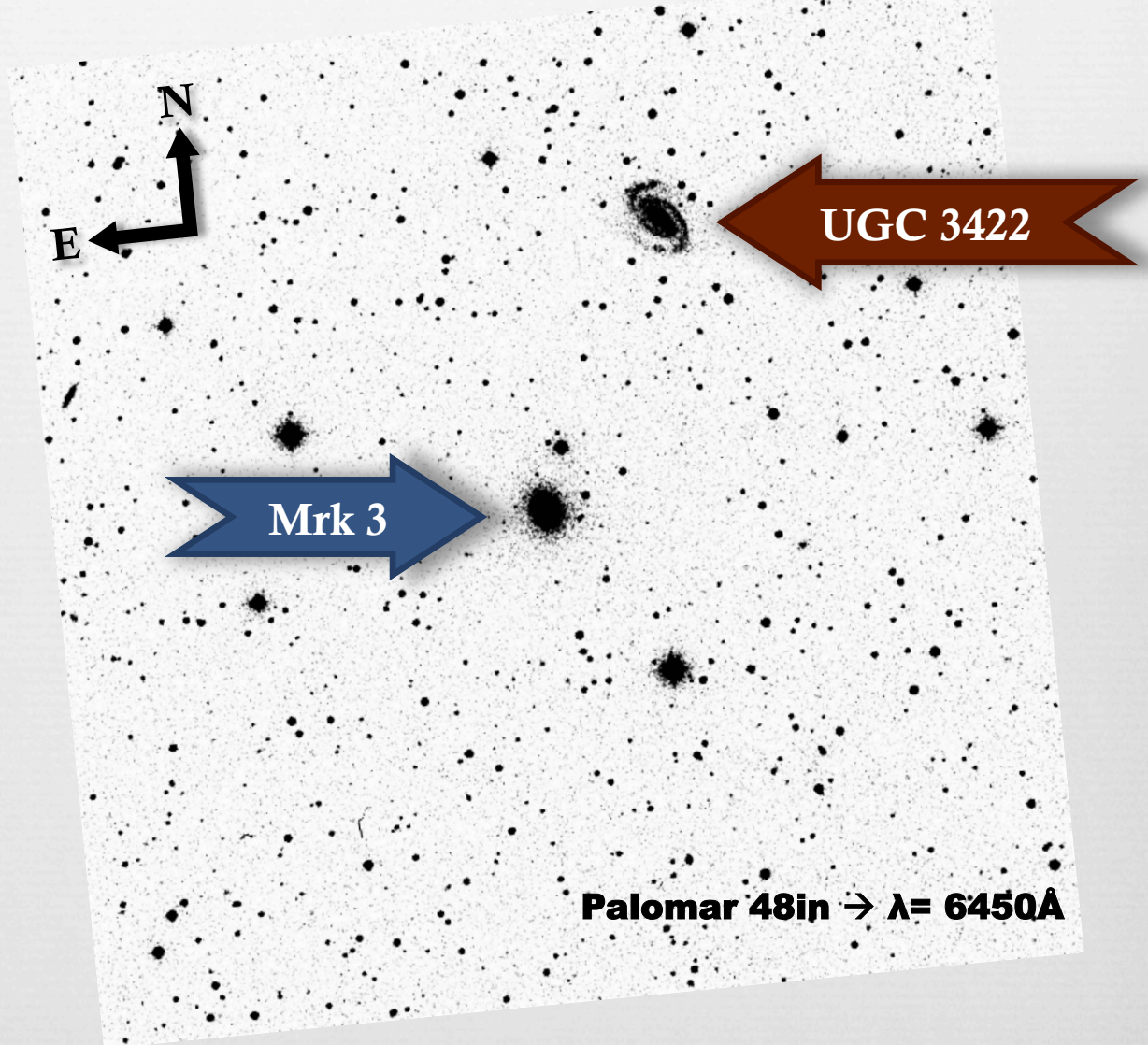
Why

the large scale?

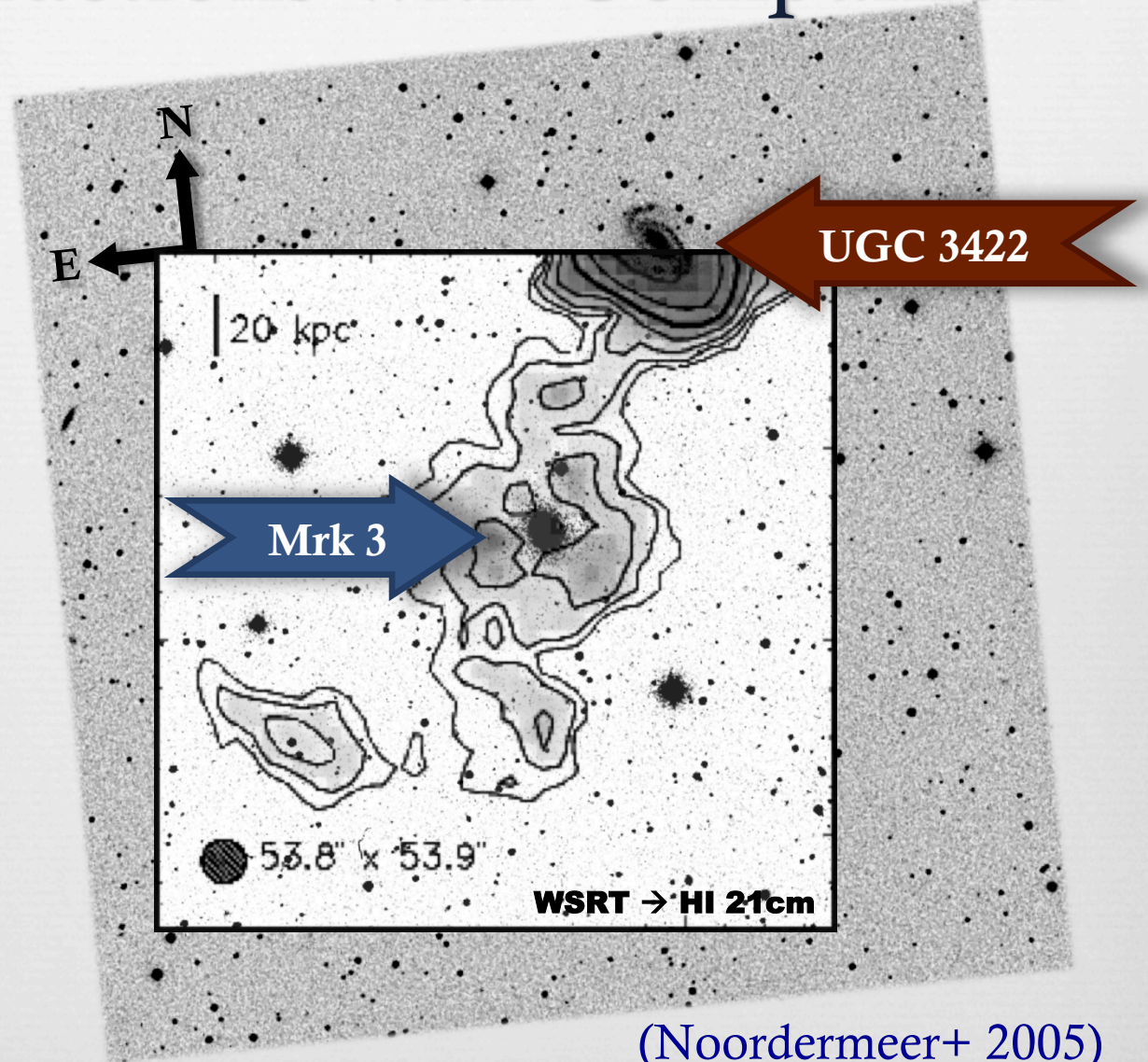


Machuca \rightarrow Poster #18

Tidal Interactions with Companion

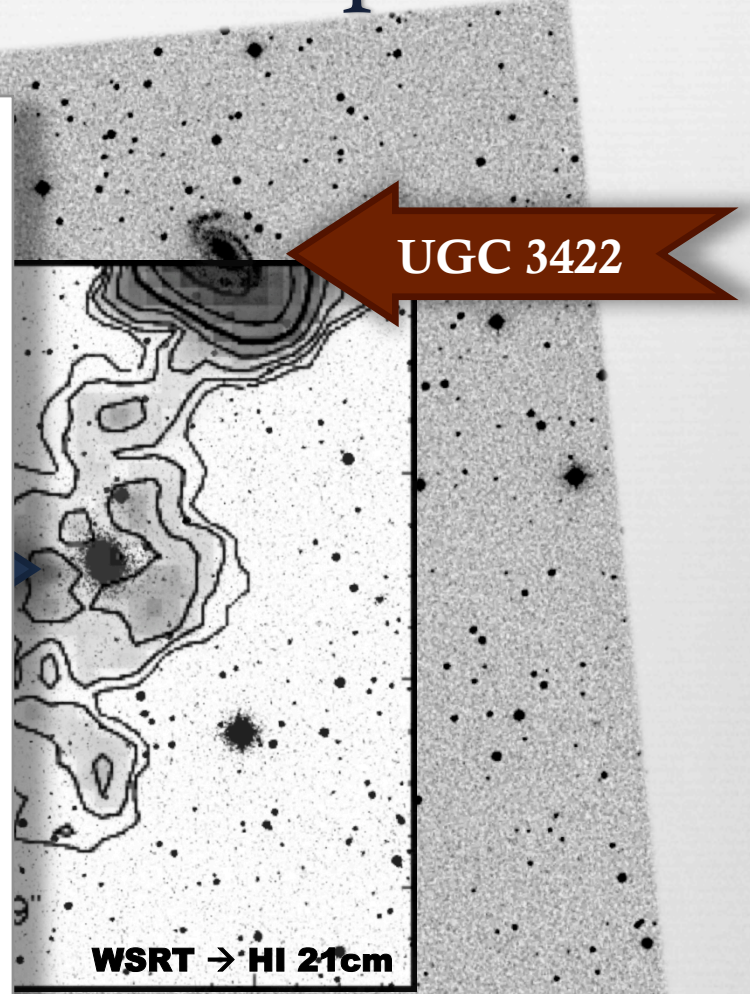
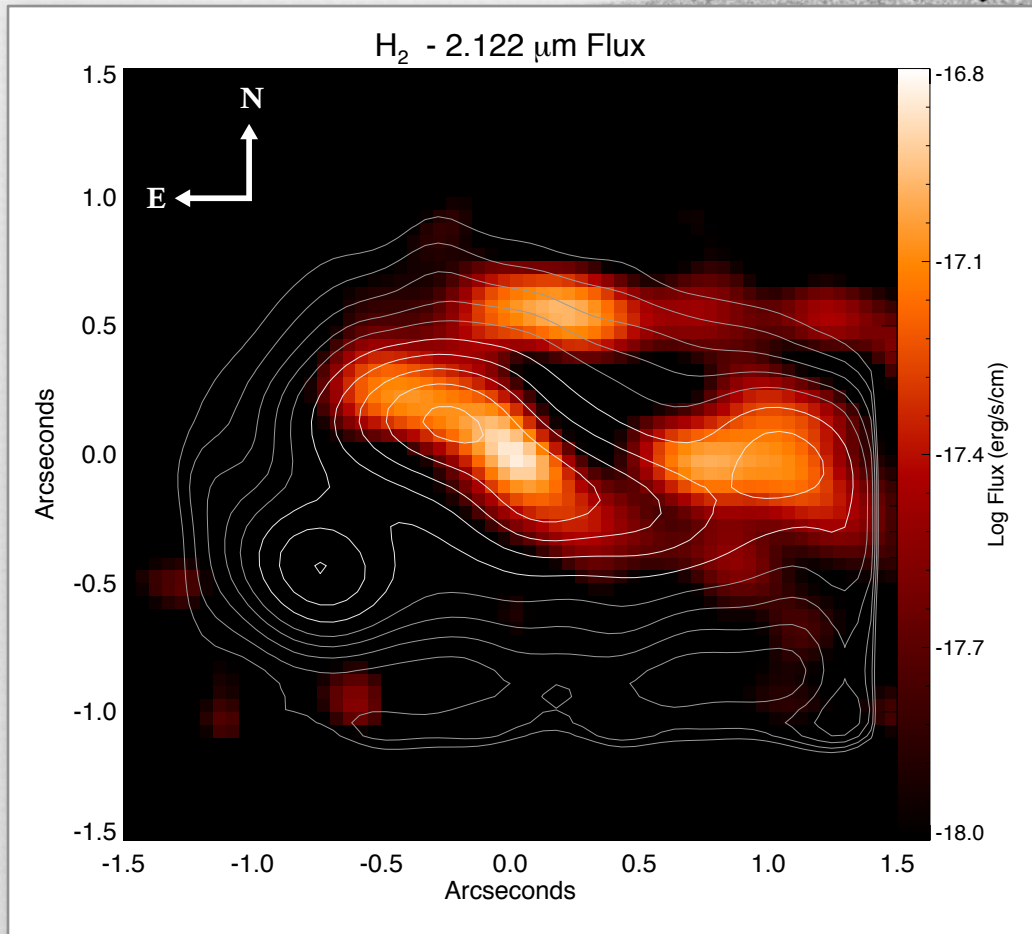


Tidal Interactions with Companion



(Noordermeer+ 2005)

Tidal Interactions with Companion



(Noordermeer+ 2005)

Conclusions

- ❧ Multi-Component fitting allows for the mapping of individual structures within NLR
- ❧ **Small-scale:** Disagreement between gas and stellar kinematics
- ❧ **Large-scale:** Gas kinematics are misaligned $\sim 90^\circ$ from the measured stellar kinematics & isophotal parameters
- ❧ Need to account for tidal interactions with companion
- ❧ Arc of molecular emission in the NW possibly aligned with inflows from the tidal interactions

Questions?

