

# Optical linear polarimetry of galaxies



Santiago González-Gaitán





# Correcting reddening intelligently for Supernova Probes

A. Mourão, L. Galbany, A. Krone-Martins, B. Pereira, A. Afonso, A. Razza, C. Gutiérrez, T de Jaeger, J. Anderson, F. Forster

1. Determine extinction from the SN through a) photometry, b) spectral lines and c) polarimetry
2. Determine extinction from the host galaxy through a) continuum/photometry, b) spectral lines and c) polarimetry



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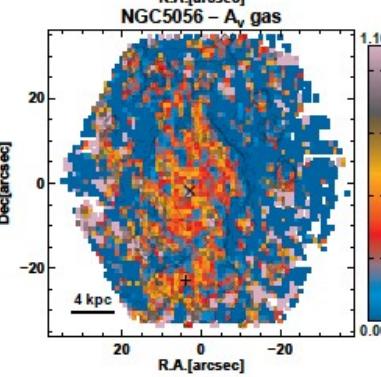
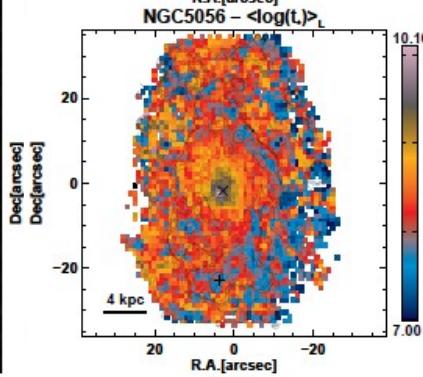
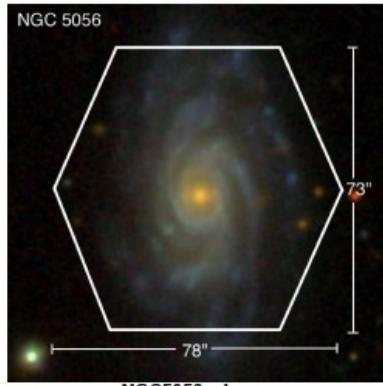
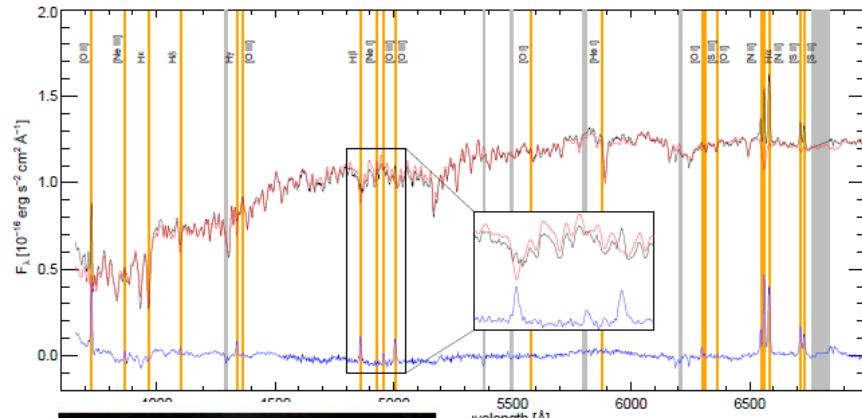
# Host galaxy extinction

- I. Methodology: 1.5D IFU fitting to SSP
- II. Obtaining  $R_V$  from IFU data
- III. Optical linear polarimetry of nearby galaxies

# I. Methodology: 1.5D IFU fitting

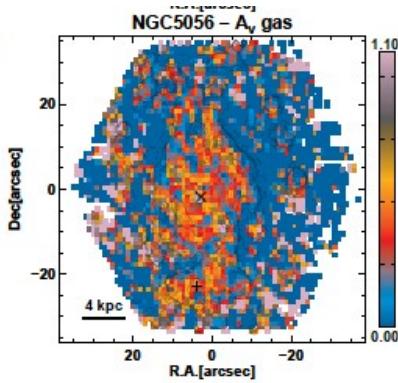
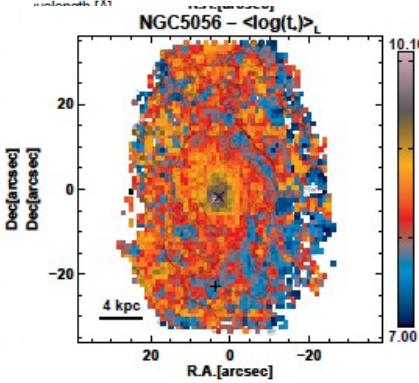
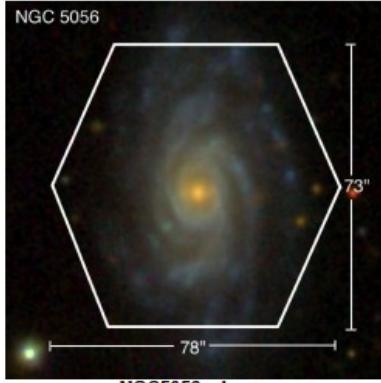
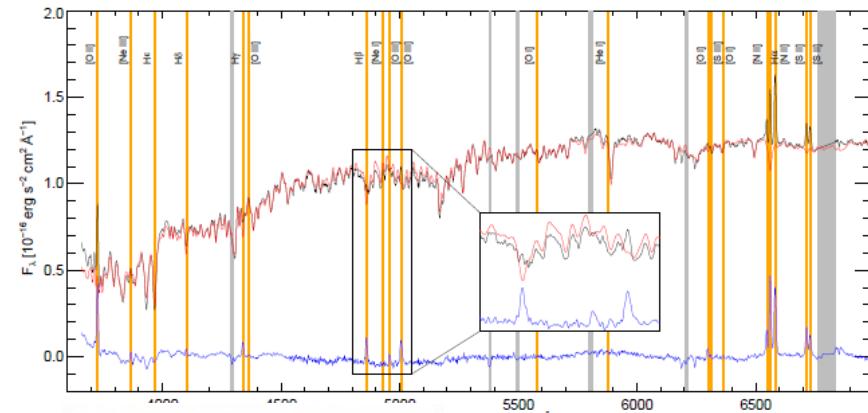
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Traditional stellar population  
fitting to IFU data

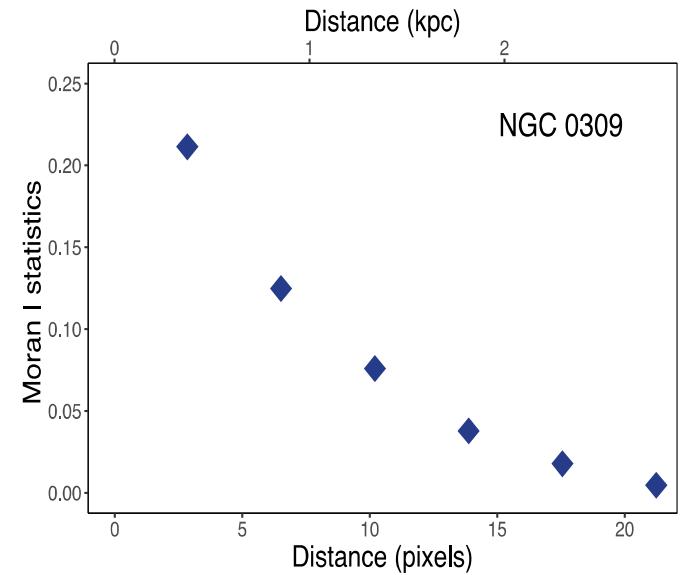


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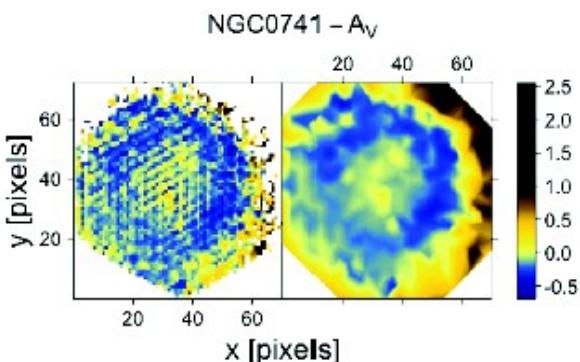
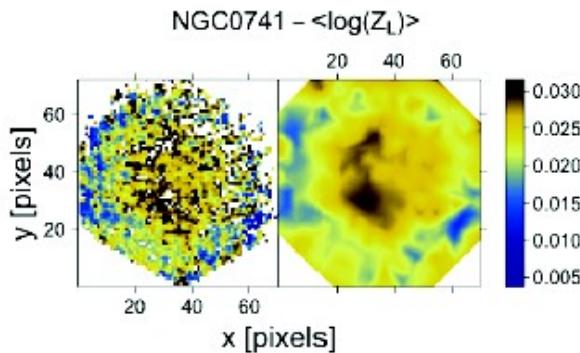


Spatial correlations



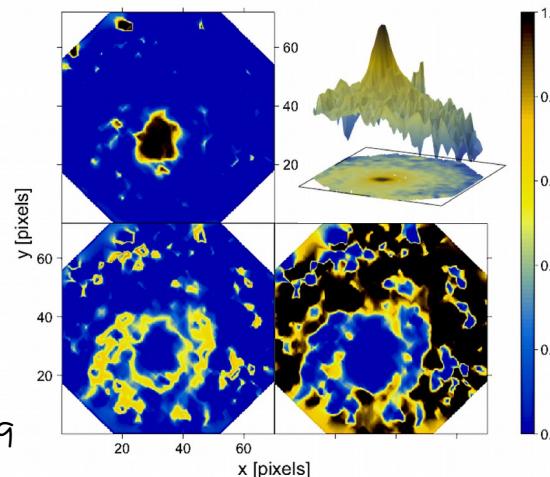
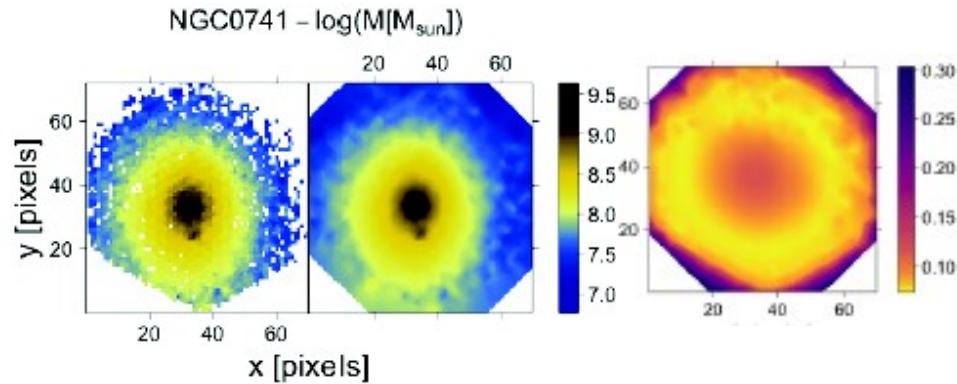
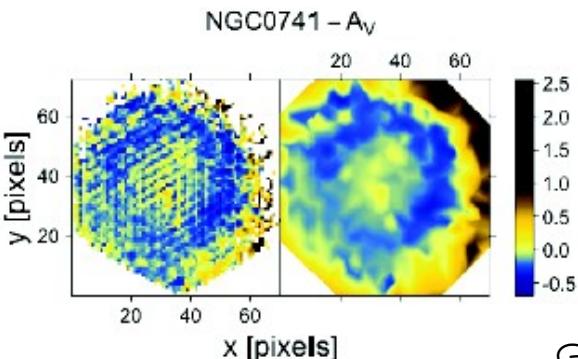
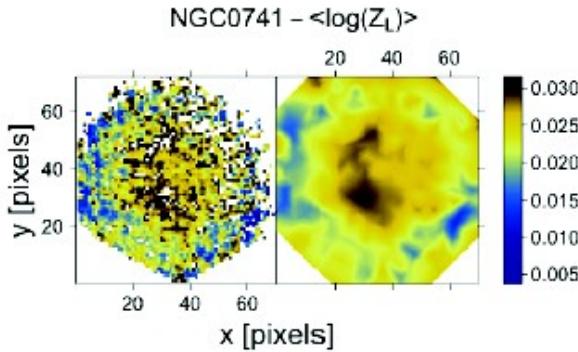
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INLA: statistical technique to treat spatial correlations in a map of a given quantity



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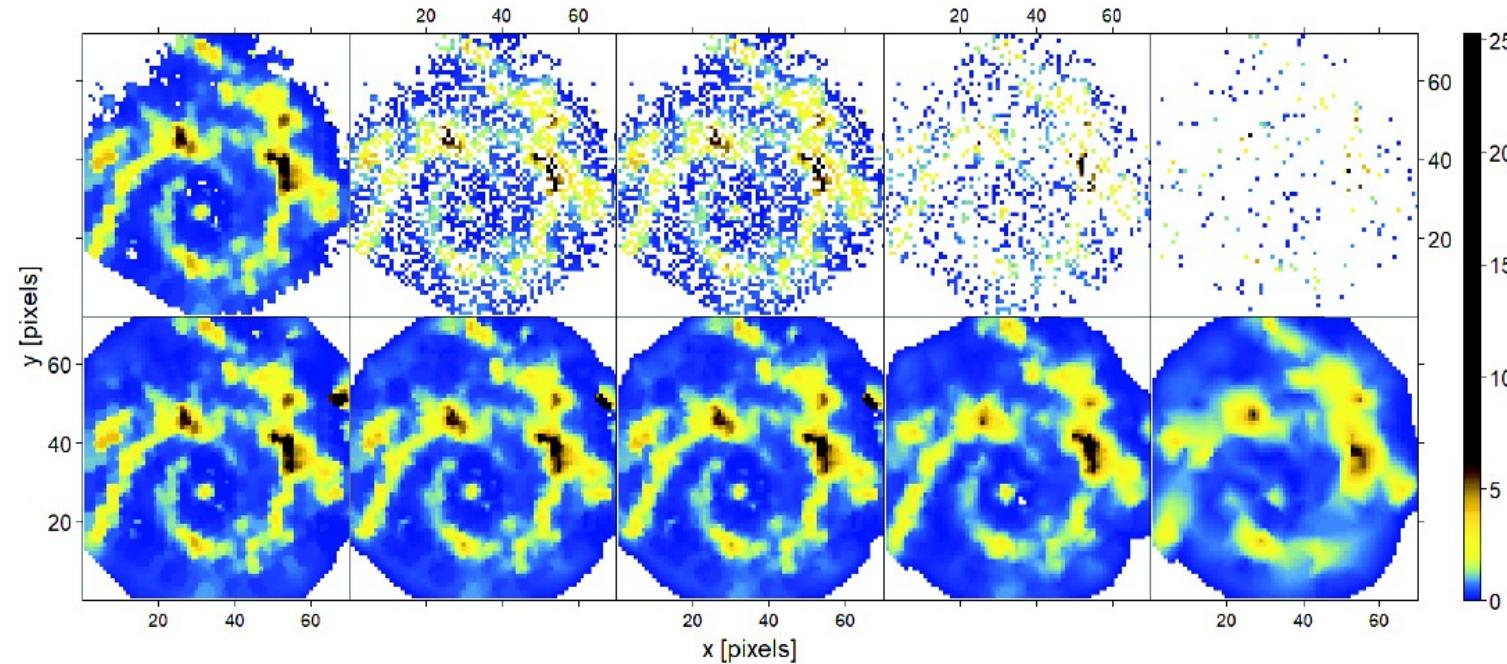
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Gonzalez-Gaitan et al. 2019

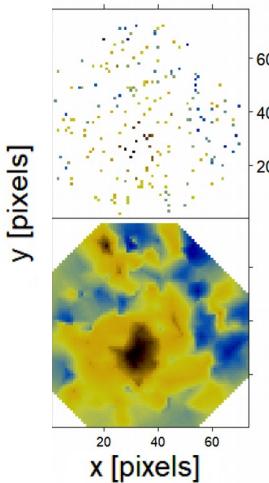
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INLA: statistical technique to treat spatial correlations in a map of a given quantity



# I. Methodology: 1.5D IFU fitting

1.5 fitting: Do iterative process between SSP fits and INLA



SSP fits of small percentage of data



reconstruct full map with INLA



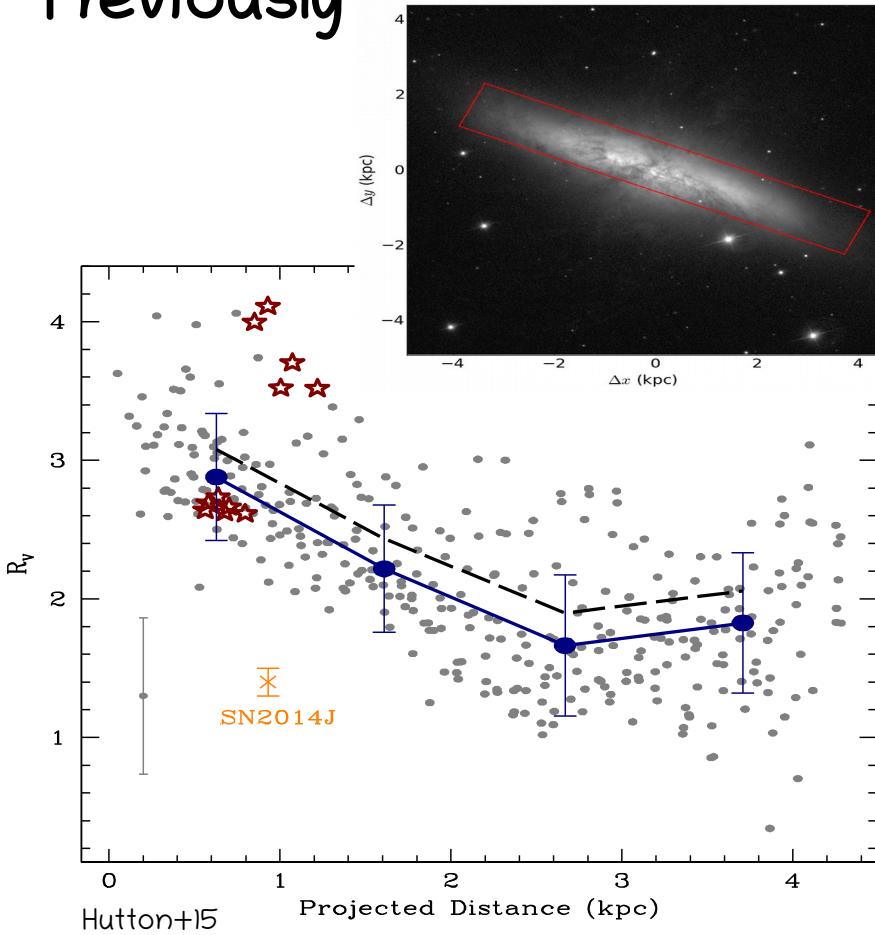
convergence

Use INLA output as prior guess into SSP fits

## II. Obtaining Rv from IFU data

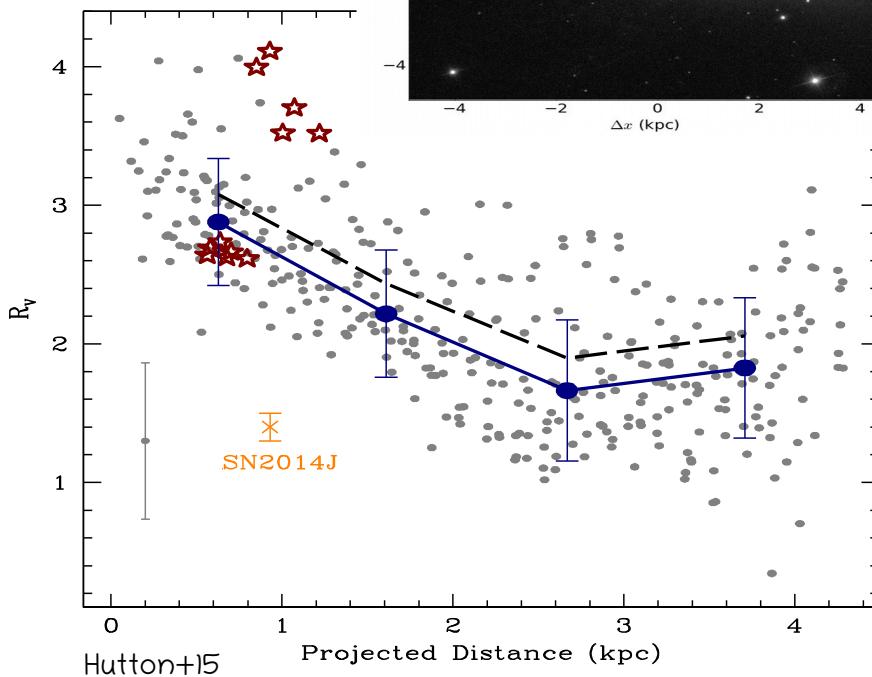
## II. Obtaining $R_v$ from IFU data

Previously



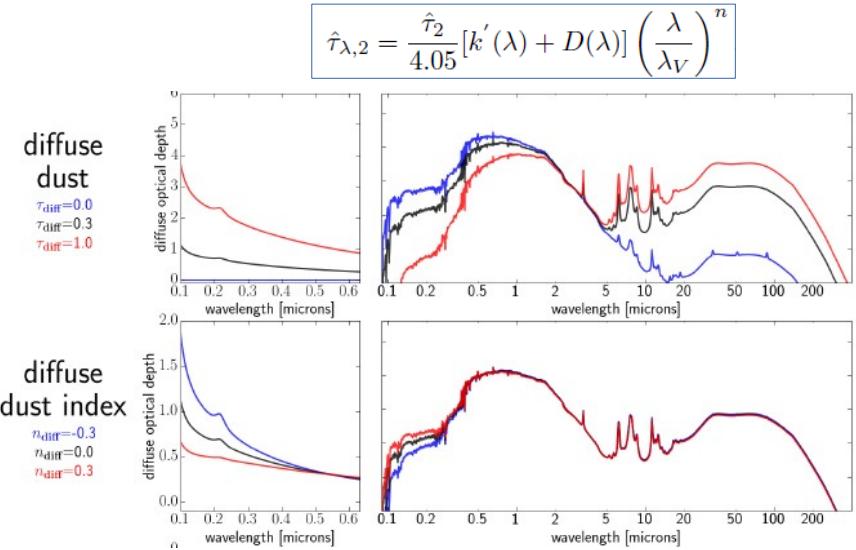
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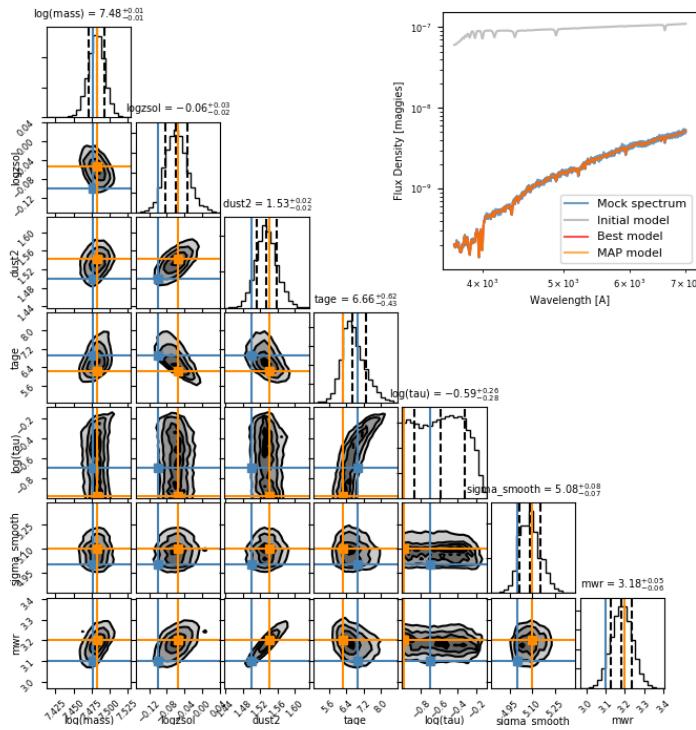
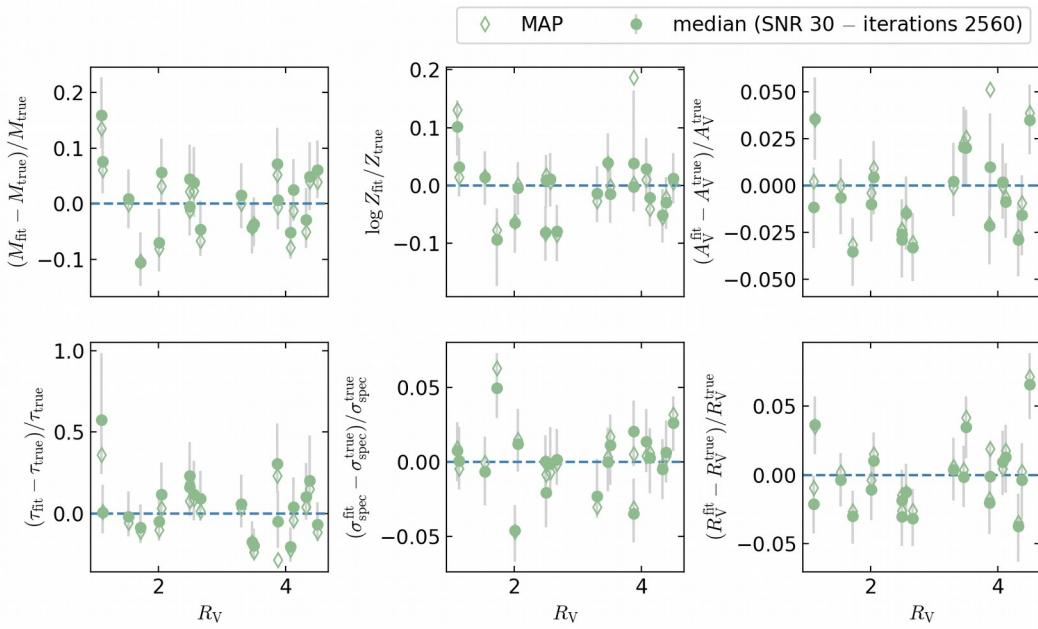
Currently

- AMUSING IFU galaxies
- Photometry in NIR and NUV
- Bayesian fitter: Prospector
- Treatment of R<sub>v</sub>:



# II. Obtaining R<sub>V</sub> from IFU data

Extensive simulation to test the method (A. Razza)

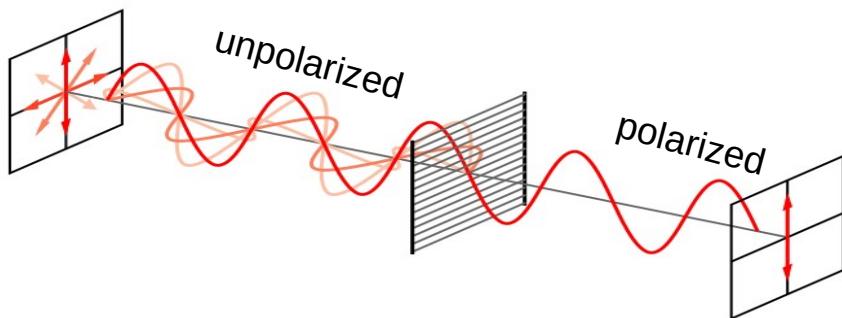


### III. Optical linear polarimetry of galaxies

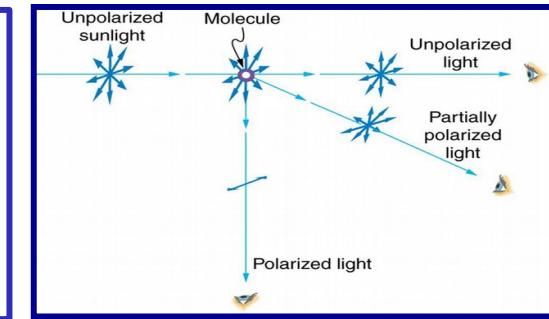
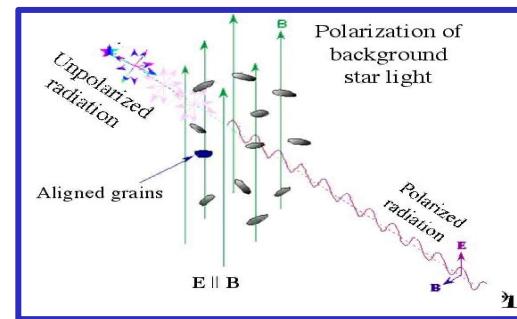


# III. Optical linear polarimetry of galaxies

Polarization: light with preferential direction of electric field

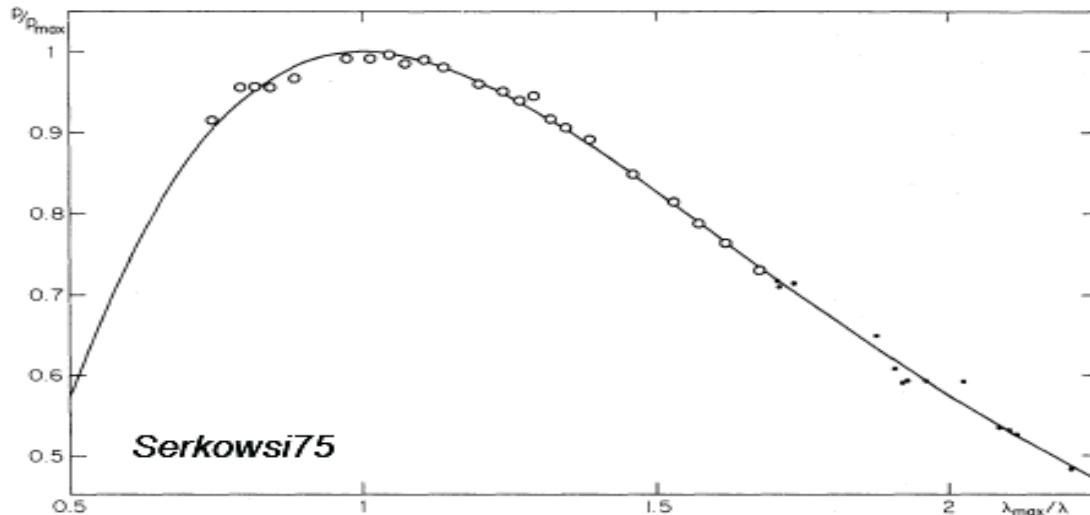


Two effects: dust alignment and dust scattering



### III. Optical linear polarimetry of galaxies

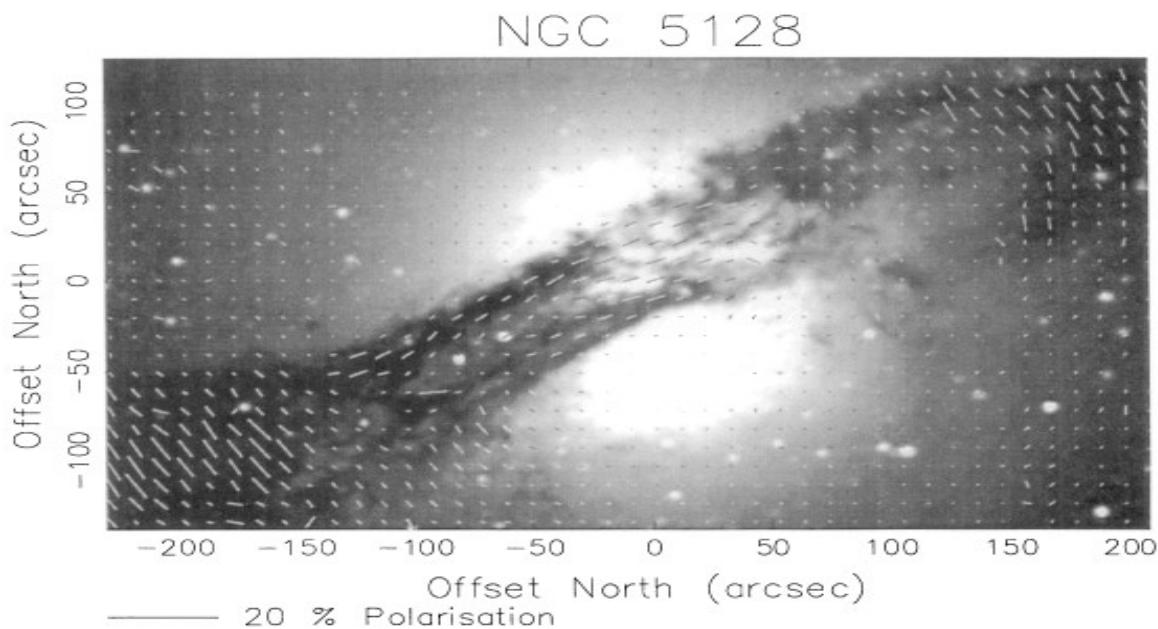
Serkowski law:



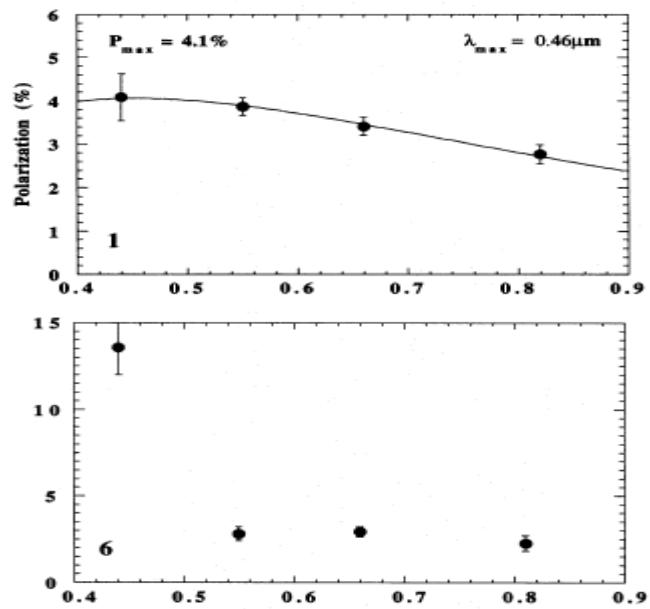
$$p(\lambda) = p_{max} \exp \left[ -K \ln^2 \left( \frac{\lambda_{max}}{\lambda} \right) \right]$$

$$R_V \simeq 3.67 (\lambda_{max}/5500\text{\AA}) - 0.29$$

### III. Optical linear polarimetry of galaxies



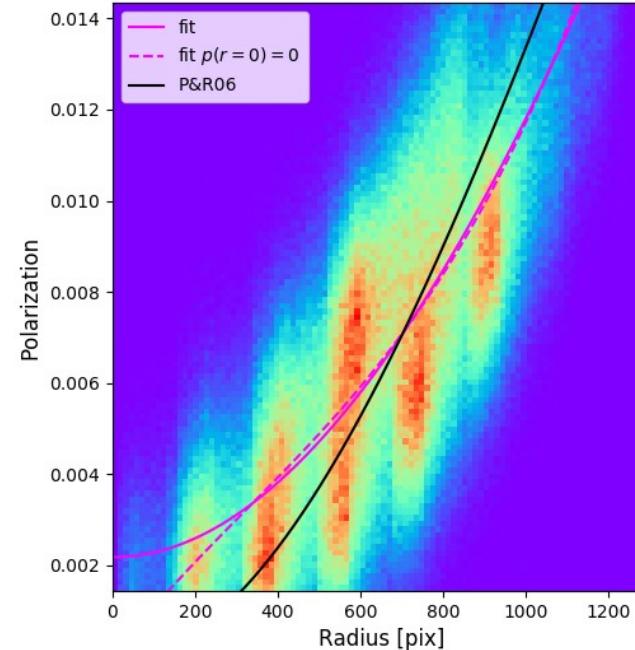
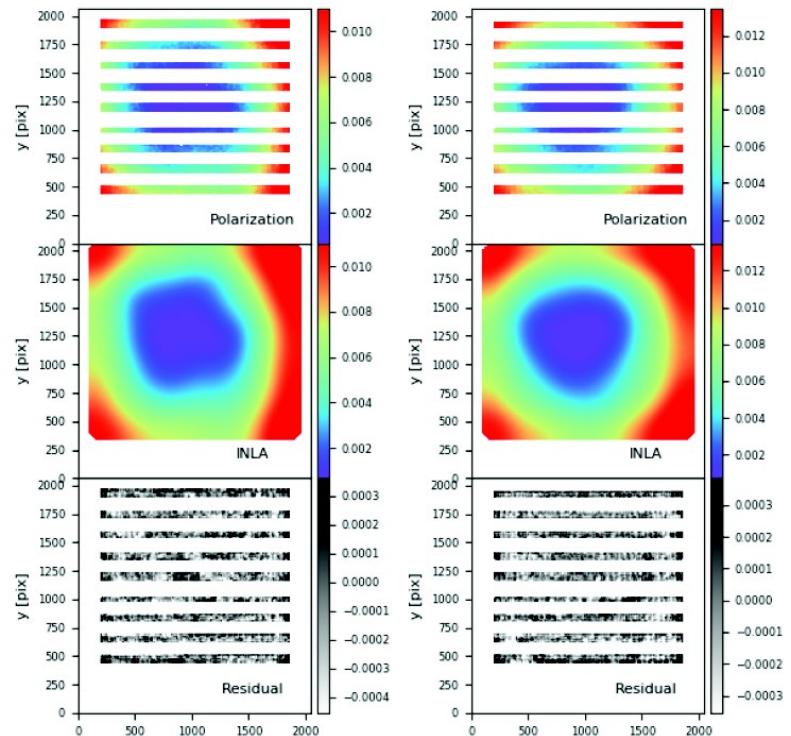
Scarrott+96



Varying Rv's and other things

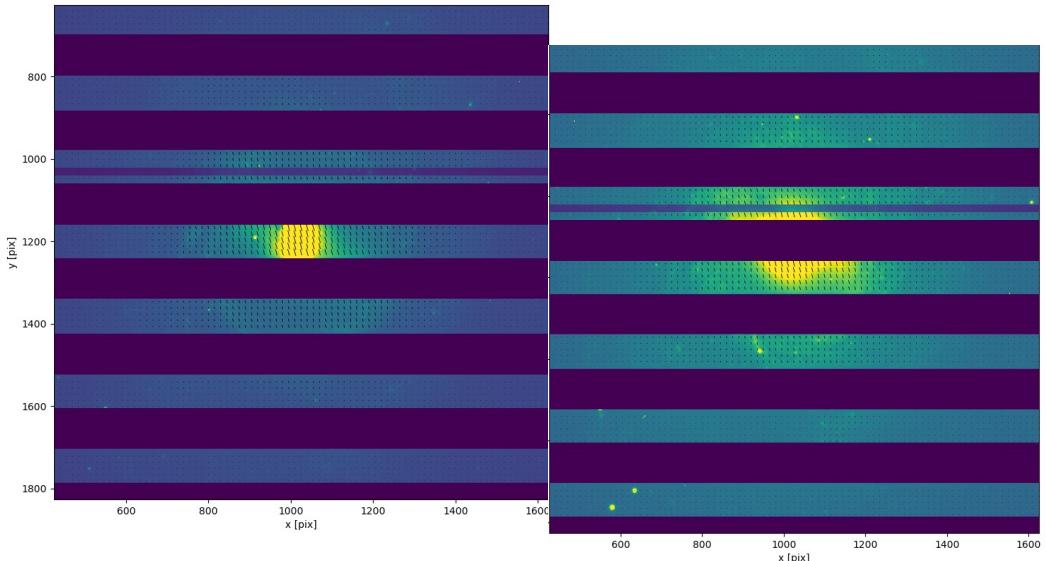
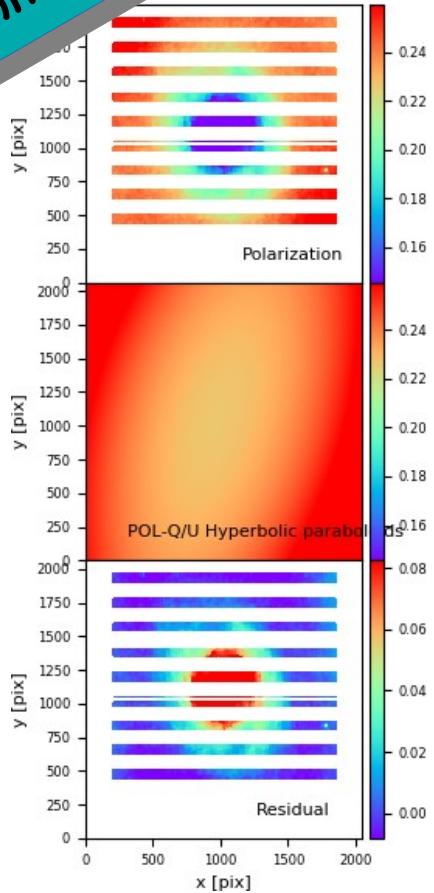
# III. Optical linear polarimetry of galaxies

## FORS2 instrument field polarization



# III. Optical linear polarimetry of galaxies

Preliminary



Thanks!