



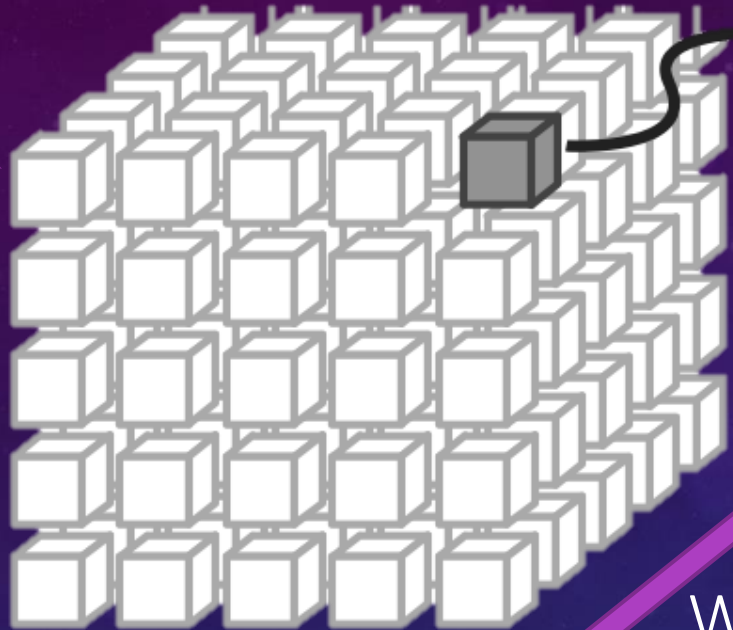
Accurate Visualization of Galaxy Velocity Fields from Three-Dimensional Integral Field Spectroscopy Data

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Background

Right ascension (2^{10})

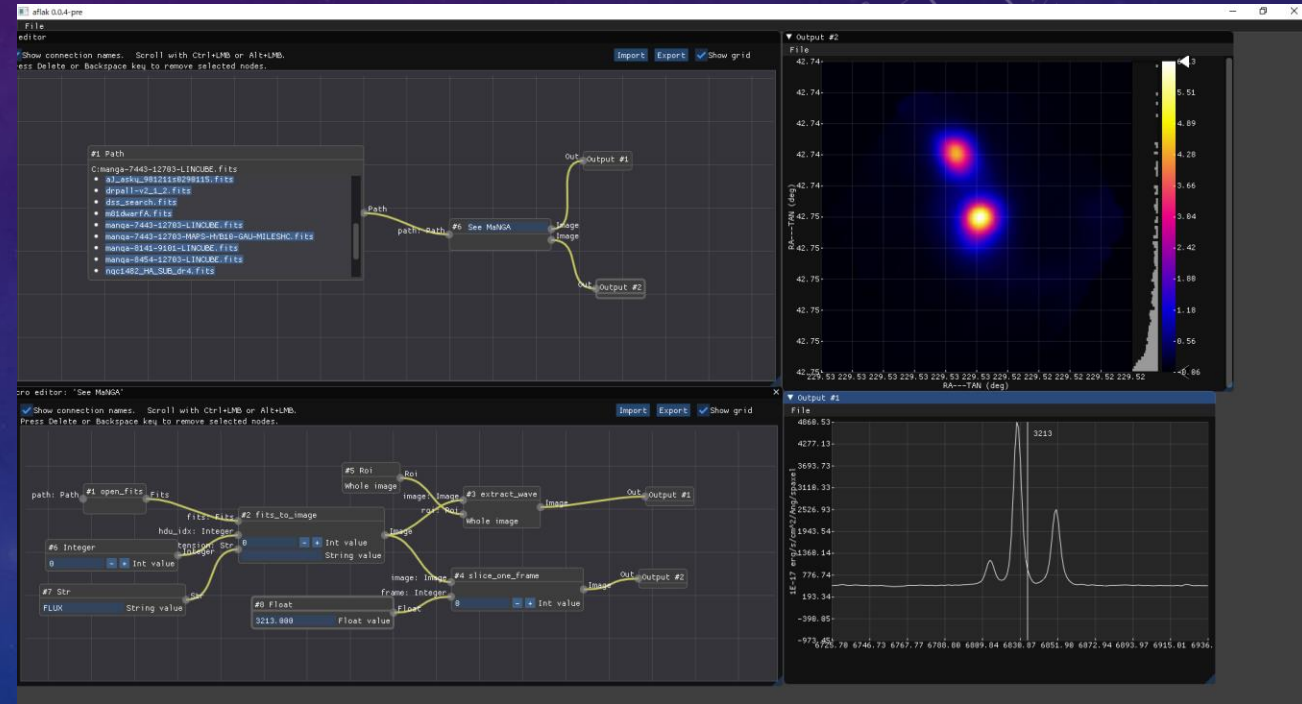


Data element (flux)

Declination (2^{10})

Wavelength (2^{13})

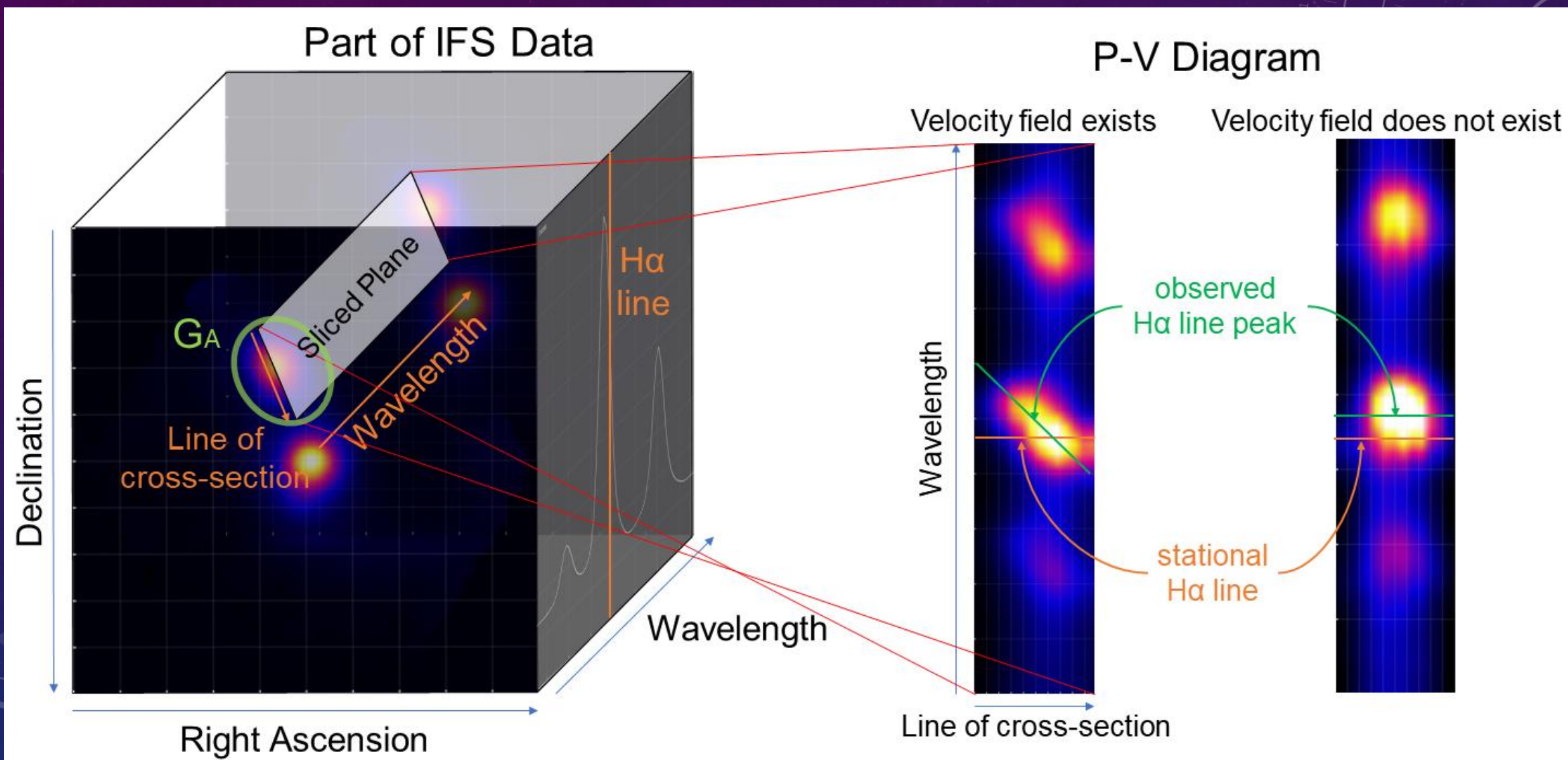
IFS (Integral Field Spectroscopy) data



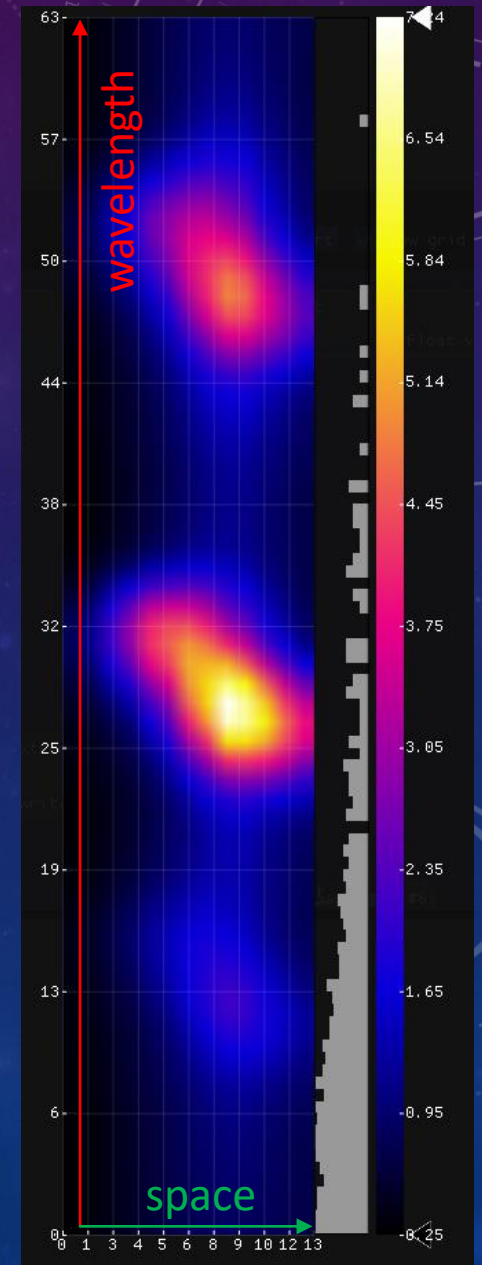
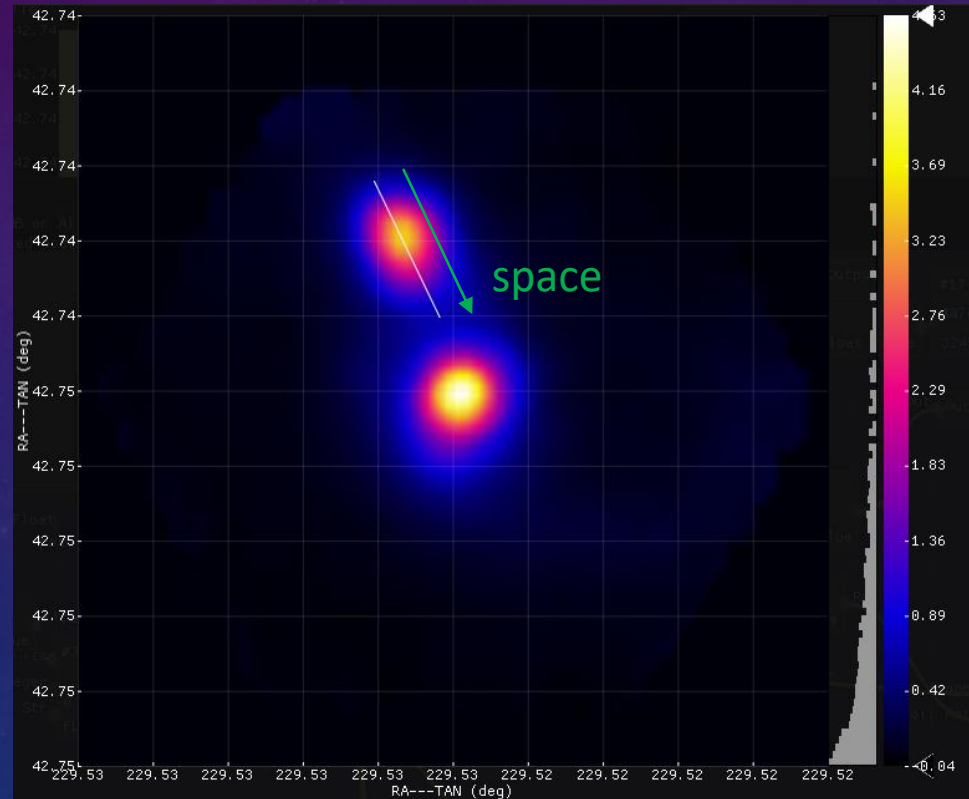
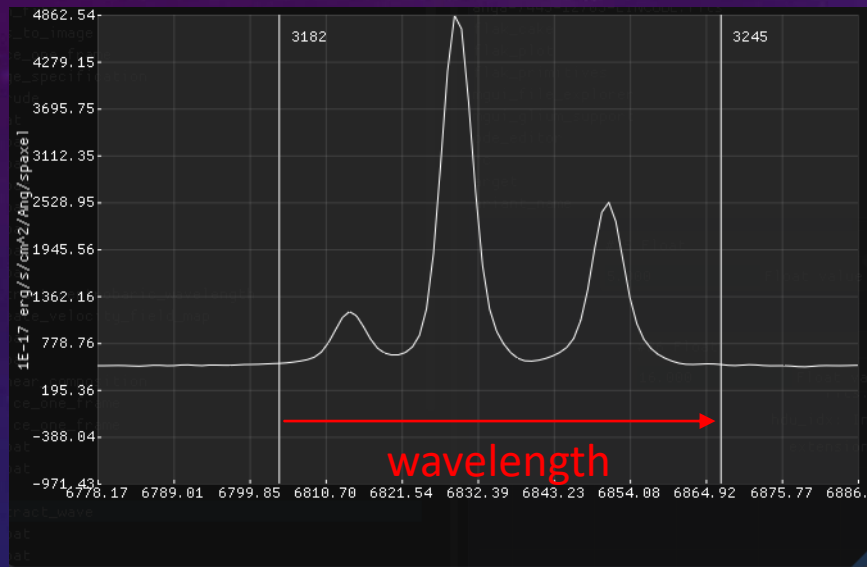
aflak

(Advanced Framework for Learning Astrophysical Knowledge)

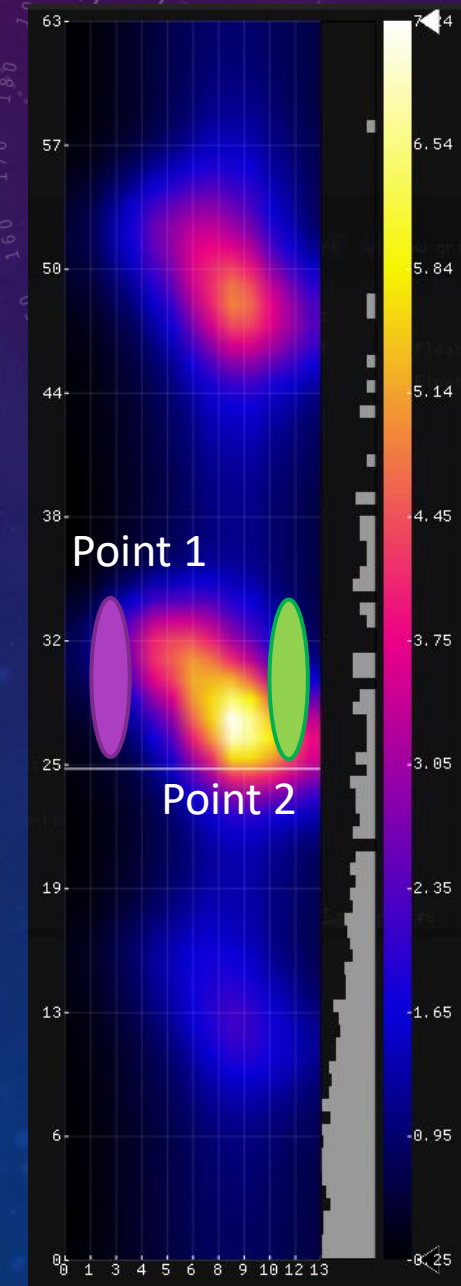
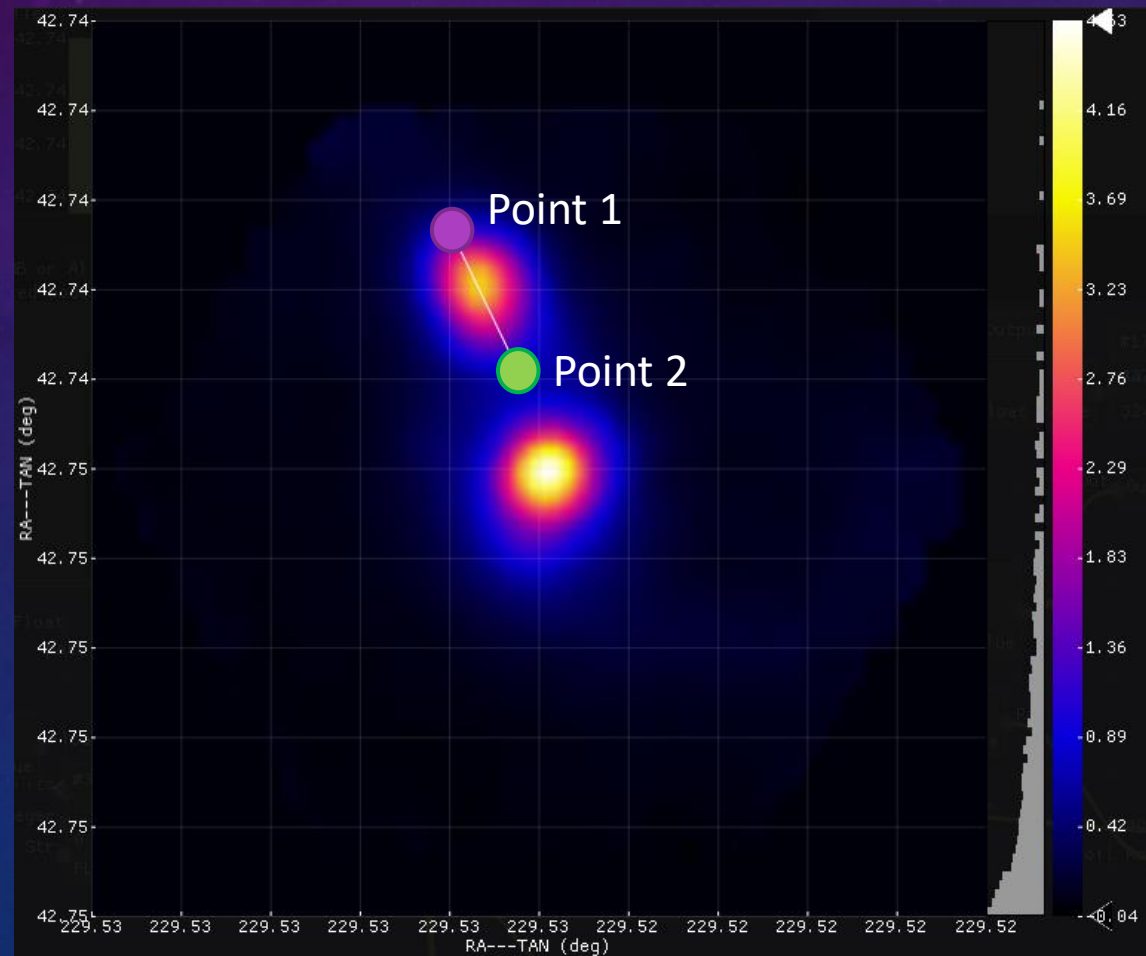
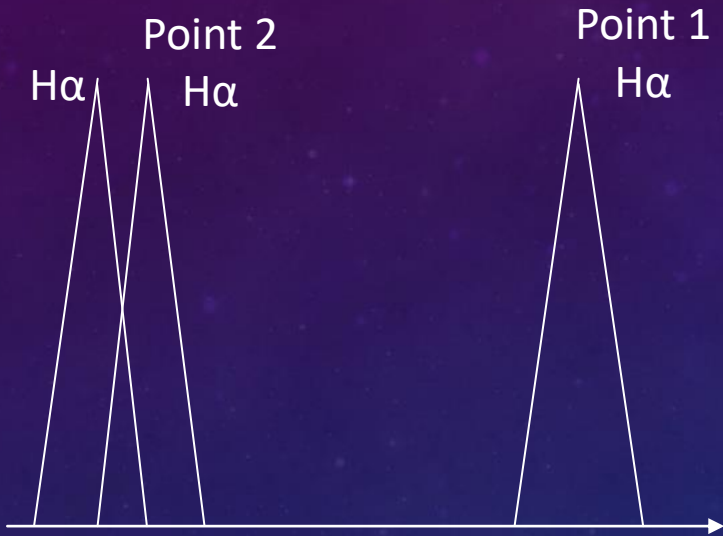
Datacube Slicer and Probe



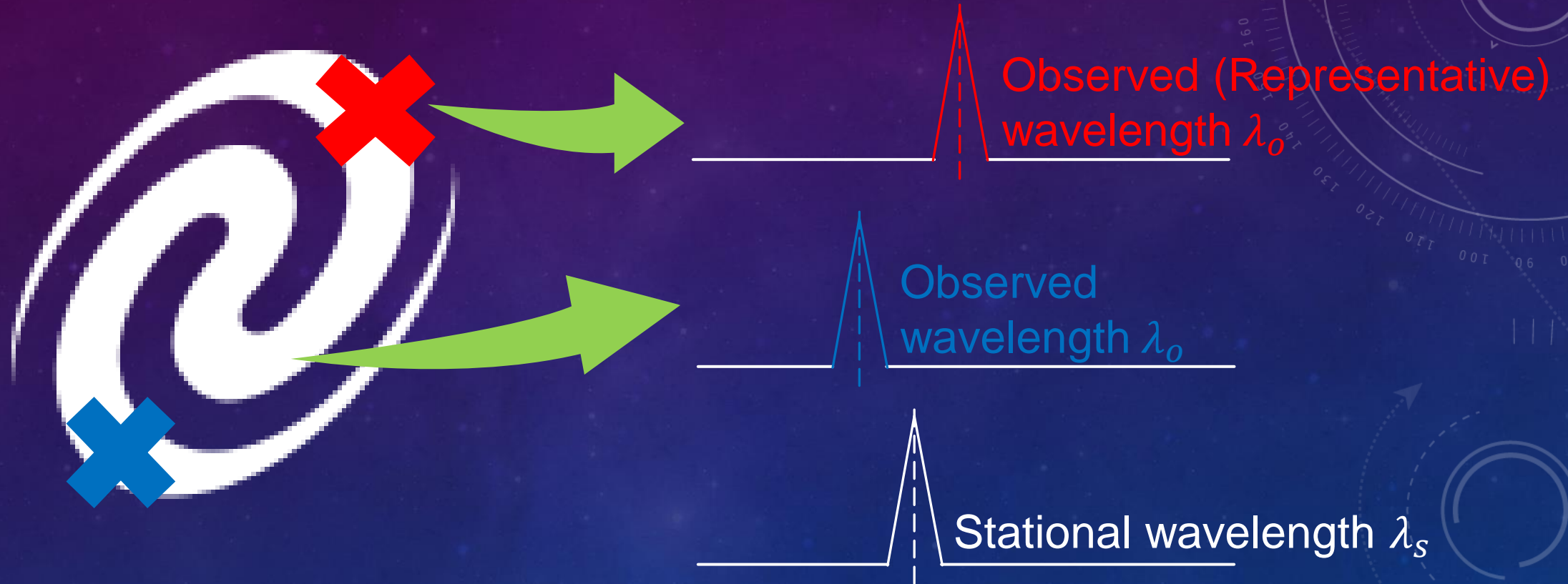
P-V Diagram of Galaxy A



Knowledge from P-V Diagram

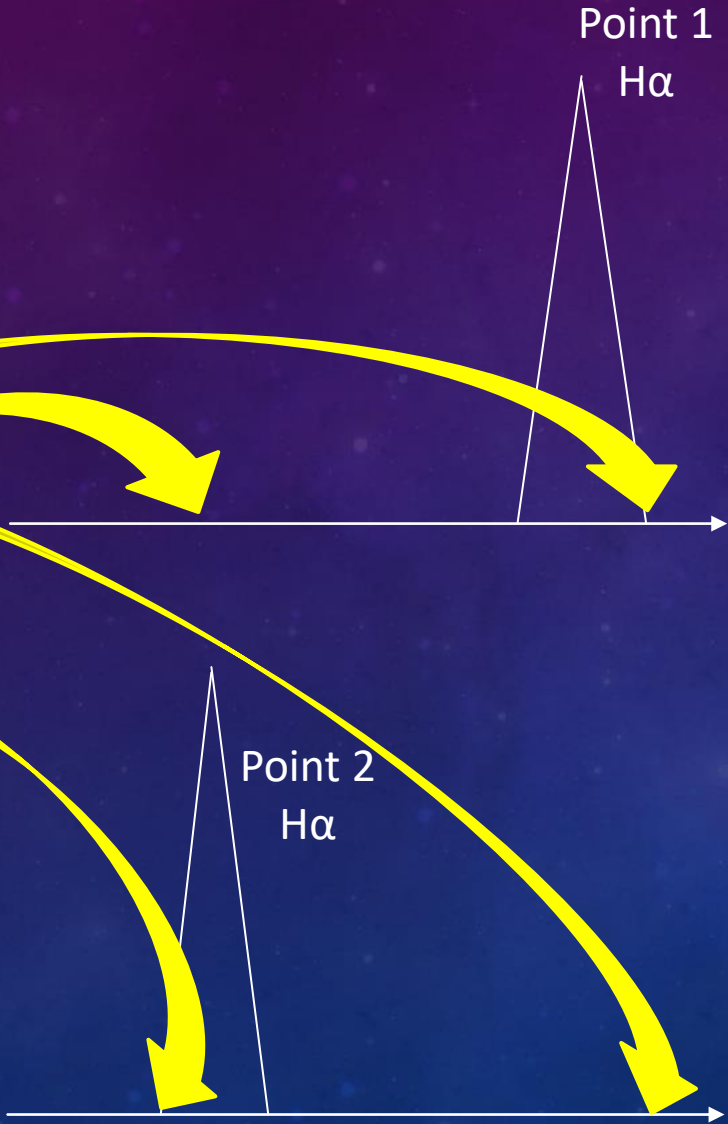
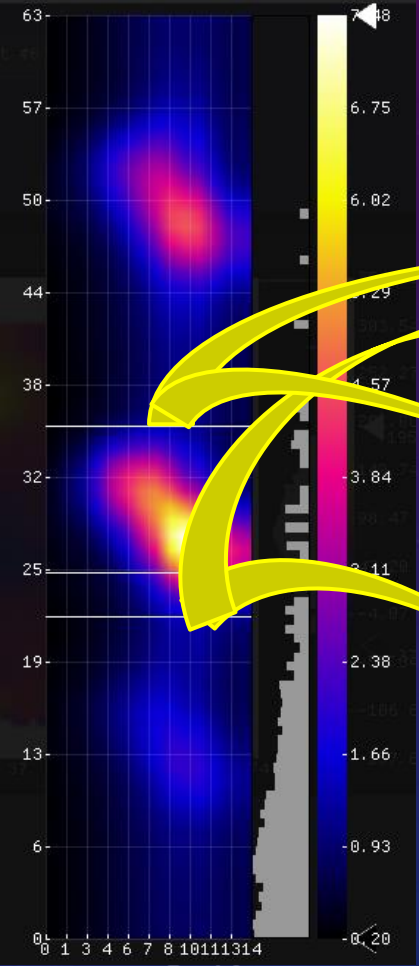


Computation of Velocity Field

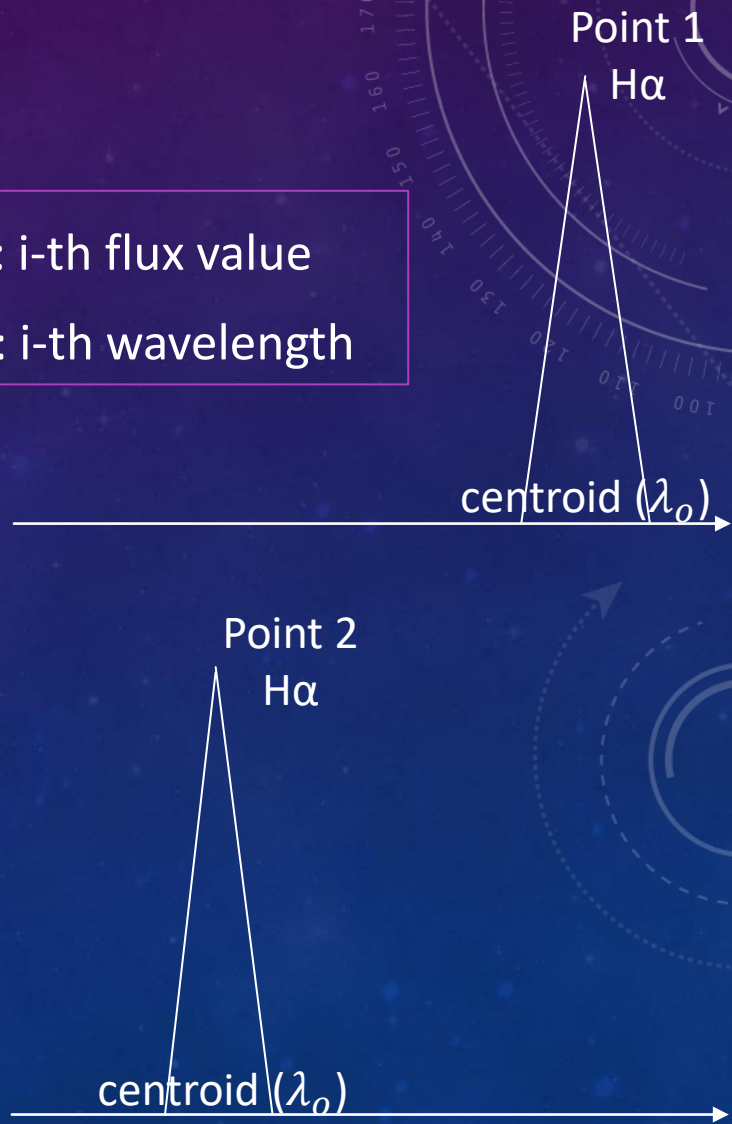


$$velocity \approx c \times \frac{\lambda_o - \lambda_s}{\lambda_s} \quad \left(\frac{\lambda_o - \lambda_s}{\lambda_s} \ll 1, c: \text{velocity of light} \right)$$

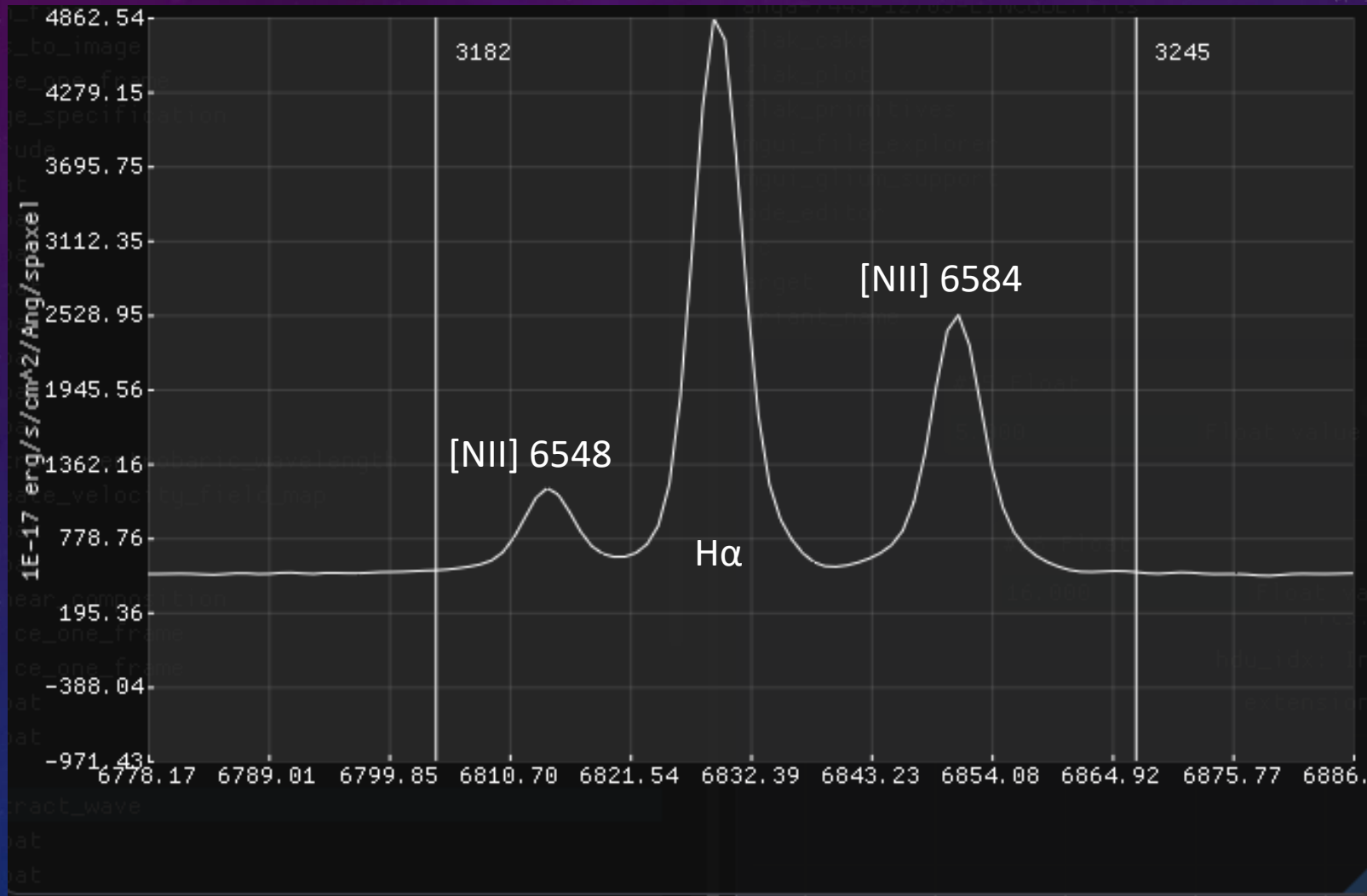
Computation of Velocity Field—Wavelength Range Determination



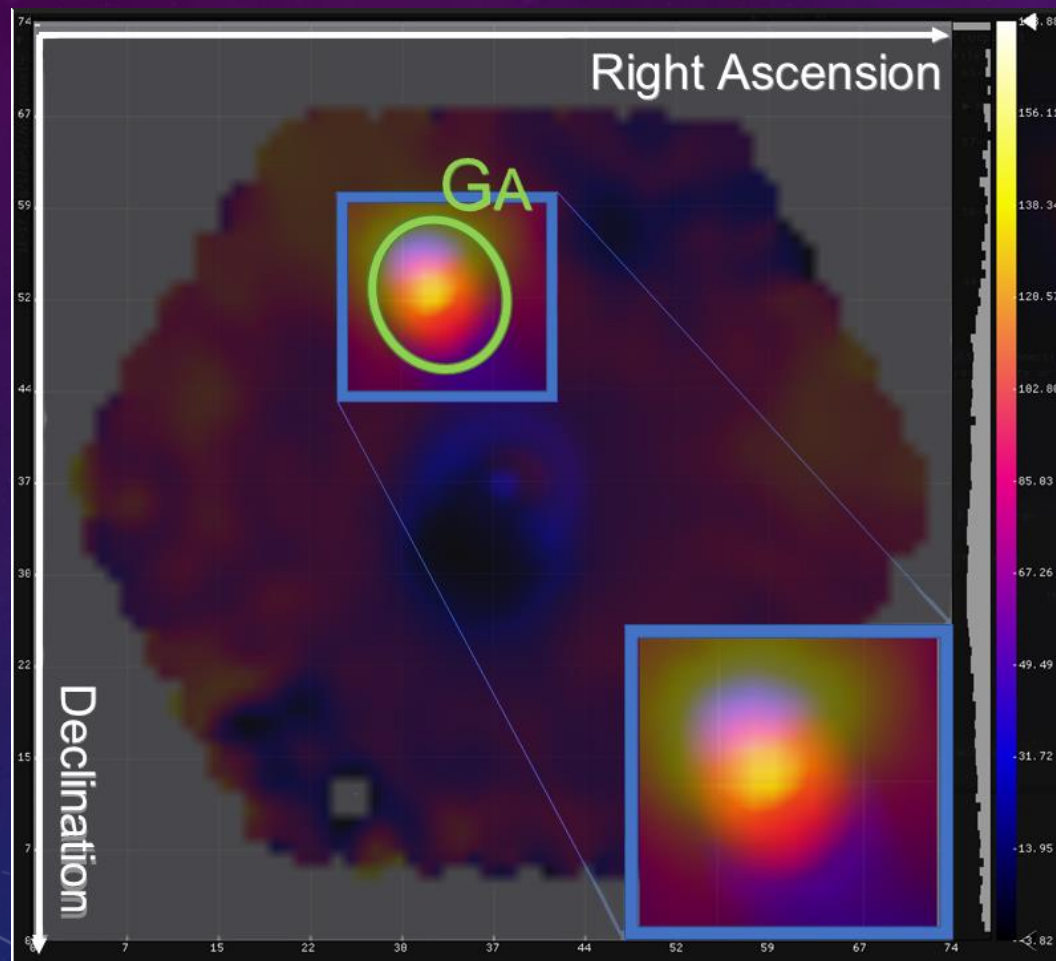
$$\lambda_o = \frac{\sum_i f_i \lambda_i}{\sum_i f_i}, f_i : i\text{-th flux value}$$
$$\lambda_i : i\text{-th wavelength}$$



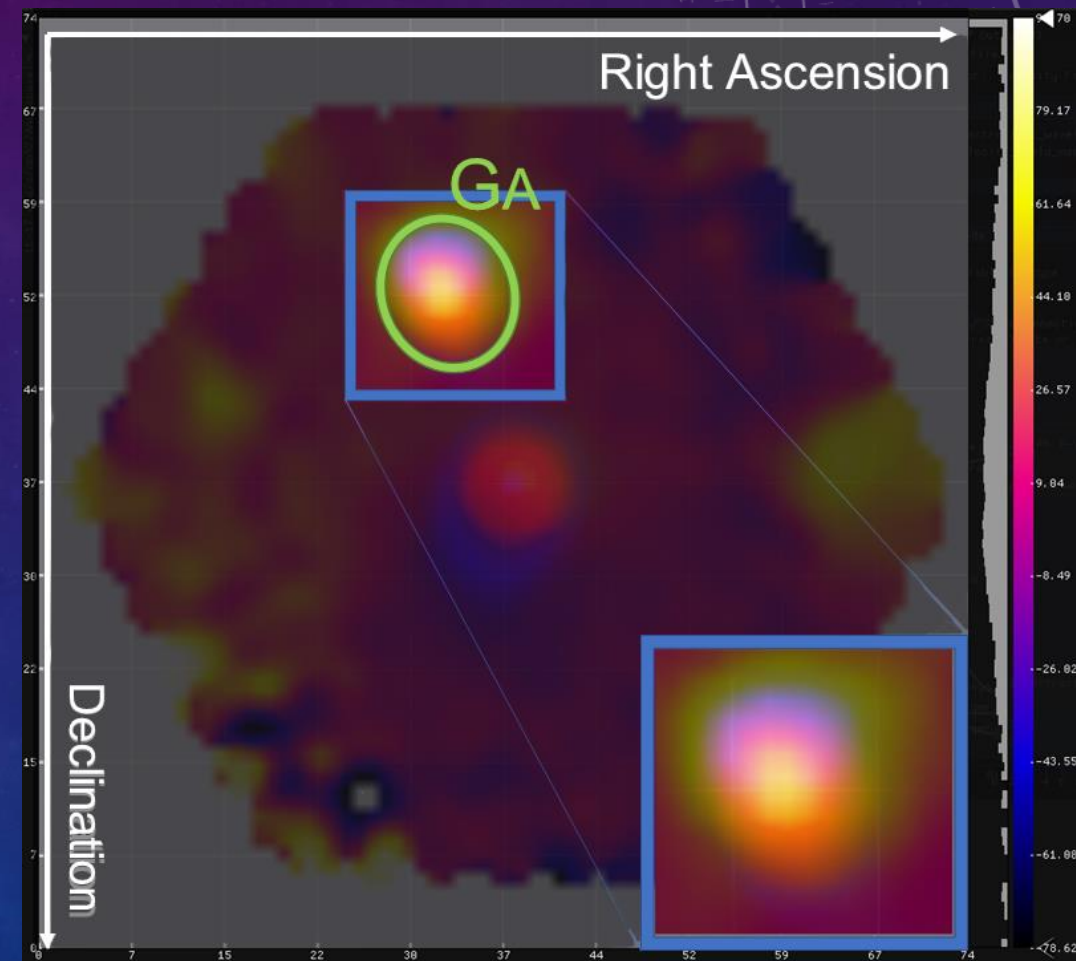
Blended Spectrum



Visualization Results of Velocity Field Map



With P-V Diagram



Without P-V Diagram

Limitation/Future Work

- Errors in the centroid computation resulting from a fixed wavelength range
- Improving the method of determining the wavelength range / the representative wavelength
- Automatic detection of the line segments that show most difference in velocity field