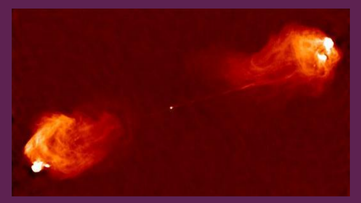

Polarization of Radio Galaxies

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What are Radio Galaxies?

- Radio galaxies are a subset of all galaxies that emit high amounts of radio waves into space.
- The radio emission originates in their supermassive black holes at the galaxy core, fueled by a continuous infall of mass.
- Particles are accelerated to relativistic speeds creating synchrotron radiation, which is detected by radio telescopes.
- Jets of fast moving plasma emerge, creating structures that can be detected through their radio emission.

Introduction

- The primary purpose of this project is to determine why radio galaxies are polarized differently from each other.
- Studying these sources through their polarization provides insight to the magnetic field structures in the plasma, and thus can help evaluate different physical models for the origin and evolution of radio galaxies.
- The project involves measuring the changes in size and structure of radio galaxies, and their relation to change in polarization.
- Further work will involve the comparison of polarization properties with other radio galaxy properties, such as luminosity, size, structure and spectrum.

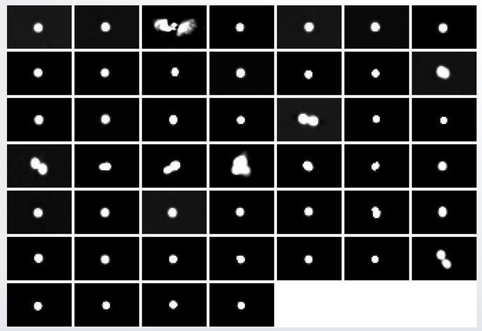
This work was done under the supervision of professor Lawrence Rudnick, and PhD student Mehdi Lamee. This project was supported by UROP.

Methods

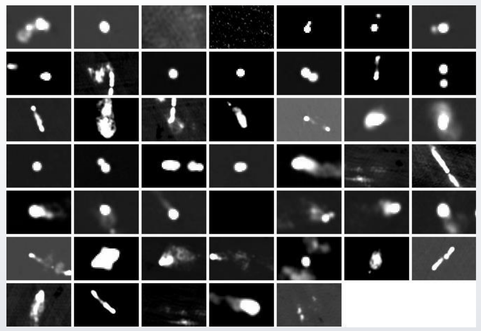
Two surveys made with the Very Large Array, the NRAO VLA Sky Survey (NVSS) and Faint Images of the Radio Sky (FIRST), were used to identify the 297 brightest (>1.2 Jy) radio galaxies in common.

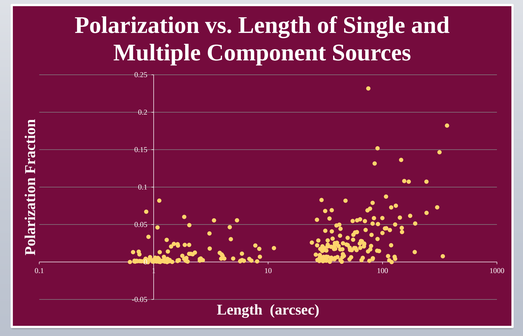
- The sources were divided into two groups; the 46 sources with the lowest fraction of polarization in the NVSS, and a group of 47 with the highest fraction of polarization. This was done in order to see if there is any difference between these two groups in terms of their structure, either single or multiple component.
- The pictures of the sources from the FIRST survey, with a beam size of 5 arcsec, were used to measure the radio source sizes using the software ds9.

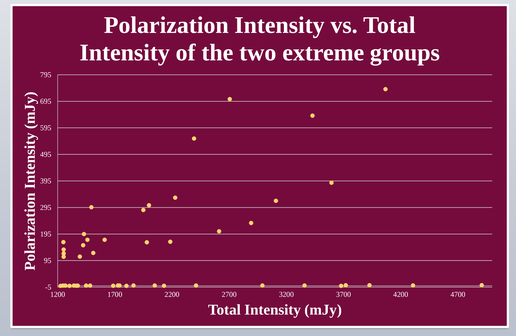
46 Lowest polarized sources



47 Highest polarized sources.



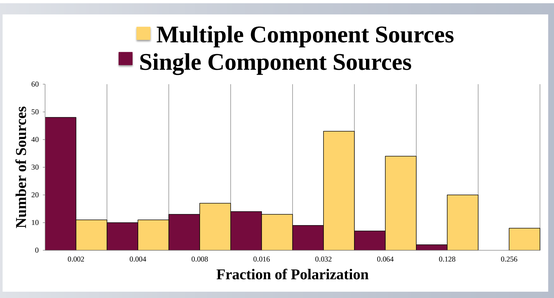




Results

The pictures of the two extreme groups clearly show that there is a difference in the morphology of the sources. Sources with the highest polarization fraction are mainly multiple component, whereas the ones with the lowest polarization fraction are mainly single component galaxies.

Also, from the graph of length versus polarization of all the sources in the sample used, there is a clear separation in the length of sources with respect to polarization.



Conclusions

- Single component sources generally have low polarization, whereas multiple component sources are generally more highly polarized.
- The change in polarization is likely due to more ordered magnetic fields in the multi-component sources, and we will investigate the underlying causes further by looking at their spectra, luminosities, and redshifts.

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