

## Introduction

This research investigates the dust attenuation of dwarf galaxies using the method of overlapping occulting galaxies. The ultimate goal is to write a user-friendly program to complete calculations for any overlapping pair.



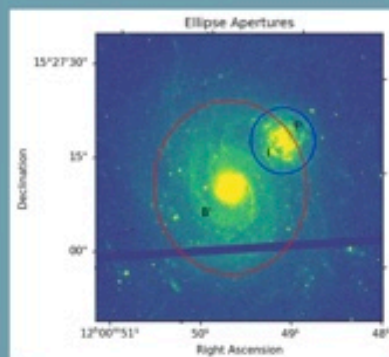
Full color image of MCG+03-31-012

Images were taken with HST, which provides sufficient resolution to construct transmission maps in the overlap region. These maps will provide vital information about dust attenuation in dwarf galaxies that can be used to further investigate their properties.

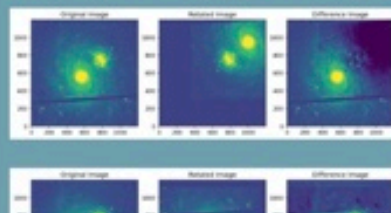
Several nearby dwarf galaxy occulters ( $z < 0.9$ ) were investigated using the program. The overlapping pair that was the focus of this research is MCG+03-31-012, a dwarf galaxy occulting a background spiral galaxy. This pair was chosen because of symmetry, image resolution, and large region of overlap. Other overlapping pairs have been investigated, but require refinement of the program to yield quality maps.

## Methods

The method of overlapping occulting galaxies is used to calculate the attenuation due to dust of the foreground dwarf galaxy. Specifically, using the approach of rotated galaxies to calculate the transmission in the overlap region.



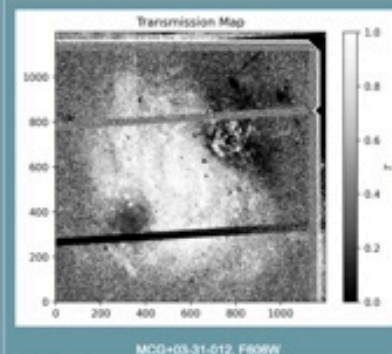
Ellipses are drawn encompassing the outskirts of each galaxy. For this method, both the foreground and the background galaxies are rotated  $180^\circ$  to create a model of each galaxy in the overlap region. The model is then subtracted from the original data to check for the residual image.



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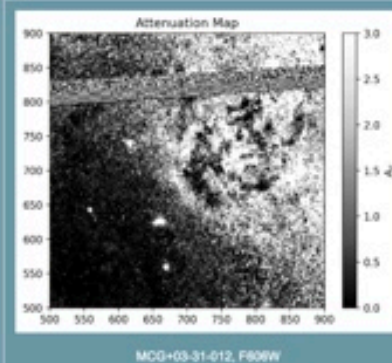
## Results

The following is the resulting transmission map:



MCG+03-31-012, F806W

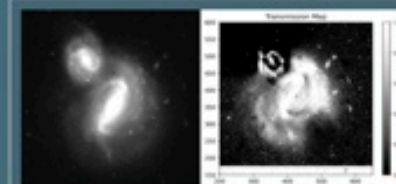
A closeup of the corresponding attenuation map:



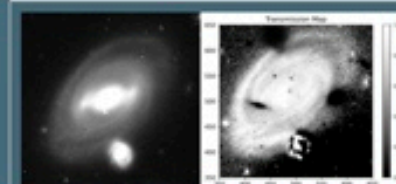
MCG+03-31-012, F806W

## Future Steps

Here are some results from other overlapping pairs investigated:



IC4271, F125W



SDSS-J151923.14+203233.6, F125W

To refine the program, the following improvements will be implemented:

- A function to optimize the center of the galaxy, which leads to the smallest residual when rotated and subtracted.
- Option to apply masks to other bright objects not of interest.
- Error propagation to get transmission uncertainty and S/N maps.
- Isophote method of achieving transmission.
- Automatic source detection of the centers of the galaxy, when a central bulge is present.