

Interim Performance Report

Grant #
Contract Number
Title
Investigator
Institution
Institution ID
Start Date
End Date
Request Date
Submitter
Reporting Period

EXAMPLE B

Summary Of Project Activities

1. Brief description of the primary objectives and scope of the project

This proposal requests 8 orbits of observations of the Milky Way RSG CD-31 4916 with the STIS coronagraph. These observations complement previous observations of the same RSG with the Gemini Planet Imager on Gemini South in the H band. Combined these data will make it possible to, for the first time, image the closer circumstellar environment of a red supergiant to determine the distribution and grain size of the dust and discriminate between different potential mass loss mechanisms in these stars.

2. Brief description of the findings

The data have all been successfully observed. We have completed a preliminary reduction of the dataset, finding that we have successfully detected circumstellar dust in the STIS observations that is largely symmetrically distributed around the star. We are currently in the process of refining this reduction to ensure that we're subtracting the best PSF match for each exposure on the science target and doing a more finely tuned masking of the residual diffraction spikes that are left in the images after the PSF subtraction. Once this is complete we will be able to quantify the geometry of the circumstellar material and comparing the HST STIS results to our previous GPI observations.

3. Name and date (or anticipated date) of the publication of results

We presented our data in poster form at the 2019 American Astronomical Society winter meeting in Seattle, and an initial draft of the paper is in progress and awaiting conclusions from our re-reduction of the data. We anticipate publishing these results by mid-2019.

4. Suggestions and additional comments

None.

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2. Brief description of the findings

The data have all been successfully observed. We are currently in the final stages of completing the data reduction; preliminary results suggested that we had successfully detected circumstellar dust, and a more careful reduction has since highlighted signs of potential asymmetries, including a clear East-West asymmetry in the brightness of the circumstellar material and several potential clumps that may be indicative of sporadic mass loss. Our main remaining task is performing a spatially-matched comparison between the HST STIS results and our previous H-band GPI observations.

3. Name and date (or anticipated date) of the publication of results

We presented our data in poster form at the 2019 American Astronomical Society winter meeting in Seattle. Refining the PSF subtraction and completing a final reduction took longer than anticipated; however, a draft of the paper is nearly complete and we anticipate publishing these results in the first half of 2020.

4. Suggestions and additional comments

None.

Final Performance Report

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2. Brief description of the findings

The data have all been successfully observed. We have completed our final reduction of the dataset, confirming that we have successfully detected circumstellar dust in the STIS observations and that there is observable asymmetry in the dust distribution in the east-west direction, with material of the same surface brightness reaching farther from the star to the west. This is an interesting comparison to previous ground-based Gemini/GPI H band observations which showed evidence of a dust clump to the south of the star. From a comparison of the data we can quantify that the dust appears clumpier in the near-IR, with a smoother distribution in the STIS data. With these results we can consider several explanations, including distribution of the dust in a spherically-symmetric face-on disk or shell, variation in grain size as a function of circumstellar radius (possibly associated with different ejection events), and the possibility that the dust distribution is clumpy in addition to the location-dependent grain size hypothesis.

3. Name and date (or anticipated date) of the publication of results

A paper draft summarizing these results is complete and in the final stages of co-author review before submission to the Astrophysical Journal.

4. Suggestions and additional comments

None.