Observation Planning

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The stars I will observe are **Cl\* NGC 2264 RMS 3946** and **Cl\* NGC 2264 RMS 4365** (shown in Figure 1)**,** which are in the open cluster NGC 2264 and in the same FOV. The comparison stars with slightly larger magnitudes are circled in purple in Figure 1 as well. The dates for observation are January 5-7, 2024 (reference Figures 2-4). I will be using Kitt Peak Observatory in Arizona because we have imaged NGC 2264 in the past. This is what we have used due to the longitude and latitude of the telescope. The weather in Pima County, AZ is predicted to be good, with a high of 60°F and a low of 28°F. The moon rises with sunrise, giving zero illumination from the moon while there is no predicted snowfall and little to no precipitation [1].

These stars are possible candidates my Python script selected out of the thousands of stars in NGC 2264. RMS 3946, for short, is a spectral type K0 with an I-magnitude of 15.81. Whereas RMS 4365 does not have a spectral classification and has an I-magnitude of 16.04 [2]. Their apparent magnitudes are within the same resolution, given an I-magnitude difference of 0.23 from Simbad [2]. Due to the dim magnitudes, I will use the Johnson-I filter since its wavelength corresponds to the NIR. This will allow the CCD to receive the most amount of light possible for a high SNR. Because of the good weather yet dim stars, I estimate the exposure time to be about 120 seconds with an average SNR of a few hundred.

My reasoning for choosing these stars for imaging is that we do not have any data on them, and they are possible candidates from the Python program. Since these were the strongest candidates, they are good targets to analyze. If these turn out to be roAp stars, we will have an updated catalog and show that the Python script works as expected. Due to the peak in the star’s transit and good weather, this month is an asset, clarifying the justification for the imaging of these stars.

Appendix

A screenshot of a computer screen

Description automatically generated

Figure 1. The Finder Chart for both stars with their Gaia designation, showing they are in the same field using the FOV of the ARK camera along with the expected comparisons [4].

A screen shot of a graph

Description automatically generated

Figure 2. Airmass plot for January 5, 2024, showing the moon rising with the sunrise and the cluster in perfect view [3].

A screen shot of a graph

Description automatically generated

Figure 3. Airmass plot for January 6, 2024, showing the moon rising with the sunrise and the cluster in perfect view [3].

A graph on a screen

Description automatically generated

Figure 4. Airmass plot for January 7, 2024, showing the moon rising with the sunrise and the cluster in perfect view [3].

References

[1] *Weather averages Pima, Arizona*. (n.d.). Www.usclimatedata.com. Retrieved December 1, 2023, from <https://www.usclimatedata.com/climate/pima/arizona/united-states/usaz0406>

[2] *SIMBAD: Query by identifiers*. (n.d.). Simbad.u-Strasbg.fr. <https://simbad.u> strasbg.fr/simbad/sim-fid

[3] *astronomical object visibility plotter | airmass.org*. (n.d.). Airmass.org. Retrieved December 1, 2023, from <https://airmass.org/chart/obsid:kpno/date:2024-01-05/object:NGC%202264/ra:100.217360/dec:9.877000>

[4] *Annotated Finding Charts*. (n.d.). Astro.swarthmore.edu. <https://astro.swarthmore.edu/transits/finding_charts.cgi>