Abstract

In October and November 2011 light curve measurements were performed on AR Per, a variable star classified as a RR Lyrae type. These measurements were combined with ESA OMC satellite data because of ESA’s Explore the High-Energy universe competition. Measurements in the visual part of the spectrum were performed by students of the Emmmascollege in Rotterdam together with their physics teacher using a Celestron C11 with SXV-H9 CCD camera. These measurements show, with the combined datasets, that the period of AR Per is 0.425548 +/- 0.000010 days.

Also in our measurements signs of the Blazhko effect can be found.

Introduction

AR Per is classified as a RR Lyrae type of star in the constellation of Perseus. More specifically, AR Per is a RRab type (with magnitude changes over 0.9 of a magnitude). This star was chosen to observe because of its relatively short period and its relatively high change in magnitude, making it a star that could be observed in a limited amount of time. It was also perfectly visible in the European skies at the time of the observations (November).

RR Lyrae stars usually show a typical light curve, starting with a slight drop in the magnitude, then a (relatively) steep rise, before dropping gradually again, with a hold in the middle of the drop (see Figure 1).

Also a commonly seen effect in RR Lyrae stars is the Blazhko effect [2], which means that the amplitude or the period of the star changes over time. Question is if the above described phenomenons also occurs in AR Per and if the Blazhko effect is detectable in our data.

Equipment and data overview

Data of AR Per has been obtained during several nights in November 2011 using a Celestron C11 in combination with an SXV-H9 CCD camera. During the sessions the setup was running in automatic guiding mode obtaining images at 30s intervals. During the observations darks, flats and darkflats were made directly after stopping the imaging procedure. Flat frames were made using a LED-panel directly after stopping the imaging procedure.

Results

In October and November 2011 light curve measurements were performed on AR Per, a variable star classified as a RR Lyrae type. These measurements were combined with ESA OMC satellite data because of ESA’s Explore the High-Energy universe competition. Measurements in the visual part of the spectrum were performed by students of the Emmmascollege in Rotterdam together with their physics teacher using a Celestron C11 with SXV-H9 CCD camera. These measurements show, with the combined datasets, that the period of AR Per is 0.425548 +/- 0.000010 days.

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Equipment and data overview

Data of AR Per has been obtained during several nights in November 2011 using a Celestron C11 in combination with an SXV-H9 CCD camera and a Baader V-filter.

During the sessions the setup was running in automatic guiding mode obtaining images at 30s intervals. During the observations darks, flats and darkflats were made directly after the measurements. Flat frames were made using a LED-panel directly after stopping the imaging procedure.

Processing

Image capturing was performed using Nebulosity 2.0. The data was saved as raw fit files. Together with every set of raw files also 10 darks, 20 flats and 10 darkflats were captured.

The image processing was performed using Maxim DL5. Also the necessary corrections were made with this program. The images were batched into batches of 5 minutes to reduce signal noise and strengthen the measurements. After stacking the images were analysed using the photometry module of Maxim DL5.

Fixed magnitude stars were used as reference stars that were kindly provided by the AAVSO. AR Per was measured relative to these reference stars. The program created a file containing Julian dates and magnitude estimates as well as the possible error.

These dates were converted to heliocentric time using the website listed in the competition introduction. Thereafter ESA’s OMC data was converted from barytime to heliocentric Julian date. The obtained dataset was combined with the ESA OMC dataset. Peranso 2.0 was used to perform period analysis on AR Per and to produce light curves of this star.

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Conclusion/discussion

The light curve of AR Per shows a typical behaviour for a RR Lyrae star. The magnitude slightly drops, then rises steeply before dropping gradually again, with a hold in the middle of the drop, almost identical to figure 1.

Variations of the amplitude of the star give indications of the presence of the Blazhko effect in the measurements, though it can’t be said with certainty the effect is there. Therefore we would recommend further investigation of this star.

References/Acknowledgements


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