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Θ^2 Sgr: SERENDIPITOUS DISCOVERY OF VARIABILITY
IN AN Am STAR?

The bright star HR 7631 was recently found to be a strong X-ray source by both the X-ray telescope (XRT) and wide-field camera (WFC) aboard the ROSAT X-ray satellite. This activity, along with the large rotational velocity of $\sim 90 \text{ km s}^{-1}$ (Dr. R.D. Jeffries¹, private communication) suggested that the star may show evidence of variability due to photospheric spots, and in July 1992 it was included in the observing program at the Monash Observatory.

Comparison stars chosen were HR 7585 (HD 188158) and HR 7624 (HD 189118, also known as Θ^2 Sgr), both of which are within 1° of the target star. Preliminary observations on July 16th yielded 28 V-band measurements of HR 7631, and while reducing these data it was immediately noticed that the RMS deviation in comparison star differences was very large. The data are shown in Figures 1 (a) and (b) as magnitude differences between target and comparison stars. The minimal scatter in the points indicates the very high quality of the night. It can be seen from Figure 1 (a) that the difference between HR 7631 and comparison star 1 remained reasonably constant over the seven hours of observations, with an RMS deviation of only 0.007 magnitude. Assuming then that neither of these stars were varying, Figure 1 (b) indicates that the second comparison star (Θ^2 Sgr) experienced a steady 0.25 magnitude increase in brightness. In addition, a flare-like event from the star was seen at about HJD 2448820.11. This showed as a rapid increase in brightness of 0.07 magnitude (corresponding to a luminosity increase in the star of about 7%), followed by an approximately exponential decrease over the next 25 minutes or so.

Θ^2 Sgr is not listed in the Bright Star Catalog as a variable star, and in fact a literature search showed it to be an Am star (Henry & Hesser, 1971). Wolf (1983) gives a detailed summary of research on peculiar A stars, saying "several extensive searches for photometric variability in the Am stars, have yielded, with few exceptions, negative results", and concludes that there is no evidence for either pulsation or surface inhomogeneities (starspots) for these objects. This is clearly at odds with the data shown in Figure 1 (b) Future observations will be made as soon as possible to verify these findings, although the evidence presented here strongly suggests photometric variability - probably due to starspots - and flaring of the Am star Θ^2 Sgr. The ROSAT target HR 7631, although listed in the Bright Star Catalog as a variable of amplitude 0.07 magnitude, showed little change over the duration of these observations. The star may simply have been in a quiescent state of photospheric activity, and further observations will examine this.

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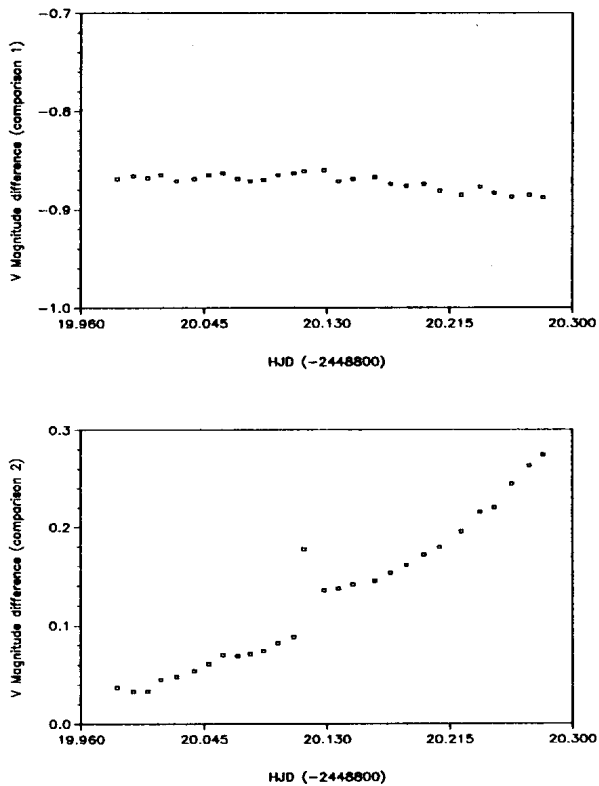


Figure 1: Magnitude differences between HR 7631 and comparison stars (a) HR 7585 and (b) HR 7624. Measurements were made in the V filter and span approximately 7 hours.

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