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**DISCOVERY OF ECLIPSING BINARY GSC 2007:761 AND
MISCLASSIFICATION OF δ SCUTI SAO 83225**

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Observatory and telescope:

The Biosphere 2 Observatory 24" Ritchey-Chretien telescope was used for these observations.

Detector:

The telescope was fitted with an Apogee AP-7 CCD camera (Peltier cooled, 512 × 512 pixels) controlled by MaxIm DL software and fitted with a V filter.

Remarks:

As a potential δ Scuti star, SAO 83225 was targeted by the Columbia University Biosphere 2 Observatory in the Spring of 2002 as part of a project to match single-mode δ Scuti pulsations to instability strips predicted by theory (Xu, 2002).

SAO 83225 (ROTSE J141249.39+243203.3, 2000 coordinates) is a 10.08V magnitude star of spectral type of F8. SIMBAD presents SAO 83225 as a δ Scuti variable having period $P=0.135$ d and amplitude of variability = 0.078. The δ Scuti classification was made automatically in the ROTSE1 sky survey (Akerlof et al., 2000). GSC 2007:761 is an 11.87 V-magnitude star with coordinates $\alpha = 14^{\text{h}}12^{\text{m}}85$, $\delta = +24^{\circ}32'05$. No additional information about SAO 83225 or GSC 2007:761 has been found in the literature. The finding chart is given in Fig.1.

613 individual observations were taken in the time interval JD2452395 - JD2452397. The relative photometry was performed using the MaxIm DL v3.03 photometry tool. In Fig.2 we present the light curve of GSC 2007:761 using SAO 83225 as a comparison star and GSC 2007:751 as a check star. Note that the comparison star's curve does not exhibit variability against the check star while that of GSC 2007:761 does, the unexpected result which prompted us to explore further.

We also present the light curve of GSC 2007:761 against GSC 2007:751 and the nonvariability of GSC 2007:751 against check-star GSC 2007:733.

Remarks:

The light curve of GSC 2007:761 exhibits primary and secondary eclipse dips and characteristic shape of a short period contact binary system. The half period, according to our observations, is $P1/2 = 0.13550 \pm 0.00085$ d, the same value that is given for as the δ Scuti pulsation period of SAO 83225, indicating that the binary system has a full period of $P = 0.2710 \pm 0.0017$ d.

Our observations yield primary minima timings: JD 2452395.7197 and JD 2452397.8873. We also present the light curve of GSC 2007:761 superimposed upon the folded light curve of GSC 2007:761 with comparison SAO 83225. The plot provides conclusive evidence of a binary system.

Given the proximity of these two stars, SAO 83225 has apparently been misidentified as a variable star (Jin et al., 2004) where it is GSC 2007:761 that is actually variable. In addition, the variability has been erroneously characterized as δ Scuti type pulsation rather than as an eclipsing binary system.

As our interest lies with the properties of δ Scuti pulsations, we report here only the most fundamental properties of the newly identified eclipsing variable GSC 2007:761. The period has been determined to be $P = 0.27$ d, designating it a Very Short Period (VSP) system (Samec et al., 1991). The amplitude of the primary eclipse is 0.55 mag while that of the secondary is 0.45 mag.

Acknowledgements:

This research has made use of the SIMBAD database and Smithsonian/NASA Astrophysics Data System (ADS).

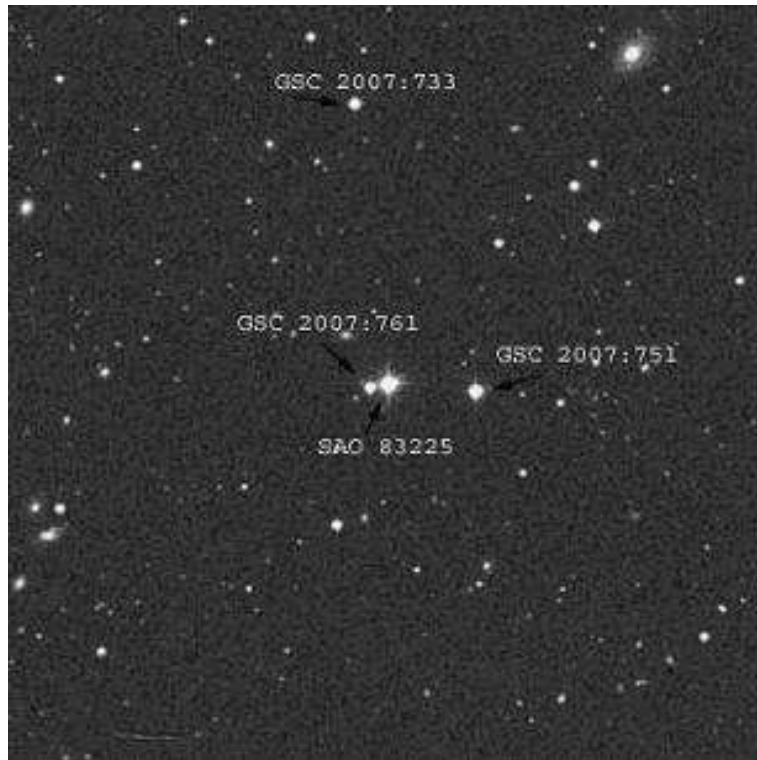


Figure 1. SAO 83225 star field.

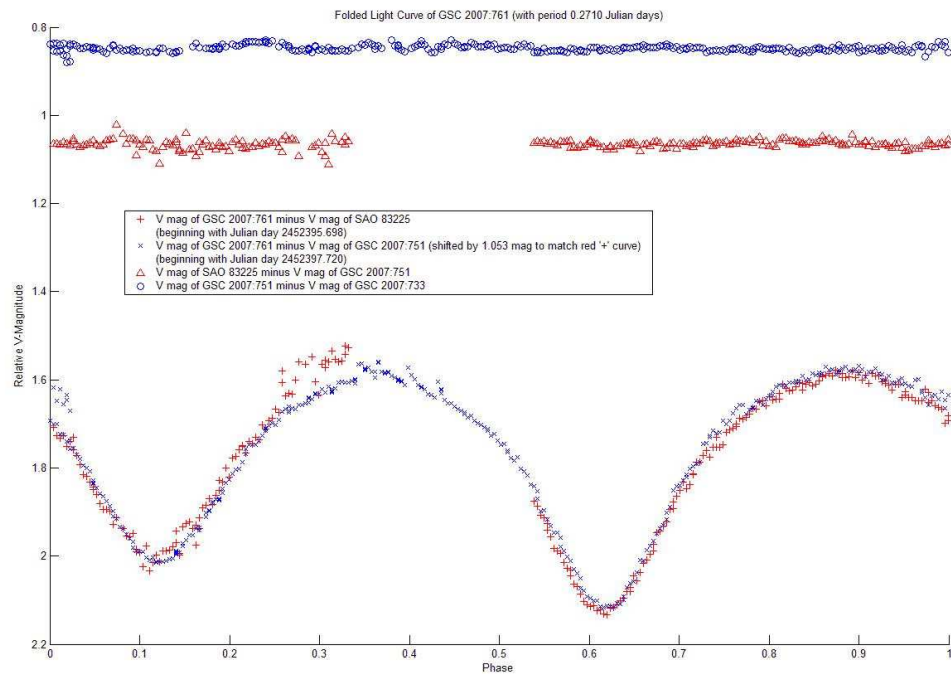


Figure 2. Light curves of GSC 2007:761 and SAO 83225 against comparison stars GSC 2007:751 and GSC 2007:733.

References:

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