Contribution ID: **35** Type: **Poster**

Updated modelling of the oscillating eclipsing binary system AS Eri

Wednesday, June 8, 2022 12:50 PM (2 minutes)

We present the results of a recent study of the Algol-type eclipsing binary system AS Eri based on the combination of the MOST and TESS light curves as well as a collection of very precise radial velocities obtained with the spectrographs HERMES operating at the Mercator telescope, La Palma, and TCES operating at the Alfred Jensch telescope, Tautenburg. The primary component is a known A3 V-type pulsating, mass-accreting star. We fitted the light and RV data with the package PHOEBE, and determined the best-fitting model adopting the configuration of a semi-detached system. We used the orbital period of 2.6641496 $\pm$ 0.0000001 days obtained from an updated (O-C) analysis and the phase gap between the MOST and TESS light curves. The absence of any cyclic variation in the (O-C) residuals confirms the long-term stability of this period. We obtained the following absolute component parameters: L_1 = 14.125 $\pm$ 0.008 $L_\odot$, M_1 = 2.014 $\pm$ 0.004 $M_\odot$, R_1 = 1.733 $\pm$ 0.006 $R_\odot$, log g_1 = 4.264 $\pm$ 0.005 and L_2 = 4.345 $\pm$ 0.003 $L_\odot$, M_2 = 0.211 $\pm$ 0.001 $M_\odot$, R_2 = 2.19 $\pm$ 0.01 $R_\odot$, log g_2 = 3.078 $\pm$ 0.003 with $T_{\mathrm{eff},2}/T_{\mathrm{eff},1}$ = 0.662 $\pm$ 0.002. Although the orbital period appears to be stable on the long term and the final solution shows residuals within the expected limits (the residuals still contain the pulsation signal), we show that the models derived for each light curve separately entail small differences, e.g. in the temperature of the companion, and that the light curve is affected by a years-long modulation. We believe that this is caused by the magnetic activity of the cool companion. The next endeavour will be to study the properties of the pulsations using the residual light curves in combination with existing and new high-resolution, time-series spectra collected with the SALT spectrograph.

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