Polarimetric evidence of a white dwarf pulsar in the binary system AR Scorpii

Supplementary Table 1: AR Sco Photopolarimetry Observing Details

<table>
<thead>
<tr>
<th>Telescope / Instrument</th>
<th>Observation Type</th>
<th>Date</th>
<th>HJD start*</th>
<th>HJD end*</th>
<th>Duration (h)</th>
<th>Orbital Phase#</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAAO 1.9-m / HIPPO</td>
<td>All-Stokes</td>
<td>2016-03-14</td>
<td>7462.604</td>
<td>7462.628</td>
<td>0.57</td>
<td>0.07–0.23</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2016-03-15</td>
<td>7463.541</td>
<td>7463.611</td>
<td>1.68</td>
<td>0.38–0.85</td>
</tr>
</tbody>
</table>

* HJD - 2450000
# from orbital ephemeris (2)
Supplementary Figure 1: Time series polarimetry.
Broad band (340 – 900 nm) photopolarimetry of AR Sco taken on 14 March 2016. The panel show, from the top, the total intensity ($I$) in 1 s bins and the Stokes $Q$, $U$ & $V$ values in 10 s bins, where the error bars are $\pm 1\sigma$. The data cover orbital phase interval $\phi = 0.07 - 0.23$ and the gap is when a background sky measurement was obtained.
Supplementary Figure 2: Time series polarimetry. Broad band (340 – 900 nm) photopolarimetry of AR Sco taken on 15 March 2016. The panel show, from the top, the total intensity ($I$) in 1 s bins and the Stokes $Q$, $U$ & $V$ values in 10 s bins, where the error bars are $\pm 1\sigma$. The data cover orbital phase interval $\phi = 0.38 - 0.85$ and the gaps are when background sky measurements were obtained.
Supplementary Figure 3: Time series polarimetry.
Broad band (340 – 900 nm) photopolarimetry of AR Sco taken on 14 March 2016, in 10 s bins. The panel show, from the top, the total polarized flux ($s$), degree of linear polarization ($p$) and position angle of linear polarization ($\theta$). The error bars are ±1σ. The data cover orbital phase interval $\phi = 0.07 – 0.23$ and the gap is when a background sky measurement was obtained.
Supplementary Figure 4: Time series polarimetry.
Red band (570 – 900 nm) photopolarimetry of AR Sco taken on 14 March 2016, in 10 s bins. The panels show, from the top, the total polarized flux ($s$), degree of linear polarization ($p$) and position angle of linear polarization ($\theta$). The error bars are ±1σ. The data cover orbital phase interval $\phi = 0.10 – 0.23$ and the gap is when a background sky measurement was obtained.
Supplementary Figure 5: Time series polarimetry.
Broad band (340 – 900 nm) photopolarimetry of AR Sco taken on 15 March 2016, in 10 s bins. The panels show, from the top, the total polarized flux ($s$), degree of linear polarization ($p$) and position angle of linear polarization ($\theta$). The error bars are $\pm 1\sigma$. The data cover orbital phase interval $\phi = 0.38 - 0.85$ and the gaps are when background sky measurements were obtained.
Supplementary Figure 6: Time series polarimetry.
Red band (570 – 900 nm) photopolarimetry of AR Sco taken on 15 March 2016, in 10 s bins. The panels show, from the top, the total polarized flux ($s$), degree of linear polarization ($p$) and position angle of linear polarization ($\theta$). The error bars are $\pm 1\sigma$. The data cover orbital phase interval $\phi = 0.40 - 0.86$ and the gaps are when background sky measurements were obtained.
Supplementary Figure 7: Polarization periodograms.
Amplitude spectra of the broadband polarized flux (s, left) and total flux (I, right)
Supplementary Figure 8: Spin-down power vs. X-ray power.
The X-ray luminosity and spindown power for a sample of spin-powered pulsars. The straight line represents the $\alpha = 0.001$ ratio that is inherent to spin-powered pulsars and also the spin-powered white dwarfs in AE Aquarii and AR Sco (adapted from I8).