Genç Ayrık Çift Yıldız HD 350731’in Doğası

Fahri ALİÇAVUŞ
Faruk SOYDUGAN, Selçuk BİLİR, Esin SOYDUGAN, Çağlar PÜSKÜLLÜ ve Tunç ŞENYÜZ
ÖNCESİ ÇALIŞMALAR VE GÖZLEMLER

- HD350731, V=9ᵐ.60, A0
- Ulupınar gözlemevi 11 gece, BVR çok renk ışık ölçümü
- Dominion Astrofizik Gözlemevi - 21 adet orta çözünürlükte tayf verisi
DIKINE HİZLAR VE YÖRÜNGE ÇÖZÜMÜ

<table>
<thead>
<tr>
<th>2450000-HJD</th>
<th>Evre</th>
<th>RV1 (kms⁻¹)</th>
<th>Hata (kms⁻¹)</th>
<th>RV2 (kms⁻¹)</th>
<th>Hata (kms⁻¹)</th>
</tr>
</thead>
<tbody>
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<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$T_0$ (HJD)</td>
<td>2454631.4603¹</td>
</tr>
<tr>
<td>$P_{orb}$ (day)</td>
<td>1.635135¹</td>
</tr>
<tr>
<td>$V_\gamma$ (km s⁻¹)</td>
<td>-10.4 ± 0.7</td>
</tr>
<tr>
<td>$K_1$ (km s⁻¹)</td>
<td>157.2 ± 1.3</td>
</tr>
<tr>
<td>$K_2$ (km s⁻¹)</td>
<td>162.7 ± 1.3</td>
</tr>
<tr>
<td>$e$</td>
<td>0.077 ± 0.007</td>
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<tr>
<td>$\omega$ (degree)</td>
<td>23.5 ± 2.3</td>
</tr>
<tr>
<td>$a_1 \sin i$ (10⁶ km)</td>
<td>3.52 ± 0.04</td>
</tr>
<tr>
<td>$a_2 \sin i$ (10⁶ km)</td>
<td>3.64 ± 0.04</td>
</tr>
<tr>
<td>$M_1 \sin^3 i$ (M☉)</td>
<td>2.79 ± 0.05</td>
</tr>
<tr>
<td>$M_2 \sin^3 i$ (M☉)</td>
<td>2.70 ± 0.05</td>
</tr>
<tr>
<td>$q (=M_2/M_1)$</td>
<td>0.966 ± 0.015</td>
</tr>
<tr>
<td>Parameter</td>
<td>W-D solution</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>$a$ ($R_\odot$)</td>
<td>10.43±0.02</td>
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<tr>
<td>$V_\gamma$ (km s$^{-1}$)</td>
<td>-10.1±0.4</td>
</tr>
<tr>
<td>$e$</td>
<td>0.077±0.006</td>
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<tr>
<td>$\omega$ (degree)</td>
<td>19.90±0.12</td>
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<tr>
<td>$i$ (°)</td>
<td>82.16±0.03</td>
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<tr>
<td>$T_1$ (K)</td>
<td>11840$^a$</td>
</tr>
<tr>
<td>$T_2$ (K)</td>
<td>11575±20</td>
</tr>
<tr>
<td>$\Omega_1$</td>
<td>5.920±0.015</td>
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<tr>
<td>$\Omega_2$</td>
<td>6.210±0.025</td>
</tr>
<tr>
<td>Phase shift</td>
<td>0.0022±0.0001</td>
</tr>
<tr>
<td>$q$ ($=M_2/M_1$)</td>
<td>0.969±0.003</td>
</tr>
<tr>
<td>$L_1$ /($L_1+L_2$)-$B$</td>
<td>0.552±0.003</td>
</tr>
<tr>
<td>$L_1$ /($L_1+L_2$)-$V$</td>
<td>0.551±0.002</td>
</tr>
<tr>
<td>$L_1$ /($L_1+L_2$)-$R$</td>
<td>0.550±0.002</td>
</tr>
<tr>
<td>$L_2$ /($L_1+L_2$)-$B$</td>
<td>0.448±0.002</td>
</tr>
<tr>
<td>$L_2$ /($L_1+L_2$)-$V$</td>
<td>0.449±0.002</td>
</tr>
<tr>
<td>$L_2$ /($L_1+L_2$)-$R$</td>
<td>0.450±0.002</td>
</tr>
<tr>
<td>$r_1$ (mean)</td>
<td>0.2026±0.0004</td>
</tr>
<tr>
<td>$r_2$ (mean)</td>
<td>0.1869±0.0005</td>
</tr>
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</table>
BİLEŞENLERİ TAYFSAL AYIRMA VE MODEL ATMOSFER
KINEMATİK ÖZELİKLER

- $S_t=11.46\pm 3.17 \text{ kms}^{-1}$
- $(U,V,W)=(8.50, 13.38, 6.49) \text{ kms}^{-1}$
- $R_{\text{min}}, R_{\text{maks}}, 7.25 \text{ ve } 7.78 \text{ kpc}$
- $Z_{\text{maks}}=70 \text{ pc}$
- $e_p=0.04$, $e_v=0.01$
- Genç ince disk üyesi (Nbody-Girardi ve Van Altena 1999)
EKSEN DÖNMESİ ANALIZI

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$T_0$ (HJD)</td>
<td>2454651.5002 ± 0.0111</td>
</tr>
<tr>
<td>$P_s$ (day)</td>
<td>1.63513 ± 0.00002</td>
</tr>
<tr>
<td>$e$</td>
<td>0.078 ± 0.028</td>
</tr>
<tr>
<td>$\omega$ (degree)</td>
<td>3.8 ± 6.3</td>
</tr>
<tr>
<td>$d\omega/dt$ (degree cycle$^{-1}$)</td>
<td>0.0173 ± 0.0131</td>
</tr>
<tr>
<td>$U$ (yr)</td>
<td>93 ± 58</td>
</tr>
<tr>
<td>$P_a$ (day)</td>
<td>1.63521 ± 0.00003</td>
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</tbody>
</table>
BİLEŞENLERİN MUTLAK PARAMETRELERİ

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Primary</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass ($M_\odot$)</td>
<td>2.90±0.10</td>
<td>2.81±0.11</td>
</tr>
<tr>
<td>Radius ($R_\odot$)</td>
<td>2.11±0.01</td>
<td>1.95±0.01</td>
</tr>
<tr>
<td>Temperature (K)</td>
<td>11840±270</td>
<td>11575±300</td>
</tr>
<tr>
<td>log $L$ ($L_\odot$)</td>
<td>1.90±0.05</td>
<td>1.79±0.06</td>
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<tr>
<td>log $g$ (cgs)</td>
<td>4.25±0.02</td>
<td>4.30±0.01</td>
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<tr>
<td>Orbital period (day)</td>
<td>1.63513±2×10^{-5}</td>
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<tr>
<td>Orbital Separation ($R_\odot$)</td>
<td>10.43±0.02</td>
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<tr>
<td>Mass ratio</td>
<td>0.969±0.003</td>
<td></td>
</tr>
<tr>
<td>Systemic velocity (km s^{-1})</td>
<td>-10.1±0.4</td>
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</tr>
<tr>
<td>Distance (pc)</td>
<td>578±30</td>
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</tr>
<tr>
<td>$V$ (mag)</td>
<td>9.60\textsuperscript{a}</td>
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</tr>
<tr>
<td>$(B-V)_{0}$ (mag)</td>
<td>-0.11±0.02</td>
<td>-0.10±0.02</td>
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<tr>
<td>$M_{Bol}$ (mag)</td>
<td>0.01±0.11</td>
<td>0.29±0.12</td>
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<tr>
<td>$BC$ (mag)</td>
<td>-0.63\textsuperscript{b}</td>
<td>-0.57\textsuperscript{b}</td>
</tr>
<tr>
<td>$M_V$ (mag)</td>
<td>0.64±0.11</td>
<td>0.86±0.12</td>
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<tr>
<td>Measured $v\sin i$ (km s^{-1})</td>
<td>69.3±1.0</td>
<td>60.4±1.2</td>
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<tr>
<td>Synchronous $v\sin i$ (km s^{-1})</td>
<td>64.5±0.1</td>
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<tr>
<td>Age (Myr)</td>
<td>~ 60</td>
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\textsuperscript{a}SIMBAD Database, \textsuperscript{b} Sung et al. (2013)
SONUÇ - TARTIŞMA

- B8V+B8V, Baş bileşenin dönme hızı senkronizasyon hızından biraz daha yüksektir.
- Yaklaşık güneş kompozisyonunda, Yolaş bileşende He, Mg ve Ti bollukları güneş kompozisyonunun biraz daha üzerinde.
- Enberi noktasının yıllık değişim hızı yaklaşık 3.9 derece, Relötivistik katkı yüzde 7.3,
- Gözlenen iç yapı sabiti log$_{10}$k$_{2,obs}$=-2.32, beklenen teorik değer ise -2.28
- 60 My yaşında ve Genç ince-disk üyesi,
• Eksen dönmesinin daha detaylı incelenebilmesi için minimum zamanlarının takibi,

• Bileşenlerin kimyasal yapısının daha iyi anlaşılabilmesi için yüksek çözünürlüklü ve geniş dalgaboyu aralığında tayfsal gözleme ihtiyaç vardır.
Bu çalışma Tübitak (no: 111T224) ve Herzberg Astrofizik Enstitüsü tarafından desteklenmiştir