Light curve and orbital period analysis of the eclipsing binary AT Peg

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Aims

• Accurate light curves derivation

• Components’ absolute parameters & evolutionary status determination

• Investigation for tertiary component

• Interpretation of the orbital period changes

• Search for pulsations
Observations & data reduction

• Telescope: 20 cm Newtonian reflector

• CCD: ST-8 XMEi – B & R photometric filters (Bessell)

• Location: University of Athens Observatory

• Method of reduction: Differential aperture photometry

• Duration: Six nights on August 2010
Light curve analysis

**Method:** Wilson & Devinney code – PHOEBE software

**LITERATURE INFORMATION**

- Spectroscopic mass ratio $= 0.478$ (Maxted et al. 1994)
- $T_1 = 8400 \pm 100$ K, $T_2 = 4900 \pm 200$ K (Maxted et al. 1994)
Light curve fitting

![Graph displaying light curve fitting with phases and magnitudes.]
### 3D Model & Absolute parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>M $[M_\odot]$</td>
<td>1.0 (1)</td>
<td>2.2 (1)</td>
</tr>
<tr>
<td>R $[R_\odot]$</td>
<td>2.14 (3)</td>
<td>1.70 (3)</td>
</tr>
<tr>
<td>T [K]</td>
<td>5189 (7)</td>
<td>8400</td>
</tr>
<tr>
<td>L $[L_\odot]$</td>
<td>3.0 (1)</td>
<td>13.0 (4)</td>
</tr>
<tr>
<td>a $[R_\odot]$</td>
<td>4.61 (9)</td>
<td>2.18 (3)</td>
</tr>
<tr>
<td>log g $[cm/s^2]$</td>
<td>3.79 (3)</td>
<td>4.31 (3)</td>
</tr>
</tbody>
</table>
Position of the components in the M-R diagram
Orbital period analysis

Method: Least squares with statistical weights

Parabola
Total function
LITE+parabola
Residuals

LITE function
(after parabola’s removal)
Conclusions

- Conventional Semi-detached system with the primary being a MS star and the secondary at subgiant stage

- No pulsations were detected

- A third light of ~7% was found through the light curve analysis

- A third body with minimal mass of ~0.6 $M_\odot$ might explain the cyclic orbital period effects but cannot explain (as a MS star) the observed light contribution

- The orbital period secular change is caused very probably due to more than one mechanisms since its curvature is opposite to the expected one (mass transfer)

- Mass loss from the system (e.g. stellar winds) or systemic angular momentum loss probably superimpose the mass transfer