ATMOSPHERIC ANALYSIS OF TMBM SB2 SYSTEMS

LAURENT MAHY - KU LEUVEN
SAMPLE:

- **TMBM:**
  - 32 epochs
  - FLAMES spectra [3950:4560] Å

- 31 SB2 systems:
  - 19 spectroscopic
  - 12 photometric
    - 5 showing eclipses
    - 2 (over-)contact
    - 7 ellipsoidal var.

Almeida et al. (2017)
For some systems, nebular contamination is too large to correctly reproduce the cores of the lines.
ATMOSPHERIC ANALYSIS OF TMBM SB2 SYSTEMS

METHODOLOGY:

- Almeida et al. (2017) measured the radial velocities for all the epochs and compute the orbital periods, mass ratios, and eccentricities
- Use Orbital solutions from Almeida et al. (2017) as inputs
- Fourier spectral disentangling (Simon & Sturm 1994, Ilijic et al. 2004)
  - Nebular contamination - line clipping is forbidden
  - 3-component disentangling to estimate the nebular lines
  - Estimation of the scaling
  - Use the scaling factors as light factor for the nebular lines
- The S/N of extracted spectra are higher than the observed ones
  \[(S/N)_{\text{ext}} \sim (S/N)_{\text{obs}} \times N_{\text{obs}}^{0.5}\]
METHODOLOGY:

- Use the CMFGEN atmosphere code (Hillier & Miller 1998)
  - Determination of the Teff, log g
  - Determination of the C and N abundances - no O lines
  - Hydrogen and Helium lines used to scale the disentangling spectra for non-photometric systems i.e. $l_1+l_2 = 1$.
  - $v \sin i$ and $v_{\text{mac}}$ determined from Simon-Diaz & Herrero (2014)
  - For some systems, no indication of the wind parameters
- Comparaison with BONNSAI for the theoretically predicted values
ATMOSPHERIC ANALYSIS OF TMBM SB2 SYSTEMS
ATMOSPHERIC ANALYSIS OF TMBM SB2 SYSTEMS

SPECTROSCOPIC HERTZSPRUNG-RUSSELL DIAGRAM
PROBLEMATIC OF THE LUMINOSITY:

- Distance of the LMC is known but uncertainties on $A_V$, mainly due to $R_V$
- Possible solution is to use $A_K$ but not possible to determine the flux ratios for the different systems in the K band to determine the individual luminosities
- Other solution:
  - Use the individual SED and recombine them to fit the observed one
  - But $U$ mag can be missing for some objects
MASS DISCREPANCY

- If the luminosities of the objects are close to the predicted ones (BONNSAI) ...
INTERACTING SYSTEMS:

- P vs. log g diagram

Some outliers indicating possible interactions: VFTS 061, VFTS 174, VFTS 176, VFTS 197, VFTS 538, VFTS 652
SYNCHRONISATION

- Two outliers here as well: VFTS 538, VFTS 652
ATMOSPHERIC ANALYSIS OF TMBM SB2 SYSTEMS

X-RAYS

- 5 systems are detected in X-Rays

---

Counts

<table>
<thead>
<tr>
<th>Objects</th>
<th>VFTS 217</th>
<th>VFTS 352</th>
<th>VFTS 450</th>
<th>VFTS 500</th>
<th>VFTS 527</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counts</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1800</td>
</tr>
</tbody>
</table>

---

VFTS 217
VFTS 352
VFTS 450
VFTS 500
VFTS 527
TO DO LIST

- Finishing the determination of the CN abundances for all the systems
- Comparing the dynamical masses (for photometric systems) to evolutionary and spectroscopic masses and check the mass ratios
- Compare the star formation history of single stars with that of binaries
- Writing the paper...
THANK YOU...