The multiplicity of Wolf-Rayet stars

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The importance of massive stars

- Drive galactic evolution with their highly energetic stellar radiation and winds
- Important feedback to the ISM through supernovae/stellar winds
Wolf-Rayet stars: classes and subclasses

The multiplicity of massive stars


The sample

Stars from the WR catalogue* that are observable with HERMES (R ~ 85000)

*http://pacrowther.staff.shef.ac.uk/WRcat/index.php

Radial Velocity measurements

For a statistically accurate, bias-corrected multiplicity analysis, we need:

- **High-quality** spectral time series
- **Homogeneous** radial velocity measurements
- **Accurate** errors
Radial Velocities: Cross-correlation

Compares a template to the data using convolution

Errors from the theory of maximum log-likelihood (Zucker 2003)
The Radial Velocity spread over ions (WR136)
WR 137 (WC7pd + O9) - 13.6 year period

\[ P = 4766 \pm 66 \text{ days from Lefevre+ 2005} \]
Conclusions & next steps

- Radial velocities accuracy of the order of 2-5 Km/s can be achieved
- Statistical errors are much smaller, wind variability dominates

A. Extend the sample to include southern targets (archival data + ESO + SALT).
B. Determine orbits for the binary candidates.
1. HERMES spectrum
2. Instrumental response & telluric corrected
3. Fit reddened SED
4. Normalized spectrum

Normalization
A test for reliable masks: autocorrelation (WR136)
Cross-correlation masks: N IV

- **Strong**
- **Moderate**
- **Weak**
Cross-correlation masks: N III

- Strong
- Moderate
- Weak
Cross-correlation masks: N V

- strong
- moderate
- weak
The cross-correlation function (CCF)
Radial velocity plot: N IV strong
Radial velocity plot: He II strong
Radial velocity plot: He II moderate