Luminous red supergiants in the Magellanic Clouds

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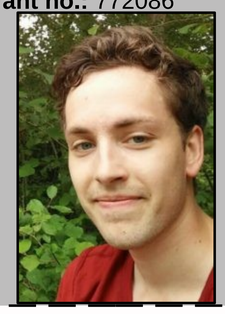
Grant no.: 772086

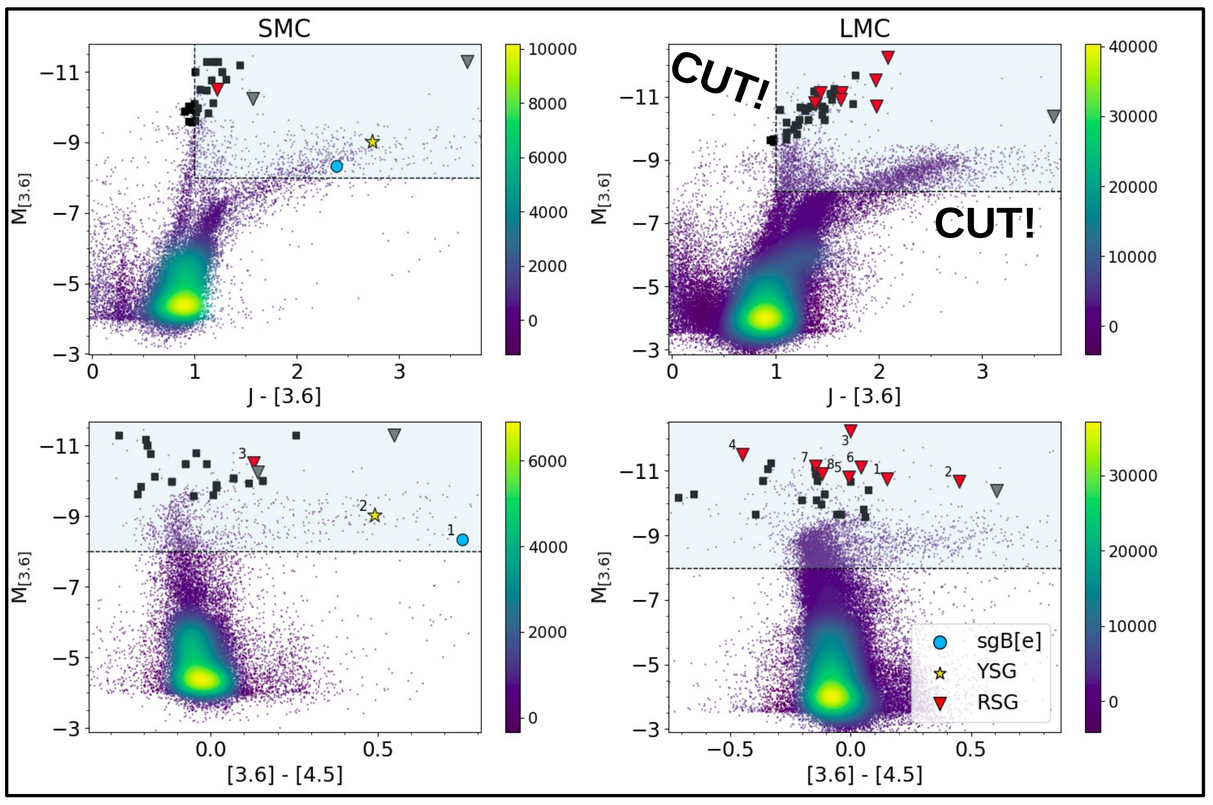


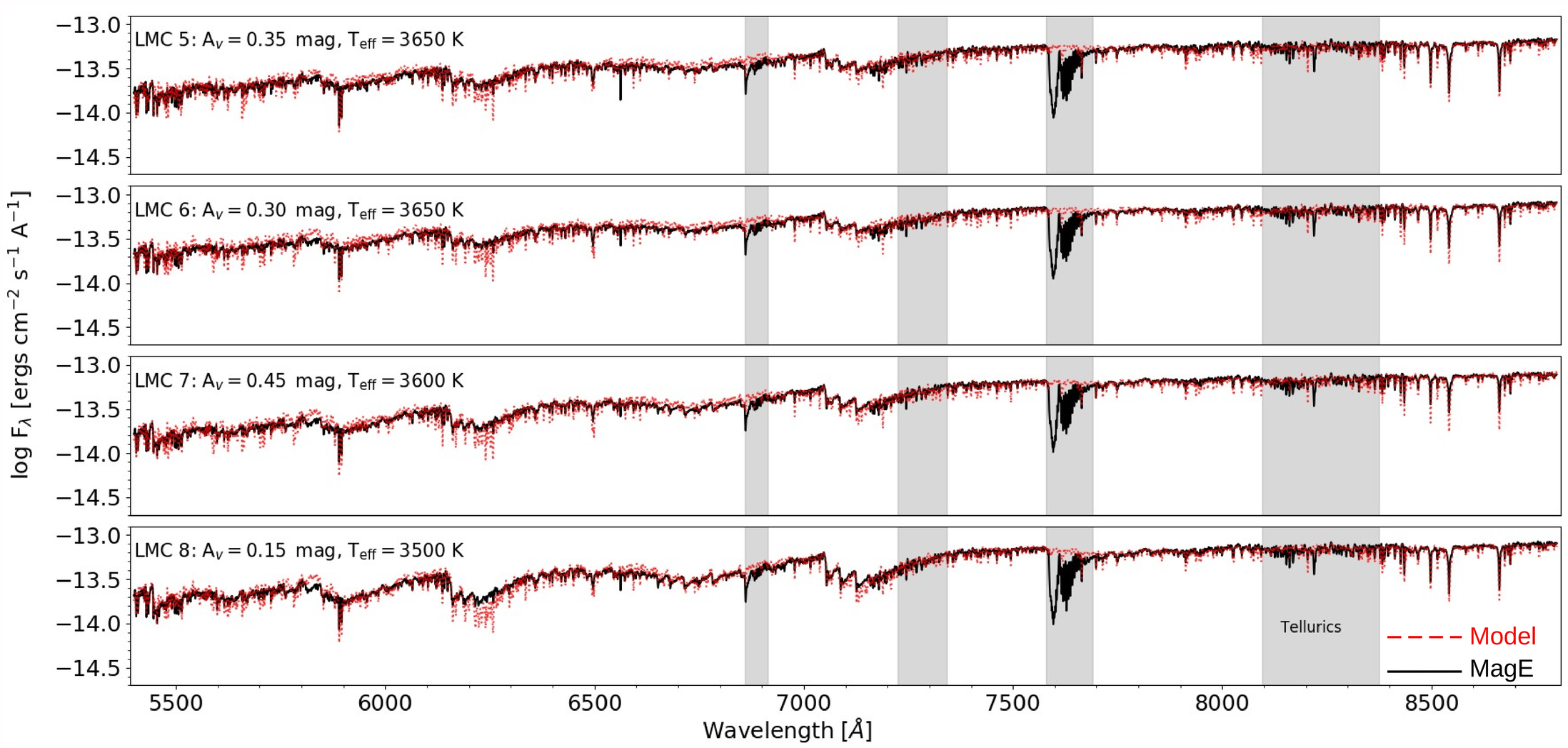
Introduction

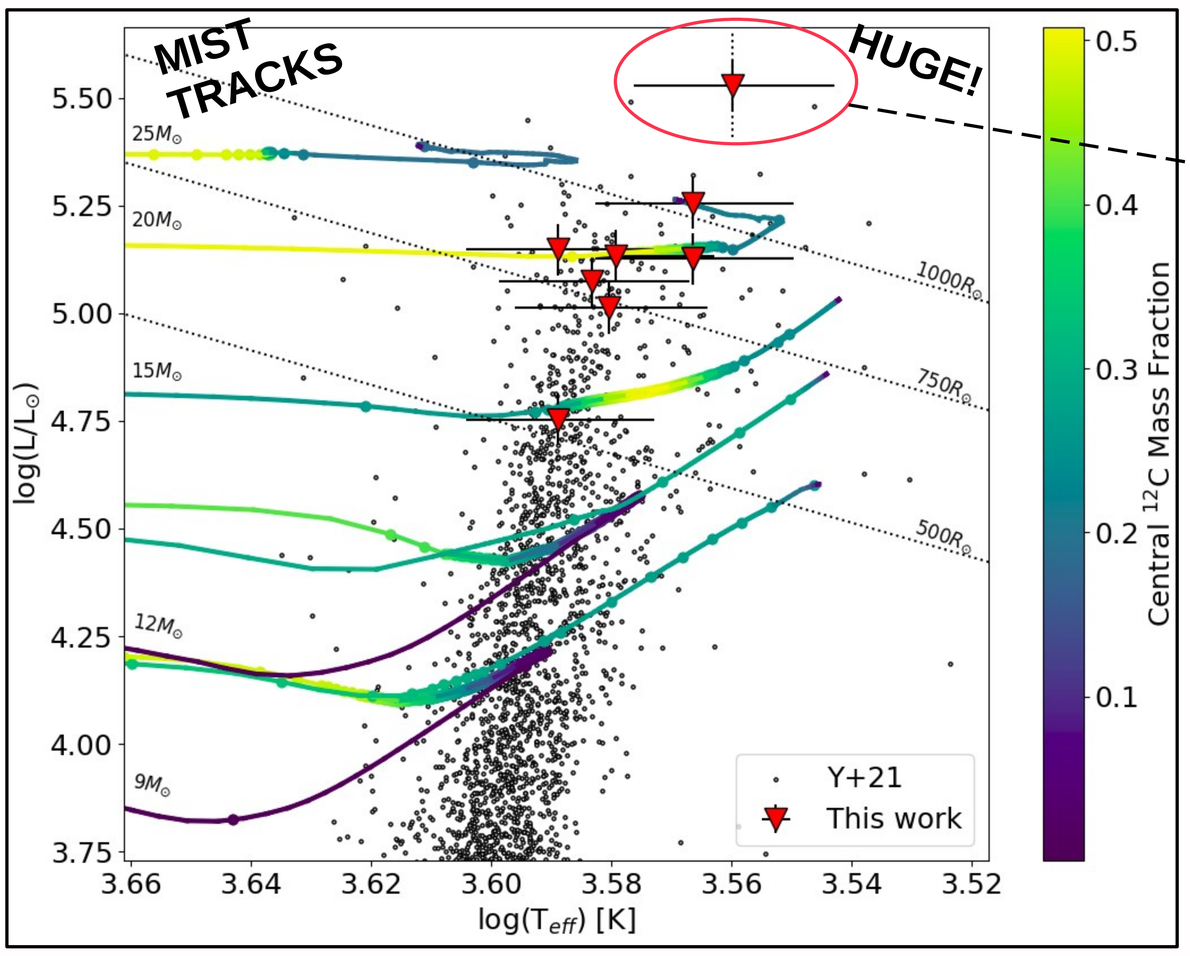
Context: There is evidence that some red supergiants (RSGs) experience short lived phases of extreme mass loss. These outburst phases help to strip the envelope of evolved single massive stars, significantly affecting their evolutionary path.

Aims: We aim to derive the surface properties and estimate the global properties of Mid-IR bright RSGs[1]. These properties will then be compared to evolutionary predictions and used for future spectral energy distribution (SED) fitting studies to measure the mass loss rates from present circumstellar dust expelled from the star through outbursts, in an attempt to shed light on the explosive nature of these massive evolved stars.

Sample: We have obtained a **new** spectroscopic sample (MagE, R ~ 4000) of **eight dusty red supergiants** in the Magellanic Clouds using the Baade telescope. The selection was performed using colour-magnitude criteria from the Near-IR, Mid-IR and optical colour magnitude diagrams (see Fig. 1), to select unstudied, bright and dusty supergiants.







Results

Properties: We obtained the effective temperature (**T_{eff}**), optical extinction factor (**A_V**) and surface gravity (**log g**) through fitting of the MARCS models (see Fig. 2). Subsequently, we have estimated global properties such as the stellar luminosity, radius and mass using supplementary photometry and stellar evolution tracks. Despite selecting dusty RSGs, we find values for A_V that are not as high as anticipated, given the expected contribution of circumstellar extinction of these evolved stars. However, this contradiction has been reported frequently when applying the MARCS models to fit the optical TiO bands[2].

Further classifications: Two other evolved massive stars have been studied in this work. We have identified a new yellow supergiant (F8I) and re-classified a known SgB[e] from B8I[e] to A0I[e].

A peculiar star: One of the stars studied in the LMC, [W60] B90, lies at the bright end of the RSG luminosity function at log(L_*/L_{sun}) ~ 5.5 and a stellar radius around **1500 R_{sun}** (see Fig. 3). These extreme properties put this object in the range of the largest star known in the LMC, WOH G64, which is currently (conservatively) estimated to be 1550 R_{sun}.

Future: We aim to classify **+/- 150 RSGs** of newly obtained low res spectra (FORS2) in various nearby galaxies targeted by the ASSESS project and derive their properties in relation to metallicity[3].

References:
1. De Wit et al. submitted to A&A
2. Davies +2013, ApJ, 767, 3
3. De Wit et al. in prep.