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The VLT-FLAMES Tarantula survey

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Abstract. The Tarantula Survey is an ESO Large Programme which has obtained multi-epoch spectroscopy of over 1,000 massive stars in the 30 Doradus region of the Large Magellanic Cloud. The assembled consortium will exploit these data to address a range of fundamental questions in both stellar and cluster evolution.

Keywords. stars: early-type, stars: fundamental parameters, binaries: spectroscopic, open clusters and associations: individual (30 Doradus)

1. Overview

The Tarantula Nebula (30 Doradus, NGC 2070) in the Large Magellanic Cloud (LMC) is the brightest and most massive H II region in the Local Group. With its rich stellar populations, 30 Dor is an ideal laboratory in which to investigate a number of important outstanding questions regarding the physics, evolution, binary fraction, and chemical enrichment of the most massive stars. Building on the successes of the VLT-FLAMES Survey of Massive Stars (Evans *et al.* 2005, 2006), we introduce the Tarantula Survey, a new time-sampled, spectroscopic survey of over 1,000 massive stars in the 30 Dor region. Our scientific motivations are discussed in more depth by Evans *et al.* (2010), and include:

- Effects of stellar rotation on surface abundances,
- Feedback to the interstellar medium from stellar winds and ionizing radiation,
- Physical properties and evolution of massive O-type stars,
- Star cluster dynamics in the context of infanty mortality,
- Binary fraction analysis,
- Providing a census of the nearest 'starburst'.

In terms of shaping the observational strategy, the most pertintent issue is binarity. Recent results (see Sana & Evans, these proceedings) find large binary fractions from multi-epoch spectroscopic studies in Galactic star clusters, as well as an apparently rich binary population in 30 Dor (Bosch, Terlevich & Terlevich, 2009). To gain a true

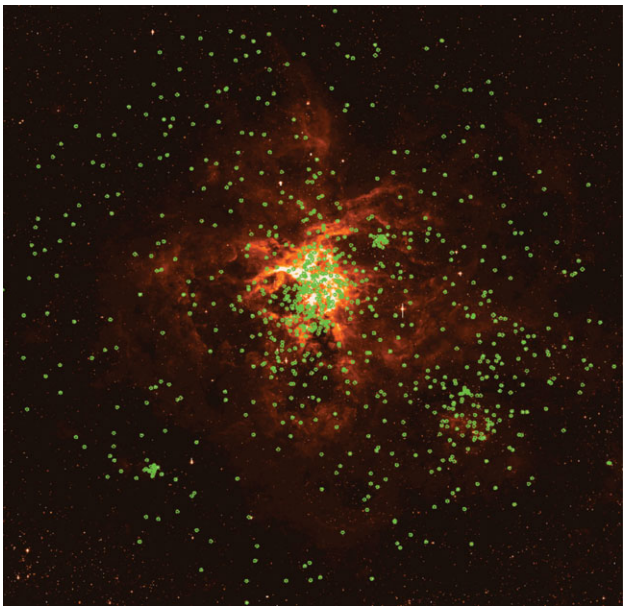

Figure 1. 20′ ×20′ V-band WFI image showing the FLAMES-GIRAFFE targets in and around 30 Dor (north to the top, east to the left).

understanding of the evolution of massive-star populations, the effects of binarity need to be fully included in our theoretical models of stellar evolution.

The majority of the data have been collected using the Medusa mode of the VLT-FLAMES instrument, which feeds 132 optical fibres into the Giraffe spectrograph. Nine field configurations were used (each with the same central pointing) to survey ∼1000 stars, covering 3980–5050 Å at a resolution of $\sim$40 km s^{-1}, and 6480-6790 Å at a greater resolution of $\sim$20 km s^{-1}. The distribution of targets is shown in Fig. 1.

At the core of 30 Dor is the dense cluster R136, thought to contain the most massive stars in the local universe (Crowther *et al.* 2010). Five areas of this inner region were observed with the ARGUS integral-field unit, to probe the dynamics of this important cluster.

2. Status

All the observations have been completed, with the data reduced and released to the consortium. Work has now begun in earnest towards the first papers, including classification of the different spectra, analysis of the stellar radial velocities/binarity, quantitative analysis of the O-type spectra with contemporary model atmospheres, and analysis of the nebular gas profiles.

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