ABSTRACT

Starbursts and starburst-driven outflows play a central role in the evolution of galaxies. However, the paucity of detailed observations of superwinds limits our current understanding of these complex systems.

To this end we have undertaken two intensive ground- and space-based observing campaigns aimed at studying the ionized gas conditions in two nearby starburst galaxies, M82 and NGC 1569. These two systems host starbursts on different scales: M82 contains densely-packed star cluster complexes that drive a large-scale bipolar superwind, whereas NGC 1569 exhibits a set of discrete superbubbles powered by only a handful of young massive clusters.

We have used long-slit spectra, obtained with the *Hubble Space Telescope* (*HST*), together with *HST* and ground-based imaging from the WIYN 3.5 m telescope, to observe M82 at optical wavelengths. The high quality *HST* spectroscopy obtained with the Space Telescope Imaging Spectrograph (STIS), have allowed us to investigate the properties of the gas across the starburst core. By combining high-resolution *HST* imaging with deep WIYN observations, we have created the most comprehensive image of the M82 superwind to date, and used it to characterise the outflow morphology.

We also observed the centre of NGC 1569 with the Integral Field Unit (IFU) of the Gemini Multi-Object Spectrograph (GMOS) on the Gemini-North telescope, and M82 with the WIYN/DensePak and SparsePak IFUs. We decomposed the observed emission-line profile shapes, and identified an underlying broad ($>$100 km s^{-1}) component across the starburst cores of both galaxies. By mapping the spatial variation of each individual line component, we have developed a new model to explain the broad emission and the state of the interstellar medium (ISM) in the central starbursts.

We have also observed the outer-wind environment of NGC 1569 with the WIYN SparsePak instrument. We find that the broad line is only found within 500–700 pc of the centre, and speculate that the boundary of this region may indicate the point at which bulk motions begin to dominate over turbulence.