The ATLAS spare fibre program for OzDES

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We propose an AAOmega spare fibres program, as part of the OzDES survey, to conduct a spectroscopic survey of the radio-detected galaxies in the Australia Telescope Large Area Survey (ATLAS). Combining a sensitive radio survey with the detailed environmental metrics provided by the DES survey will allow measurement of the role of AGN feedback in galaxy formation/evolution and the growth of structure. We propose to use ~30 spare AAOmega fibres per OzDES observation, yielding redshifts and spectroscopic typing to i<22 for 300-600 radio sources each campaign year.

The ATLAS 21cm radio continuum survey is one of the deepest wide area radio surveys yet attempted, covering about 7 square degrees to an rms of 15 microJy. All radio observations are complete, with the first data release published (Norris et al., 2006, Middelberg et al., 2008). The second data release is close to publication (Hales et al., 2013), and the third and final data release in preparation (Banfield et al., 2013). These observations include polarisation and spectral index measurements.

The survey contains in excess of 15,000 radio galaxies, and has formed the basis of 20 journal papers to date, with many more to come. The ATLAS survey is based on the CDFS and ELAIS-S1 SWIRE fields, which are also covered by deep survey observations with Spitzer-SERVS, Herschel-Hermes, and Vista-VIDEO, for all of which we have data access agreements. The ATLAS fields correspond closely to the E1, E2, C1, C2, C3 fields of DES.

The ATLAS science goal relevant to OzDES is the opportunity to determine the role of AGN *radio-mode* feedback via a cross-correlation of radio emission from galaxies with the classic environmental metrics (i.e., galaxy clustering) that will be available from the DES survey.

ATLAS is necessarily dependent on optical observations to obtain redshifts. To this end we have obtained a total of 24 AAOmega nights over the past five years. However, due to adverse weather we have only ~800 spectroscopic redshifts, predominantly for the brightest sources (Mao et al. 2012). With ~30 spare fibres per OzDES field targeting ATLAS galaxies in the regime $20<i<22$ we improve this situation, significantly improving the sampling of both star-formation and AGN galaxy luminosity functions, with the addition of 300-600 radio source redshifts each year. We will select galaxies from the ATLAS data release 3, selected with $i<22$, which experience indicates provides a high success rate with integrations of 2-4 hours out to redshifts $z\sim1.5$. This redshift and magnitude range is essential to resolve uncertainties in radio source evolution currently only hinted at by low-redshift and high-luminosity wide field work.

It is significant to note that many ATLAS sources will also be members of the wider DES photometric redshift survey. Radio source have historically proved to be some of the most pathological outliers in photo-z work, due to their composite SEDs, and as such the ATLAS sample will provide an important sub-component of the wider photo-z effort. A subsidiary goal of this proposal is as a pathfinder for the ASKAP-EMU project to be run on the $160m ASKAP telescope under construction in WA, which will survey the sky to a depth some 50 times deeper than NVSS, yielding 70 million galaxies. We are using ATLAS data as training set for EMU, to develop a variety of templates and algorithms for automated processing of EMU data.