Characterizing the redshifts and luminosities of WISE selected obscured quasars using SALT optical spectra

Raphael E. Hviding[1], Ryan C. Hickox[1], Kevin N. Hainline[2], Christopher M. Carroll[1], Mike A. DiPompeo[1], Mackenzie L. Jones[1]

[1]Department of Physics and Astronomy: Dartmouth College
[2]Steward Observatory: University of Arizona

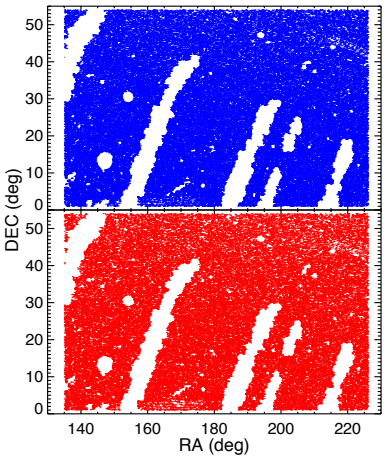

Figure 1: WISE-selected AGN split into obscured (blue) and obscured (red) from DiPompeo et al. 2014, highlighting the large population of quasars that can be selected with WISE.

Objective

We attempt to characterize the population of *Wide-Field Infrared Survey Explorer* (*WISE*) selected luminous obscured quasars. Candidates were identified by their mid-infrared emission and studied using long-slit optical spectroscopy with the Robert Stobie Spectrograph (RSS) on the Southern African Large Telescope (SALT).

SALT Observations

In an attempt to probe the most heavily obscured quasar population, we used the following selection criteria:

- W1−W2 > 0.7 (Vega), relaxed from Stern et al. (2012).
- 7 ≥ W4 ≥ 6.5 (Vega) from Hainline et al. (2014).
- They lie below the Mateos et al. (2012) wedge.

The observed frame spectra cover 3500-6000 Å. The rest frame spectra of objects with z < 1 are presented in Figure 2, most with clear narrow-line emission.

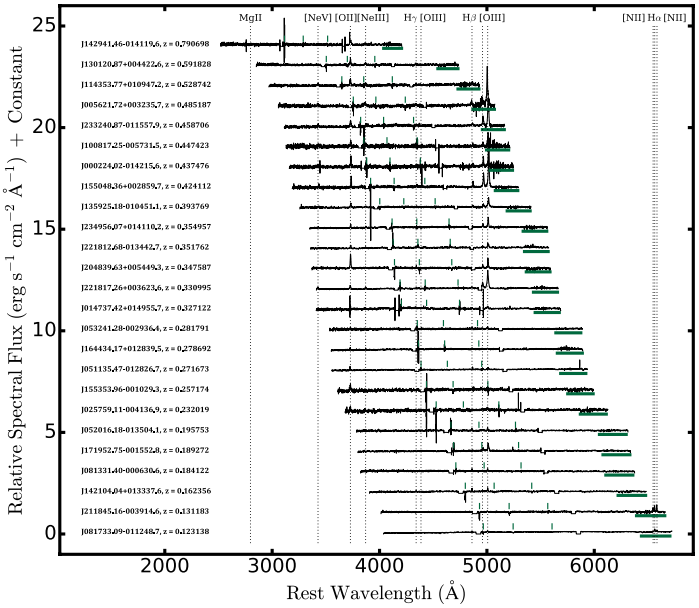

Figure 2: SALT spectra of obscured quasar candidates. Green marks represent sky lines or regions with substantial atmospheric interference.

Spectral Analysis

We obtain redshifts for 26 of the 39 candidate obscured quasars. The remaining 13 objects had a single line or no identifiable lines. Most objects lie at moderate redshifts (z < 1; Figure 3), with one object at z = 2.59 (not pictured). However, only 18 objects had spectral coverage of [OII]λ3729 and [NeIII]λ3870 that did not fall on the chip gap.

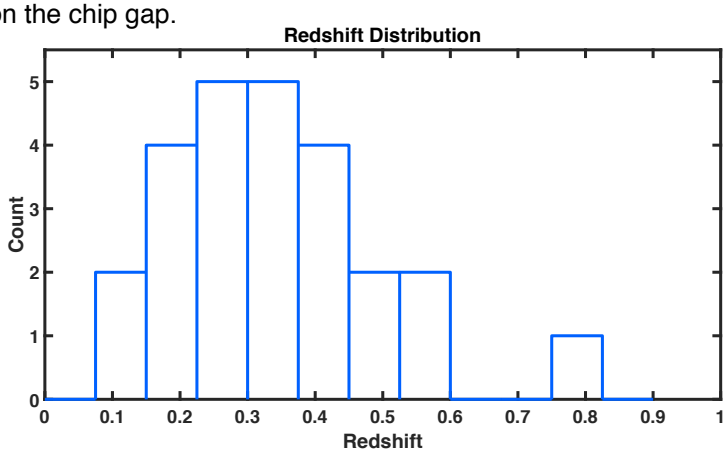

Figure 3: Redshift distribution of SALT sources.

We measure [OII]/[NeIII] for 13 of our 27 obscured quasar candidates, and obtain upper limits on [NeIII] for 5 objects. All 13 objects with both measurements lie confidently in the AGN regime color space as defined by Trouille et al. (2011) (Figure 4). Most objects with upper limits have high enough $^{0.0}(g-z)$ to place them comfortably in the AGN or composite regime. Only one object lies near the star forming domain.

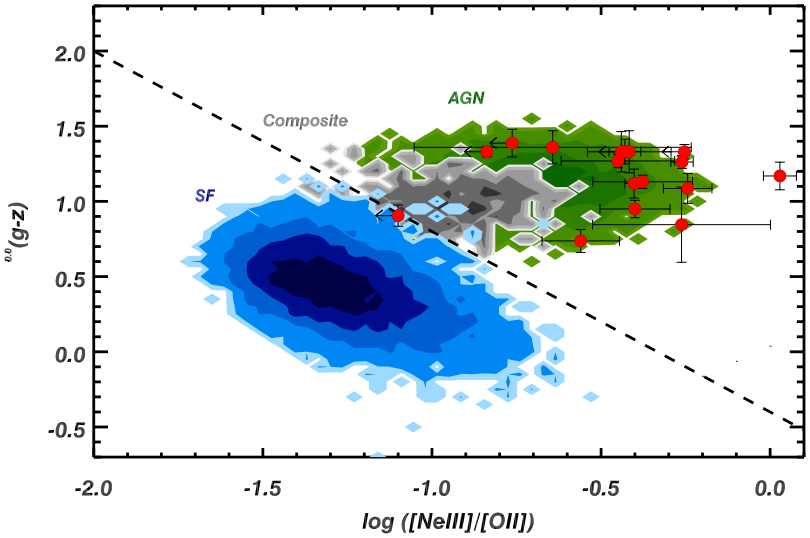

Figure 4: Color-excitation plot for objects with [OII] and [NeIII] measurements or [NeIII] upper limits, using the Trouille, Barger & Tremonti (2011) diagnostic.

Conclusion

Our results demonstrate the efficacy of mid-IR selection of heavily obscured quasars. By focusing on the area outside the Mateos et al. (2012) wedge, we are able to capture a previously unattainable population of obscured quasars through infrared and optical photometry alone. This selection criteria for obscured quasars allows for a more complete understanding of *WISE*-selected AGN.

Acknowledgements

The work uses data taken from the Southern African Large Telescope, and it is supported in part by the Dartmouth E.E. Just Program, by the National Science Foundation under AAG award numbers 1211096 and 1515364, and by an Alfred P. Sloan Research Fellowship.

References

DiPompeo et al. 2014, arXiv: 1406.0778
Hainline et al. 2014, arXiv: 1409.4773
Mateos et al. 2012, MNRAS, 426, 3271
Stern et al. 2012, ApJ, 753, 30
Trouille et al. 2011, ApJ, 742, 46