RevMexAA (Serie de Conferencias), **44**, 100–100 (2014)

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

AGN TORUS PROPERTIES WITH WISE

R. Nikutta[1,2], M. Nenkova[3], Ž. Ivezić[4], N. Hunt-Walker[4], and M. Elitzur[2]

Beginning with an unbiased sample of unobscured QSOs (type 1 within AGN unification), we identify regions in the WISE color space that harbor the putative population of obscured type 2 counterparts. For the first time, we can predict the relation of their number vs. flux limits of a survey, applying knowledge from the CLUMPY torus models. This proceedings contribution is a preview of a forthcoming pair of papers (Nikutta et al. 2014a,b).

The Wide-field Infrared Survey Explorer (WISE, Wright et al. 2010) scanned the sky in four bands between 3.4 and 22μm at the highest sensitivity to date. The WISE Point Source Catalog[5] contains precise magnitudes and photometric colors of hundreds of thousands of AGN.

We cross-match the WISE catalog with known QSOs in the Sloan Digital Sky Survey, and define reliable infrared (IR) color selection criteria for AGN, confirming the WISE QSO locus found previously by Yan et al. (2013). The type 2 counterparts, postulated by AGN unification (Urry & Padovani 1995), are more difficult to identify. The dusty AGN torus (Antonucci & Miller 1985) dims the observed fluxes in type 2 orientations, and leads to redder IR colors.

The population of type 2 counterparts, drawn from the same intrinsic AGN population as type 1s, will have colors redder than the QSOs. We can not know from observations alone, however, where exactly in the color space these putative type 2s fall, and we also have no handle on their expected number to be observed at a given sensitivity. This missing knowledge can be provided by models of AGN IR emission. Our group presented the first self-consistent clumpy torus model (CLUMPY, Nenkova et al. 2002, 2008a,b). We provide $\sim 1.3 \cdot 10^6$ model SEDs[6], which are being used extensively in SED fitting (e.g., Asensio Ramos & Ramos Almeida 2009; Nikutta et al. 2009; Alonso-Herrero et al. 2011; Deo et al. 2011; Malmrose et al. 2011; Mason et al. 2013).

The CLUMPY models cover a large parameter volume. We here require that they provide some viewings with QSO-compatible colors (type 1 viewings). All viewings to such models, however, contribute to this "model sample". For any color locus redder than the QSOs we then select models which also have other viewings with colors in that locus – the putative type 2 counterparts. Averaging separately the model fluxes of type 1 and type 2 viewings, we can determine the distribution of mean *model dimmings* per WISE band, when switching perspective. As a final step in testing the predictions of unification, we apply randomized dimming magnitudes to every observed source within the QSO locus, and determine if it survives the 5σ detection limits; sources that become too faint in at least one of the WISE bands, drop out from the sample. In certain color loci we find a striking agreement between the predicted number of putative type 2 sources and the actually observed numbers. These color regions are indeed hosting the type 2 population. We will report much more detailed results in Nikutta et al. (2014b).

REFERENCES

Alonso-Herrero, A., et al. 2011, ApJ, 736, 82
Antonucci, R. R. J. & Miller, J. S. 1985, ApJ, 297, 621
Asensio Ramos, A. & Ramos Almeida, C. 2009, ApJ, 696, 2075
Deo, R. P., et al. 2011, ApJ, 729, 108
Malmrose, M. P., et al. 2011, ApJ, 732, 116
Mason, R. E., et al. 2013, ApJ, 777, 164
Nenkova, M., Ivezić, Ž., & Elitzur, M. 2002, ApJ, 570, L9
Nenkova, M., et al. 2008a, ApJ, 685, 147
Nenkova, M., et al. 2008b, ApJ, 685, 160
Nikutta, R., Elitzur, M., & Lacy, M. 2009, ApJ, 707, 1550
Nikutta, R., et al. 2014a, MNRAS, submitted
Nikutta, R., et al. 2014b, MNRAS, to be submitted
Urry, C. M. & Padovani, P. 1995, PASP, 107, 803
Wright, E. L., et al. 2010, AJ, 140, 1868
Yan, L., et al. 2013, AJ, 145, 55

[1]Departamento de Ciencias Físicas, Universidad Andrés Bello, Av. República 252, Santiago, Chile (robert.nikutta@gmail.com).

[2]Department of Physics & Astronomy, University of Kentucky, Lexington, KY 40506, USA (moshe@pa.uky.edu).

[3]School of English and Liberal Studies, Seneca College, Toronto, ON, M2J 2X5, Canada (Maia.Nenkova@senecacollege.ca).

[4]Astronomy Department, University of Washington, Box 351580, Seattle, WA 98195-1580, USA (ivezic@astro.washington.edu, nhuntwalker@gmail.com).

[5]`http://wise2.ipac.caltech.edu/docs/release/allsky/`

[6]`http://www.pa.uky.edu/clumpy/`