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# Project AMIGA: Characterizing the Circumgalactic Medium of the Andromeda Galaxy

Chris Howk\*<sup>1</sup>

<sup>1</sup>University of Notre Dame – United States

## Abstract

The Andromeda galaxy provides unique opportunities to study the structure of galaxies like our own Milky Way in great detail. I will report on the results from Project AMIGA (Absorption Maps In the Gas of Andromeda), which uses HST/COS ultraviolet spectroscopy of  $\sim 30$  background AGNs projected within  $\sim 300$  kpc of M31 to study the distribution of metals in its circumgalactic medium. Additional very deep 21-cm observations with the GBT constrain the presence of dense, cold gas about M31. We find an extremely high covering factor of metals in our data, with  $\sim 90\%$  covering factor of Si III within 300 kpc. The absorption by low-ionization species is at a lower column density than seen in other galaxy-selected CGM studies. A nearly complete lack of 21-cm emission to  $\log N(\text{HI}) \sim 17.6$  limits the covering factor of such high HI column densities to  $< 5\%$  over the same area. This is in contrast to, e.g., the COS-Halos sample at  $z \sim 0.2$ , which has a covering factor higher by factors of 2-3 for comparable impact parameters. I will discuss the implications of these results for the mass of the CGM about Andromeda and the nature of the diffuse CGM about galaxies more generally.

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\*Speaker