Julie Davis

**Award:** WSGC Graduate and Professional Research Fellowship; $5000.00

**Status:** Ph.D., Astronomy

**Advisor:** Eric Wilcots

**Research Topic:** Gas Cycling and the Circumgalactic Medium in CHILES Galaxies

**Abstract:** (First two Paragraphs of Proposal) Of all the baryonic matter in the universe today, only a small portion of it exists as familiar visible collapsed objects such as stars, galaxies, groups, and clusters. A much larger fraction of baryonic matter has been found to exist in multi-phase gaseous reservoirs surrounding galaxies and in intergalactic space. Thus, understanding how this gas moves from the diffuse intergalactic medium (IGM) into galaxies and back out again is a crucial component in understanding the overall formation and evolution of galaxies in the universe. Material in the virialized area around a galaxy--the circumgalactic medium (CGM)--represents a convergence region where both infalling and outflowing gases often have sufficient densities to be observationally probed simultaneously. This is the target region for galaxies in this project.  
Given that a large portion of the circumgalactic medium is very diffuse and thus difficult to measure in emission, many observational studies have focused primarily on viewing the CGM in absorption, using ultraviolet quasar absorption lines in neutral hydrogen (HI), Mg II, O VI, and a variety of other species to probe different gas regimes (e.g. Tumlinson et al. 2013, Nielson et al. 2013, Tripp et al. 2008, Davis et al. 2015 ). While we cannot directly detect in emission the lower (101 3 to 101 8 cm- 2 ) column densities reached by these absorption studies, radio observations with sufficiently long integration times offer the ability to probe emission from cold neutral hydrogen in the CGM to scientifically interesting mass limits, along with continuum emission from energetic galactic outflows. Combined with longslit Hα observations as a probe of warm ionized galactic gas, it is possible to produce a more complete kinematic picture of gas cycling through galaxies. As a member of the COSMOS HI Large Extragalactic Survey (CHILES), I have access to a uniquely long 1000 hour integration dataset. Therefore, I propose using the CHILES HI and continuum radio data along with longslit Hα spectroscopy of an ensemble of galaxies out to z ~ 0.1 to probe gas dynamics through the whole inflow/star-formation/outflow cycle for a variety of galaxy environments and morphologies.

**Biography:** Julie Davis is a second year graduate student in the astronomy PhD program at the University of Wisconsin-Madison. She graduated magna cum laude with a B.A. in physics and astronomy from the University of Colorado, Boulder. Julie now works with her graduate advisor Prof. Eric Wilcots on the distribution of extragalactic neutral hydrogen at intermediate redshifts as part of the CHILES survey on the Very Large Array (VLA) radio interferometer. Outside of her research interests in observational extragalactic astronomy, Julie enjoys participating in science outreach activities, science policy, and social advocacy.

**Congressional District:** 2

**Congressional Representative:** Mark Pocan