Summary Of Project Activities

1. Brief description of the primary objectives and scope of the project

Grasping the way gas gets in and out of galaxies is fundamental to our understanding of galaxy formation and evolution, and COS observations are slowly providing a better picture of these gas flows. Recent COS observations of the circumgalactic medium (CGM) have revealed two puzzles: the bimodal metallicity distribution of Lyman Limit Systems (LLSs) proximate to galaxies ([Redacted] et al. 2013) and the low volume density for cold absorbers in the CGM ([Redacted] et al. 2014). This program aimed to address both of these issues through the execution and analysis of grid-based cosmological hydrodynamics simulations of unprecedented resolution. By modeling galaxies at very high resolution using a physically-motivated, momentum-based feedback method, we wanted to perform the first grid-based studies of the CGM at this scale, allowing us to identify analogs to the observed cold absorber population responsible for these puzzles. We wanted to trace the simulated cold absorbers through time to understand their origins, producing a full picture of how they acquire and expel their gas.

2. Brief description of the findings

My main role as part of this program was to provide access to the observational COS and Keck datasets used to produce the bimodal metallicity distribution result, help producing realistic synthetic COS spectra that can be directly compared with the observations, and develop similar tools to analyze the synthetic spectra used for the COS spectra. As part of my work for this grant (and other grants), I developed a database of QSOs observed with COS G130M and G160M spectra. I developed and refined automated tools that can be used on both real and synthetic spectra to determine the properties of the absorbers. My group has also developed put statistical tools to compare results from observations and simulations. While we have not used them for the simulations developed by the PI of this program, they are ready to be used as they have been tested on other recent simulations (FIRE, EAGLE simulations developed by other groups collaborating with CoI [Redacted]).

Cosmological hydrodynamic simulations with additional spatial resolution directed in the galactic halo have finished running, but have not been fully analyzed. The enormous processing requirement to achieve high spatial resolution of the CGM made the running time of these simulation long. Although the grant funding has reached its end, we expect analysis of these simulations in the next few months, and in particular the PI and CoIs will meet in a workshop held in two weeks to discuss some of this work.

3. Name and date (or anticipated date) of the publication of results

4. Suggestions and additional comments