CASPEN programme exit report **Teresita Suarez Noguez**
Host: Prof. David Weinberg Starting Date: 25/09/17
Institution: Ohio State University (OSU) End Date: 13/10/17

I visited OSU to start a collaboration with Prof. David Weinberg, Prof. Paul Martini and doctoral student Suk Sien Tie, in which we wanted to study the impact of ionisation fluctuations on the statistics of the Lyα forest using cosmological simulations.

During my stay at OSU, I attended the weekly activities in the Astronomy department e.g. the daily astro-coffee meeting, journal club, group meetings and seminars. I also gave a talk at the CCAPP seminar aimed to all the department and discussed one of my papers at the daily coffee meeting.

On top of my planned programme at OSU, I managed to get invited to present my work at two nearby universities. First, I visited Carnegie Mellon University to give a *lunch talk* on Sep 26th, where additionally I had the opportunity to discuss both my papers with experts in my field. I also visited KICP at the University of Chicago on Sep 29th, to present my work at the weekly group discussion.

Description of the work and main results

I developed a code that generates a random distribution of quasars in a 1 Gpc^3, then it calculates the ionising radiation at selected points. In Fig.1, I show the simplest version of this code, which shows the distribution of 1000 quasars (left panel) and the contribution of the UV photoionisation rate on points located on a mesh separated by 250 Mpc. This will function as a tool that imports a halo distribution generated by cosmological simulations, e.g. LyMAS, to compute the UV background fluctuations at any position in the simulation's volume.

The LyMAS simulations (Peirani et al. 2014, Lochhaas et al. 2016) is used to predict the 3-point correlation function (3PCF) of the Lyα forest. The first part of the project, which S. S. Tie is working on, is to calculate the response of the forest to a fluctuating UV background. Then, I will take the halo positions from the N-body simulation that we use for LyMAS to compute the UV background fluctuations.

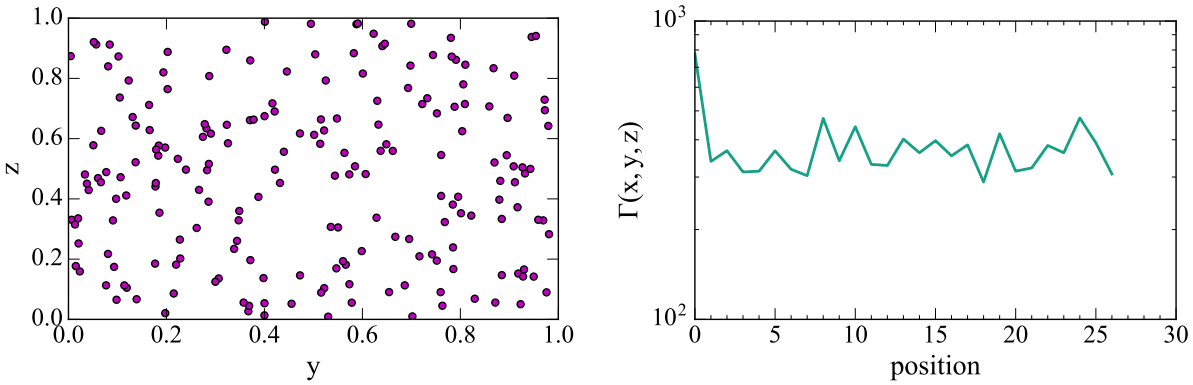

Figure 1: Left: Example of a 2D slice showing a random distribution of quasars in a 1 Gpc cube. Right: UV background contribution on every point in a grid

Future work and publications

In future work, we would like to add anisotropic quasar emissivity and time variation to this numerical calculation. We are currently working on these results and expanding this work to the LyMAS simulation with an intended purpose of writing the results for a refereed publication in the near future.