Thesis Proposal: A Connection Between Star Formation Rate and Dark Matter Halos at $Z \sim 6$ In 2013 Planck Cosmology

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Abstract

During the last century astrophysics and cosmology have evolved rapidly due to theoretical and observational developments. Technology allows us have to a glance of the universe farther and farther with ground and space telescopes. Our conception of the universe has changed from a static universe to a dynamic one originating from the Big Bang.

Many models exist for trying to explain the universe and its evolution. The most accepted one is the λ-CDM model, which has three components: Baryonic matter (4%), Dark Matter (26%) and Dark Energy (70%).

Baryonic matter is mainly constituted by atomic nuclei and electrons, that is what we call matter in our daily experience. Dark matter on the other hand, refers to that component of the universe which interacts with baryonic matter through gravity while not having electromagnetic interaction. It is not possible to detect it directly. Dark energy is the component associated to the accelerated expansion of the universe and the vacuum energy. There is not agreement between cosmology and quantum mechanics to explain its magnitude.

Understanding dark matter would mean to understand beyond the 4% of the studied universe. Dark matter space distribution is directly related to baryonic matter distribution. It seems to be that each galaxy is surrounded by a Dark Matter Halo (DMH), Milky Way inclusive. Dark matter is present in the whole universe, it forms large scale structures clustering galaxies. To understand dark matter, important cosmic simulations have been developed as laboratories to test cosmic models.

Recent observations have detected distant galaxies (at redshift $z \sim 6$ and farther away), when the universe was only 10% of its current age. To study galaxy forming processes would lead us to understand not only other galaxies

but ours as well.

This work aims to find the relationship between baryonic matter and dark matter at high redshift. We have DMHs catalog from simulations at $z = 5.9$. We will suppose that each DMH hosts a galaxy. We will assign luminosity and stellar formation rates by implementing a mathematical model as function of host DMH mass. The model will be adjusted to observational data using Markov Chain Monte Carlo Method. We expect to nd different Galaxy Luminosity Functions due to cosmic variance.

Subject headings: Dark Matter, Star Formation Rate, High Redshift Galaxies.

REFERENCES

This manuscript was prepared with the AAS LaTeX macros v5.2.

Table 1: Programming Activities

	2014					
Activity	May	Jun	Jul	Aug	Sep	Oct
Ipython Notebook Immersion	X					
Learning to work with Catalogs	X					
Building the First LF		X				
Fitting using grid method		X				
Cosmic Variance (over 64 boxes)			X			
Building the second LF			X			
Fitting using Chi Square Method				X		
Cosmic Variance (over 64 boxes)				X	X	
Final Results						X

Table 2: Theoretical Background Cronogram

	2014					
Topic	May	Jun	Jul	Aug	Sep	Oct
Bolshoi Simulation	X					
Schechter Luminosity Function		X				
Observational Techniques			X			
Likelihood and Chi Square Fitting				X		
Star Formation Rate **?**					X	
SFR at high redshift models						X

Table 3: Writting Cronogram

	2014							2015	
Section	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Chapter 1: Introduction									
The Λ-CDM model	X								
Dark Matter: Evidences	X								
Simulations		X							
The Multidark DataBase		X							
Galaxy Luminosity and Magnitude			X						
Schechter Luminosity Function			X						
Star Formation Rate				X					
Chapter 2:									
Observational Data				X	X				
Fitting Models						X			
The Program							X		
Chapter 3: Results & Discussion									
Overall: Power Law and 4-Par Mode							X		
Cosmic Variance in two models								X	
SFR at high redshif in other models								X	
Conclusions									X