Submitted for publication in ApJ Letters
Preprint typeset using LaTeX style emulateapj v. 12/16/11

FIRST ESTIMATE OF A GALAXY ROTATIONAL VELOCITY FROM ITS OBSERVED LYMAN-α LINE

Maria C. Remolina-Gutierrez, Juan N. Garavito-Camargo, Jaime E. Forero-Romero
Departamento de Física, Universidad de los Andes, Cra. 1 No. 18A-10, Edificio Ip, Bogotá, Colombia
Submitted for publication in ApJ Letters

ABSTRACT

First.
Subject headings: galaxies: high-redshift — line: formation — methods: numerical — radiative transfer

1. INTRODUCTION

Introduction...
Garavito-Camargo et al. (2014)

1.1. *Theoretical Background*

Garavito-Camargo et al. (2014) presented an analytical expresion that approximates the results for the Lyman-α line morphology for a spherical galaxy rotating as a solid body.

Ths input parameters of the analytical solution are the optical depth τ_H, the rotational velocity at the sphere's surface $V_{\rm max}$ and the angle of view measured from the equatorial plane (which is perpendicular to the rotational axis) θ. A `C` source code implementation is available in the public repository associated to this paper.

The main result Garavito-Camargo et al. (2014) is that rotation does have a noticeable impact on the Lyα line morphology. This impact is two fold. First, the rotation axis breaks the spherical symmetry, introducing a dependence of the line shape with viewing angle. Second, for increasing rotational velocities and viewing angles off the rotational axis, the intensity at the line's centers increases; for sufficiently high rotational velocities the line becomes single peaked.

An approximated analytic solution was derived for a spherical galaxy with central Lyman α sources.

$$J(x,b,\phi,i) = \frac{\sqrt{\pi}}{\sqrt{24}a\tau_0}\left(\frac{(x-x_{\rm b})^2}{1+\cosh\left[\sqrt{\frac{2\pi^3}{27}}\frac{|(x-x_{\rm b})^3|}{a\tau_0}\right]}\right), \quad (1)$$

$$J(x,i) \approx 2\pi \int_0^R db\, b \int_0^{2\pi} d\phi\, J(x,b,\phi,i) \quad (2)$$

1.2. *Low redshift observations*

The Lyα emission line is a powerfull tool to study the properties of the high redshift Universe. Important intrinsic properties of this galaxy population, such as the redshift, luminosity functions, equivalent width and the kinematic state are derived from the Lyα line. With the aim to study in more detail the impact of this properties on the Lyα line several surveys have observe nearby galaxies whose properties are known from . We are particularly interested in study the kinematic state of the galaxys using the Lyα line. The (**?**) survey have observed 14 nearby galaxies with strong Lyα emission using the HST telescope and the .

The LARS survey have observed galaxies with different properties, the spectra of all this galaxies and their properties are described in detail in (**?**) (**??**).

mc.remolina197@uniandes.edu.co
jn.garavito57@uniandes.edu.co
je.forero@uniandes.edu.co

2. RESULTS

$$\tau_H = 69663.485$$

$$V_{\rm max} = 49.961\,{\rm km\ s^{-1}}$$

$$\theta = 44.495^\circ$$

$$T = 9962.731{\rm K}$$

$$\Delta V_{off} = -9.722\,{\rm km\ s^{-1}}$$

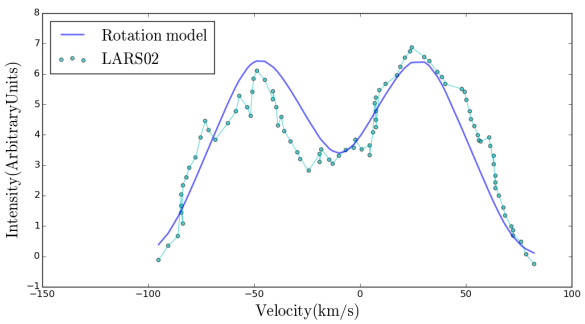

Fig. 1.—

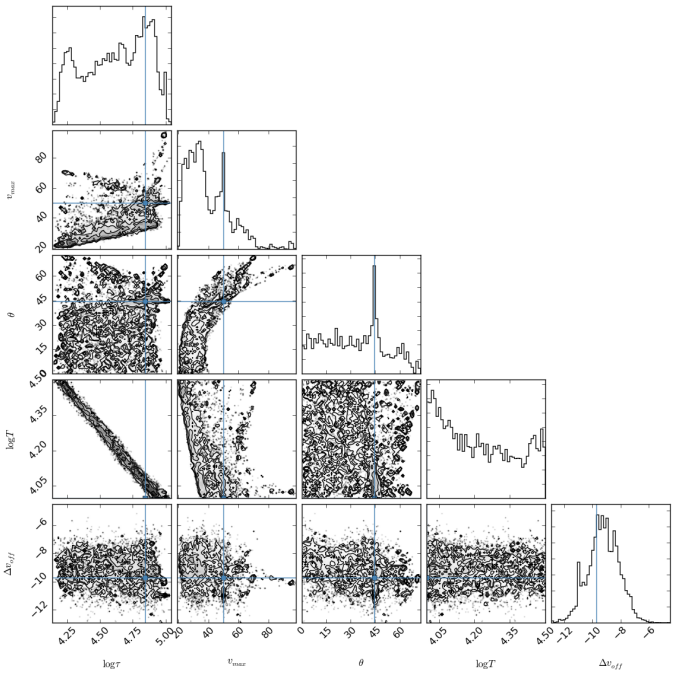

FIG. 2.—

Results...

3. DISCUSSION

Discussion...

4. CONCLUSIONS

Conclusions...

ACKNOWLEDGMENTS

Acknowledgments...

REFERENCES

Garavito-Camargo, J. N., Forero-Romero, J. E., & Dijkstra, M. 2014, ApJ, 795, 120