

# The Effect of Equatorial noise on the Proton Density Structure of the Inner Van Allen Belt

Jayasri Joseph<sup>1</sup>, Allison Jaynes<sup>2</sup>, Gregory Howes<sup>3</sup>, David Hartley<sup>1</sup>, and Maria Usanova<sup>4</sup>

<sup>1</sup>University of Iowa

<sup>2</sup>University of Colorado at Boulder

<sup>3</sup>Department of Physics and Astronomy, University of Iowa

<sup>4</sup>University of Alberta

January 20, 2023

## Abstract

We present evidence of damping of equatorial noise due to Finite-Larmor-radius (FLR) effect in the inner Van Allen belt. Detail observation of the FLR phenomenon in the inner belt region has not been reported until now. Waves primarily damped by the FLR mechanism can influence the energy dependent proton density structure. We analyze a typical case recorded by the Van Allen probe that involves FLR damping of equatorial noise, which was propagating radially towards the Earth, at L-shell  $\sim 1.7$ . As a result of this damping, protons in the energy range of  $\sim 18 - 21$  MeV at L-shell  $\sim 1.7 - 2$  get energized. This kind of wave-particle interaction should be included in the future models of the inner Van Allen belt. This phenomenon may also account for the unknown proton loss mechanism reported in Selesnick and Albert (2019).

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Jayasri Joseph

12/13/2021

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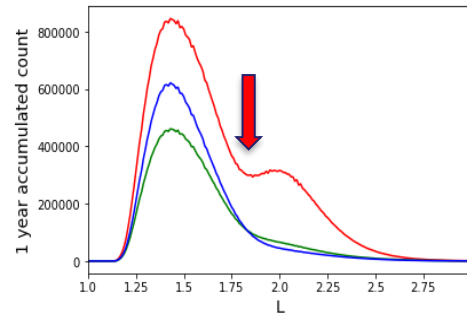
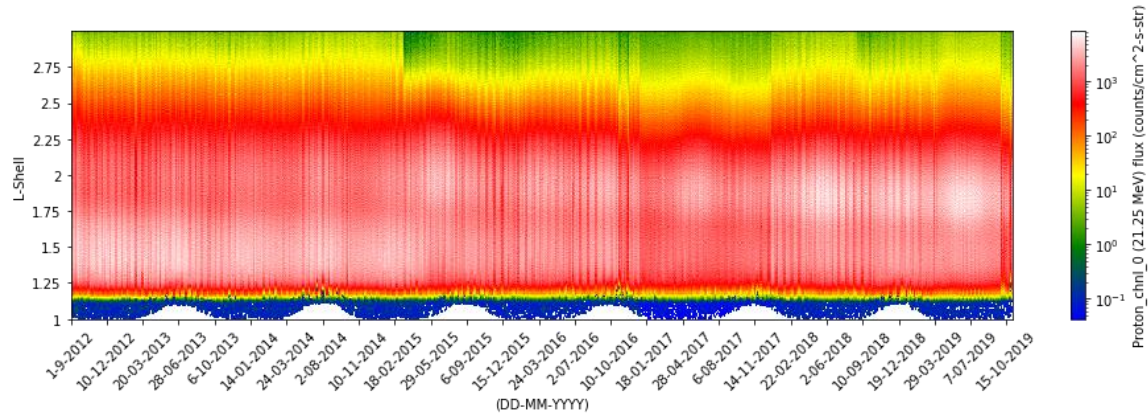
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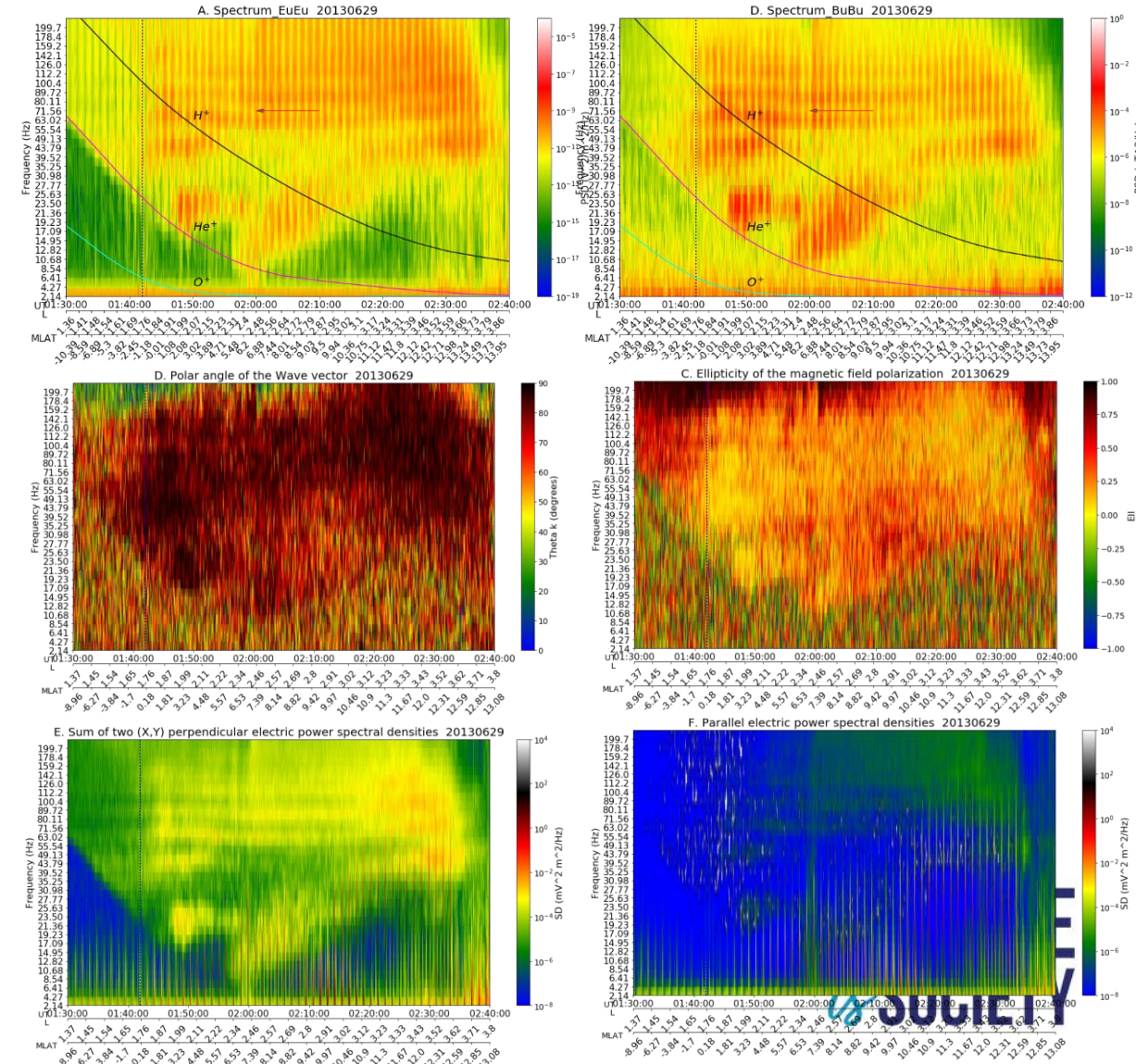




# ANOMALOUS PROTON DENSITY STRUCTURE



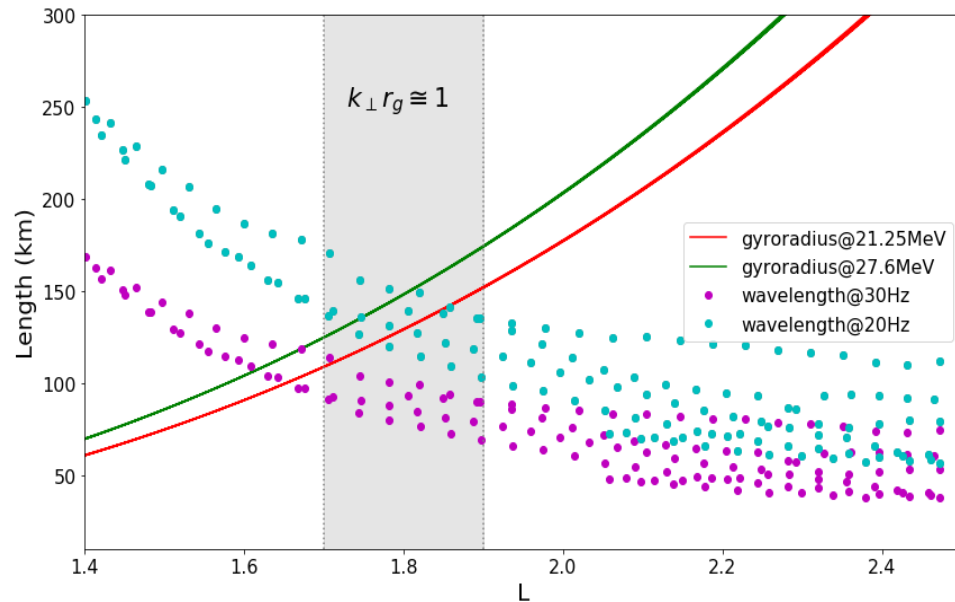
- Do Wave-particle interactions have any role to play?



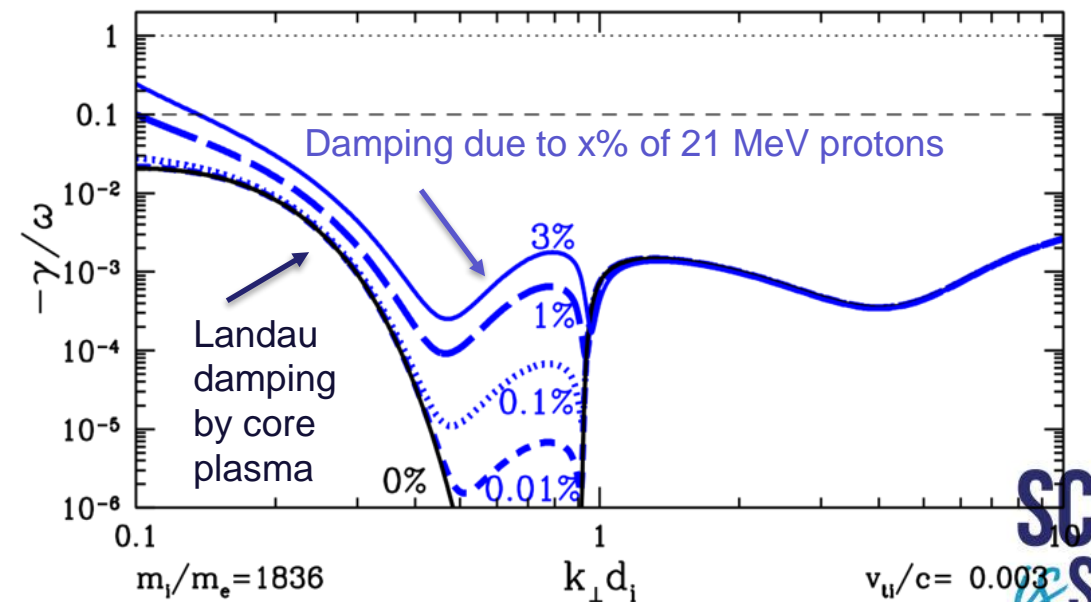
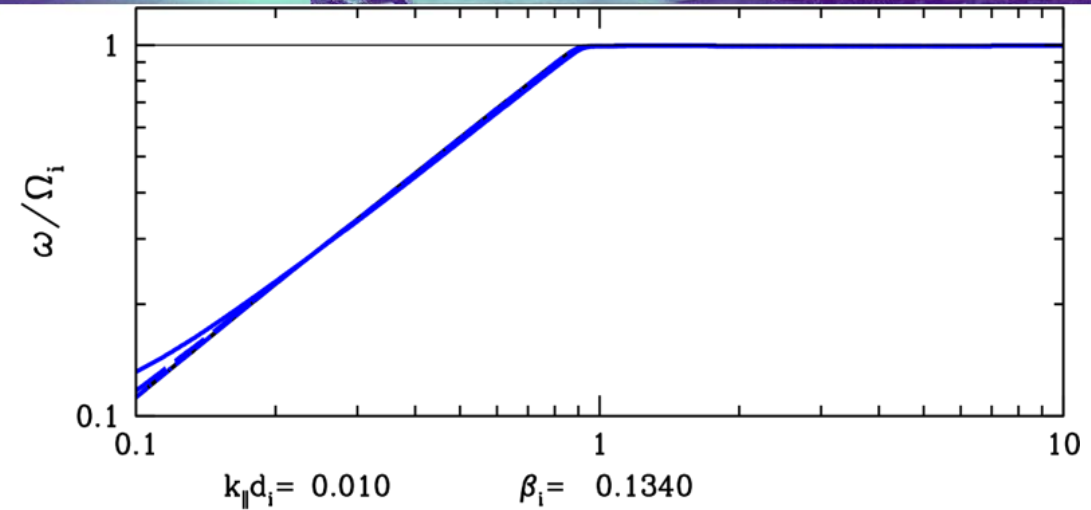


## ENERGIZATION OF 21 MEV PROTONS

Wave-particle interaction



- Larmor radius of ~21 MeV protons = Wavelength of the magnetosonic wave.
- Wave electric field was perpendicular to the background magnetic field.







## FLR INTERACTION AFFECT THE DENSITY STRUCTURE OF INNER BELT

- Finite Larmor radius (FLR) interactions in the magnetosphere are known in the tail region, boundary layer and cusp region. Now FLR interaction is reported in the innerbelt region too.
- Update inner belt model.
- Does it shed any light on the unknown energy dependent proton loss mechanism reported in Selesnick and Albert (2019)? Is it due to reorganization of protons?

# THANK YOU

Contact information:

Jayasri-joseph@uiowa.edu

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