

## P5.4009 Nonlinear oscillations in a protoplanetary disk

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See full abstract here <http://ocs.ciemat.es/EPS2019ABS/pdf/P5.4009.pdf>

In a protoplanetary disk (PPD) system, the magneto-rotational instability (MRI) driven turbulence produces a strong electric field in the neutral co-moving frame when the ionization degree is low [2]. This electric field leads to plasma heating at some parts of a weakly ionized protoplanetary disk, which results in an asymmetric electron distribution that can be represented by Davydov distribution function [1, 3]. In this work, we investigate how this asymmetry in electron distribution plays a significant role in the behavior of electrostatic solitary waves (ESW) that are produced in the PPD. We derive the electron density from Davydov function and incorporate it into the Poisson's equation which gives a Sagdeev potential that is very similar to that of the Maxwell distribution when the asymmetry is very small. We further look into the case where we find out the domain of soliton existence when the asymmetry becomes large.

Reference:

1. B Davydov, Phys Z Sowjet 8, 59 (1935)
2. Inutsuka, S., & Sano, T., ApJL, 628, L155 (2005)
3. Okuzumi and Inutsuka, The Astrophysical Journal, 800:47 (19pp) (2015)

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