Study of the relationship between the observation of electron distribubtion in the solar wind and interplanetary magnetic field fluctuations

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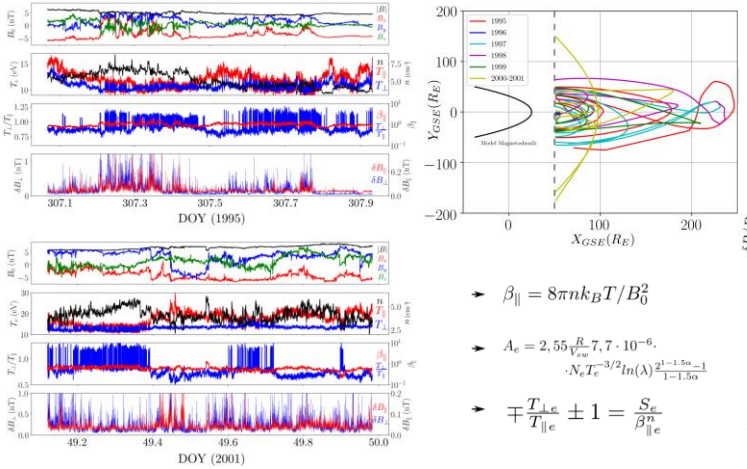
The behavior of the expanding Solar Wind, poorly collisional and non-thermal plasma open questions that motivate us to study several plasma parameters 'in situ' thanks to multiple space missions. With the aim of carrying out a statistical analysis of plasma moments, thanks to data obtained by the WIND mission between 1995-2001, we studied the effect of collisions on plasma thermalization and the influence of magnetic fluctuations on the regulation of the temperature of the gas anisotropy.



- $\beta_{\parallel} = 8\pi n k_B T / B_0^2$
- $A_e = 2,55 \frac{R}{V_{sw}} 7,7 \cdot 10^{-6} \cdot N_e T_e^{-3/2} ln(\lambda) \frac{2^{1-1.5\alpha}-1}{1-1.5\alpha}$
- $\mp \frac{T_{\perp e}}{T_{\parallel e}} \pm 1 = \frac{S_e}{\beta_{\parallel e}^n}$

Fig.1: Comparative time series between solar minimum and maximum. Useful orbits for pristine solar wind data. Sample of equations to be used in the treatment.

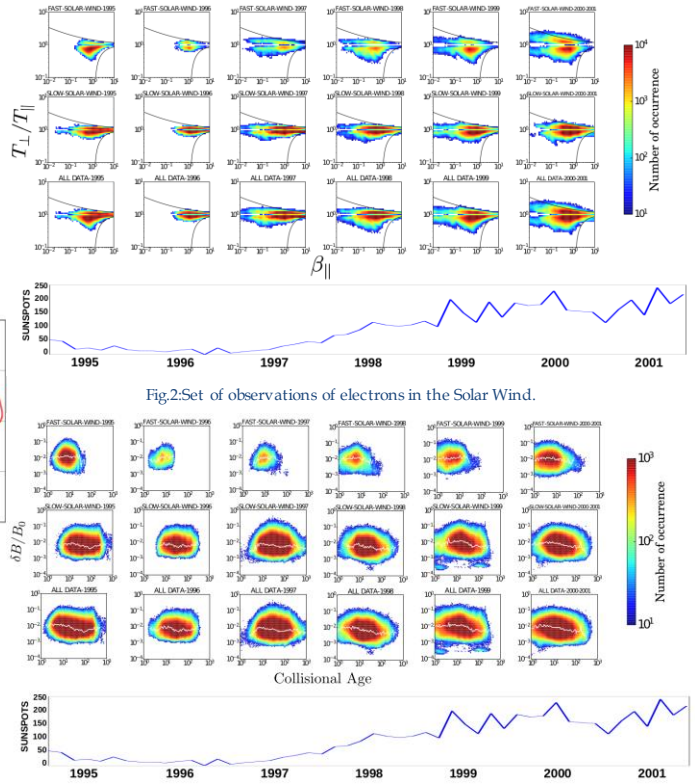


Fig.2:Set of observations of electrons in the Solar Wind.

Fig.3:Distribution of magnetic fluctuations as a function of collisional age.

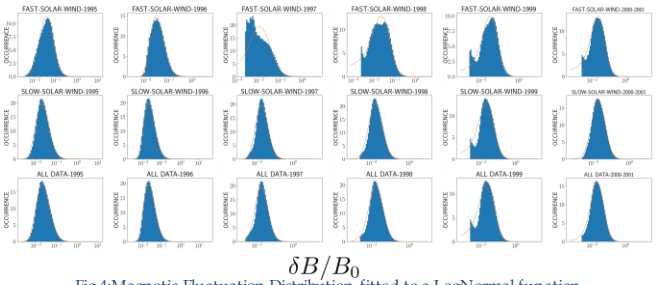


Fig.4:Magnetic Fluctuation Distribution fitted to a LogNormal function.

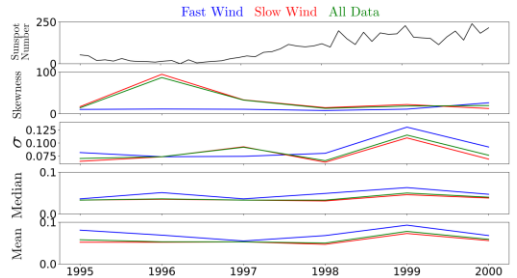


Fig.5:Comparative time series of parameters of magnetic fluctuation distributions.

We conclude that the electron firehose and whistler cyclotron kinetic instability thresholds adequately adjust the electron distribution, so that the wave-particle interactions seem to regulate the temperature anisotropy. In addition, the slow solar wind has a greater collisional age than the fast wind and a smaller amplitude of fluctuations. On the other hand, the amplitude of the distribution of magnetic fluctuations increases as the solar maximum approaches.

We can deduce that Coulomb collisions, although infrequent, play a role in eVDF thermalization and the quasi-equilibrium properties between plasma and electromagnetic turbulence.

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