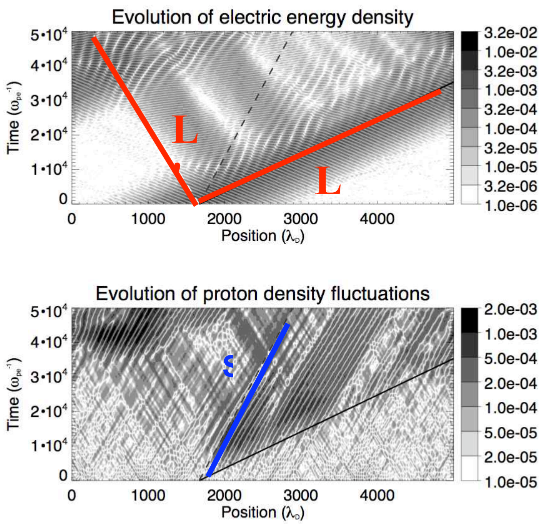
Vlasov-Poisson simulations of Langmuir Decay

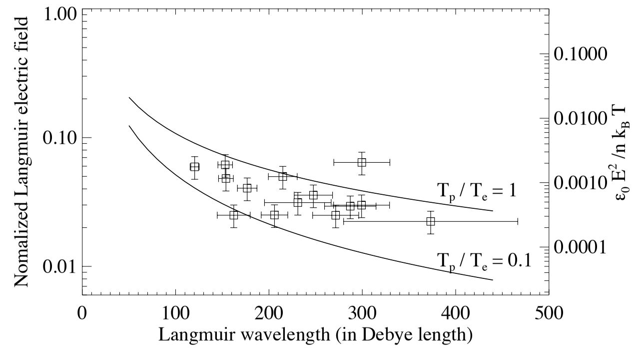
Vlasov simulations of Langmuir decay



Nonlinear evolution of a Langmuir wavepacket:

- $\lambda_L = 200\ \lambda_D$
- $D = 10\ \lambda_L = 2000\ \lambda_D$
- $E_L = 6.10^{-2}$
- $m_p/m_e = 1836$
- $T_p/T_e = 0.1$

Confrontation with in-situ observations



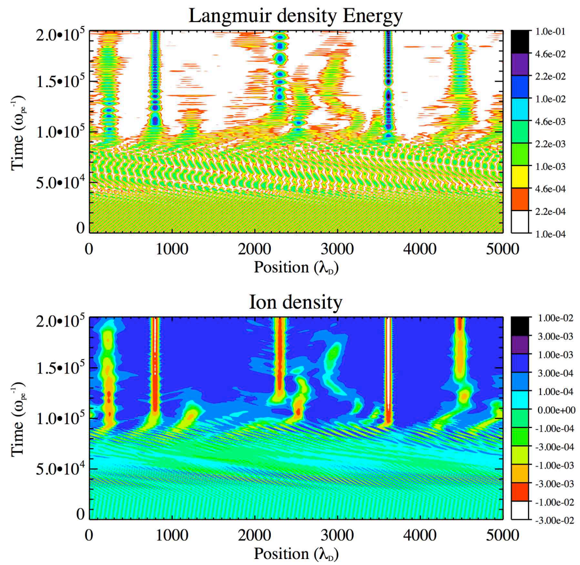
$$E_{LED}^{threshold} = \left(\frac{6\ k_L^{1-\beta}}{\Gamma \Delta} \right)^{1/\alpha}$$

Vlasov simulations confirms that Type III waveform observations show Langmuir electrostatic decay L → L′ + S

(Henri & al, JGR, 2010)

Breakdown of weak Langmuir turbulence

Vlasov simulations of long time evolution of weak turbulence

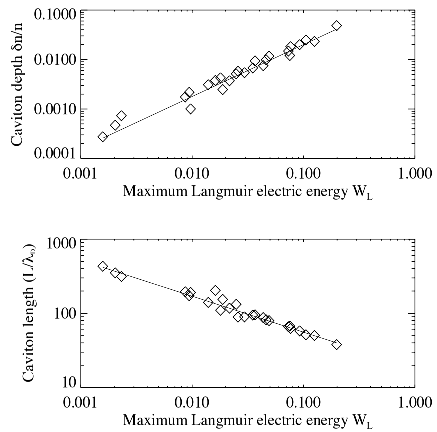


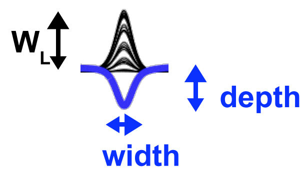
Nonlinear evolution of a Langmuir monochromatic wave:

- $\lambda_L = 100\ \lambda_D$
- $W_L = 10^{-3}$
- $m_i/m_e = 1836$
- $T_p/T_e = 1$

First: Langmuir decay

Then: formation of coherent structures both in ion density and electric field





Evidence that "large" and “shallow" cavitons may exist in the solar wind.

Cavitons can saturate at low energy (until $\varepsilon_0 E^2/nk_BT \sim 10^{-3}$) unlike the wide-spread belief that such structures should be found at higher energy ratios ($\varepsilon_0 E^2/nk_BT \sim 1$).

Henri & al, submitted to PRL