

Plasma Instabilities in the Ionosphere

Pierre Degond (Toulouse)

The ionospheric plasma is subject to strong instabilities (the gradient-drift instabilities) which produce fairly complex dynamical patterns, the so-called ionospheric irregularities or striations. In a first part, we will introduce the audience to the modeling of ionospheric plasmas and their instabilities.

Then, we will concentrate on the mathematical study of this instability in the framework of the so-called dynamo model. We will prove that situations which lead to a linear instability are indeed nonlinear unstable (joint work with C. BESSE, H. J. HWANG and R. PONCET).

The growth of the instability leads to a very chaotic dynamics, for which we will propose a model inspired from the statistical approach to turbulence in fluid mechanics. Numerical simulation of the original and of the 'turbulent' dynamo model will be presented to illustrate our considerations (joint work with C. BESSE, J. CLAUDEL, F. DELUZET, G. GALLICE and C. TESSIERAS).