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Nonlinear Oscillations of a Dust Cloud in a rf Plasma MAXIME MIKIKIAN, LENAIC COUEDEL[1], MARJORIE CAVARROC[2], YVES TESSIER, LAIFA BOUFENDI, OLIVIER VALLEE, GREMI, UMR6606, CNRS/Universite d'Orleans, 14 rue d'Issoudun, BP6744, 45067 Orleans Cedex 2, France — In a plasma, dust particles acquire a negative charge. Thus, a high density of dust particles strongly reduces the free electron density and can drastically alter the plasma equilibrium leading to a wide variety of instabilities (as in electronegative plasmas). One of these instabilities concerns the dust-free region (void) often appearing in the center of the discharge. This void is maintained by two forces of opposite directions and a break in this equilibrium can lead to strongly nonlinear oscillations of the void size. In this presentation we analyze these low-frequency oscillations on the dust cloud and the plasma thanks to high-speed imaging. Correlations are made with the evolution of the discharge current which shows a nonlinear behavior similar to mixed-mode oscillations (MMOs) well-known in other fields like chemistry or neuronal science. We perform an analogy between MMOs in these fields and the ones we obtained. These MMOs are also highly studied through dynamical system theories which can provide a new approach for studying plasma instabilities.

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