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Collective excitations of charged dust grains in dusty plasma lattices IOANNIS KOURAKIS, PADMA KANT SHUKLA, Ruhr Universitaet Bochum, TP4, Germany — *Dusty Plasmas* (or *Complex Plasmas*) are large ensembles of interacting particles, consisting of electrons, ions and massive, heavily charged, micron-sized dust particulates. The presence of the latter modifies the plasma properties substantially and allows for new charged matter configurations, including liquid-like and solid (quasi-*crystalline*) states (Debye crystals). One- dimensional (1d) dust crystals are formed in discharge experiments, where the electrode *sheath* electric fields and electrostatic interactions constitute a highly nonlinear environment. The nonlinear aspects of horizontal (longitudinal, acoustic mode) as well as vertical (transverse, optical mode) motion of charged dust grains in a (1d) dust crystal are discussed. Different types of localized excitations, predicted by nonlinear wave theories, are reviewed and conditions for their occurrence (and characteristics) in DP crystals are discussed, in a continuum approximation. Dust crystals are shown to support nonlinear *kink*-shaped supersonic solitary excitations, related to longitudinal dust grain displacement, as well as modulated *envelope localized modes* associated with either longitudinal or transverse oscillations. Furthermore, the possibility for highly localized *discrete breather*-type excitations to occur is investigated, for first principles. The relation to known results on atomic chains and on strongly-coupled dust layers in gas discharge plasma experiments is discussed.

Ioannis Kourakis
Ruhr Universitaet Bochum, TP4, Germany

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