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4-Two-fluid models in solid-state plasmas

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The possibility of producing graphene samples of extreme purity has revealed an electronic regime that was realized theoretically in the 1960s, but that always lacked experimental confirmation - the hydrodynamic regime. In this regime, electron-electron collisions dominate over scattering with disorder - phonons and impurities, and electronic dynamics can be described with classical fluid equations. By applying a hydrodynamical model to graphene-based bilayer systems, we will search for physical mechanisms that can sustain plasmonic instabilities, i.e collective charge oscillations whose amplitude grows exponentially in time until a saturation regime is reached. Maintaining these plasma oscillations after they've reached saturation is a challenge with great technological interest, since it offers a promising path for the development of tunable sources of TeraHertz radiation.

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