Effect of ionization-absorption balance processes on the potential
distribution around a test particle in isotropic complex plasma

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Using a hydrodynamic model we have investigated the collective effects (due to many dust particles) on the linearized test charge potential in isotropic, homogeneous complex plasma with arbitrary dependence of the ionization source on the electron density. The fundamental properties, such as, dust charge variation, ion-neutral collisions, plasma production due to ionization and plasma loss due to absorption on dust particles have been taken into account self-consistently. We found that the potential can have an attractive part in the regime of stability against ion perturbations only in very limited circumstances. A realistic case for it to occur is that of a constant ionization source and comparable ion and electron temperatures. The results can be of importance in the context of complex (dusty) plasmas, space plasmas, astrophysical plasmas as well as in low-temperature plasma physics.