nMHDust: A 4-Fluid Partially Ionized Dusty Plasma Code

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nMHDust is a next generation 4-fluid partially ionized magnetized dusty plasma
code, treating the inertial dynamics of dust, ion and neutral components. Coded
in ANSI C, the numerical method is based on the MHDust 3-fluid fully ionized
dusty plasma code. This code expands the features of the MHDust code to in-
clude ionization/recombination effects and the netCDF data format. Tests of this
code include: ionization instabilities, wave mode propagation (electromagnetic and
acoustic), shear-flow instabilities, and magnetic reconnection. Relevant parameters
for the space environment are considered, allowing a comparison to be made with
previous dusty plasma codes (MHDust and DENISIS). The utility of the code is
expanded through the possibility of a small dust mass. This allows nMHDust to be
used as a 2-ion plasma code. nMHDust completes the array of fluid dusty plasma
codes available for numerical investigations into nonlinear phenomena in the field of
astrophysical dusty plasmas.

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