Geophysical Research Abstracts
Vol. 16, EGU2014-7355, 2014
EGU General Assembly 2014

Scattering of electromagnetic radiation based on numerical calculation of the T-matrix through its integral representation

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A novel numerical technique is presented to calculate the T-matrix for a single non-spherical particle by the volume integral equation for electromagnetic scattering. It is based on the method called Coupled Dipole Approximation (O. J. Martin et al. J. Opt. Soc. Am. A,1073, 1994). The basic procedure includes the parallel use of the Lippman-Schwinger's and the Dyson's equations to iteratively solve for the T-matrix and the Green's function dyadic respectively. The boundary conditions of the particle are thus automatically satisfied. The method can be used for the evaluation of the optical properties (e.g., Mueller matrix) of anisotropic, inhomogeneous and asymmetric particles, both in far and near field, giving as output the T-matrix. The T-matrix depends only on the scatterer itself and is independent from the polarization and direction of the incoming field. Estimation of the accuracy of the method is provided through comparison with the analytical spherical case (Mie theory). The talk will report on (a) the technique to make a parallel use of two Lippman-Schwinger's equations, how to discretize them using sparse-octrees in order to calculate the Green's function dyadic and the related T-matrix for an arbitrary particle when an electromagnetic wave is incident on it (b) results for a sphere, and novel cases including sharp edges particles like cubes and particles with irregular shapes.