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Study of small rough ice particles with the GDT-matrix model and the SID instrument

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A new technique is presented to compute the T-matrix for a single arbitrary shaped particle through the volume integral equation for electromagnetic scattering (the Green's Dyadic technique for T-matrix shortly the GDT-matrix). The method exploits the Dyson equation for the propagator and thus is particularly sensitive to the presence of irregularities or distortions on the surface of the scatterer. Validation against Mie theory and also against the established ADDA code are made for various shapes. Then, we make comparisons between the simulations and 2D forward scattering intensity measurements of ice particles with symmetrical, irregular and rough shapes, performed with the SID instrument (Small Ice Detector run by Dr. M. Schnaiter at KIT, the Karlsruhe Institute of Technology). In particular we propose some candidate fractal particles that can produce very irregular speckle patterns.