
Radiative transfer in layered heterogeneous media, experiments and modelling

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We have measured the reflectance of numerous samples using our old field goniospectrometer FIGIFIGO. We have recently build a smaller desktop goniopolarimeter to measure smaller samples in higher accuracy in laboratory. We can now measure the linear polarisation, and soon the full Muller matrix of reflected radiation.

The results from new and old system agree rather well in the first test samples, and confirm the inaccuracies are not alarming in neither instrument. The new one should have much better polarisation accuracy.

We have upgraded our old models to a new composition. Small particulate sublayers are initialised using Monte Carlo ray tracing. These sublayers are doubled for quasihomogeneous layers of arbitrary thickness. Several different layers can be added to form the full layered medium. The particles are modelled as rough ellipsoids. The surfaces or interior of particles can be covered by small point scatterers, here computed using Monte Carlo based volume integral equation technique.

The model agrees rather well with the measurement data of snow, sand, and gravel. There are still some minor details in forward polarisation needing further attention. Next, rough top layers will be returned to the model and compared to measurements, and then we implement more complex 3D structures, when we get more measurements from targets with controlled structures.