



LIDORT: Linearized discrete ordinate radiative transfer forward modeling for remote sensing retrieval applications

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The LIDORT family is a group of discrete ordinate multi-layer multiple scattering RT models with a linearization facility. The models were developed to provide rapid and accurate generation of radiances and Jacobians (weighting functions or sensitivity partial derivatives) in forward model simulations typical of iterative least-squares retrievals. Jacobians are derived analytically; the discrete ordinate solution is fully differentiable with respect to its optical property inputs. This analytic linearization obviates the need for cumbersome finite difference estimation of radiance derivatives.

Weighting functions are generated for atmospheric profiles (trace gases, aerosol distributions), atmospheric bulk properties (total columns, total optical depths), and surface quantities (albedos, BRDF parameters). VMR or partial-column weighting functions are important for ozone profile UV backscatter retrievals from GOME, GOME-2, OMI and related instruments. All LIDORT models have a pseudo-spherical capability (solar beam attenuation in a curved stratified atmosphere). Some models have additional source function integration along line-of-sight paths in a curved atmosphere; this is important for wide-angle off-nadir viewing (GOME-2, OMI for example).

The VLIDORT code with a Stokes-vector treatment of polarized light was developed recently and is now fully linearized. Another new development is the linearization of the coupled ocean-atmosphere discrete ordinate model appropriate for ocean-color retrieval from MODIS-type instruments. Another family member is the LIDORT-RRS model, containing an analytic first-order treatment of inelastic rotational Raman scattering; we demonstrate its use to characterize Ring effect interference (Fraunhofer and absorption feature filling-in) in UV/visible trace gas retrievals.

LIDORT codes will be available soon the Web: LIDORT Version 3.0, VLIDORT Version 2.0 and LIDORT-RRS Version 1.5. Interested people should contact R. Spurr at RT Solutions Inc. for details