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IDENTIFICATION OF FOG PARTICLE SIZE DISTRIBUTION BY A RADIATIVE TRANSFER EQUATION INVERSION

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ABSTRACT. For autonomous driving applications, we investigate the fog Droplet Size Distribution (DSD) identification from spectral radiation measurements in the range 350 nm - 2500 nm by inverting the 1D stationary radiative transfer equation (RTE). This distribution together with Lorenz-Mie scattering theory allow to compute the optical properties (scattering coefficient, absorption coefficient, and scattering phase function). The inverse problem is based on a cost function minimization by using a gradient descent-based algorithm. In order to calculate the gradient, the method proposed in this work relies on the introduction of an adjoint problem of the RTE which can contain an in-scattering term. The work is then not restricted to the Beer-Lambert case as often encountered in the literature. We present some numerical results obtained on synthetic forescattering and backscattering measurements. The robustness of the reconstruction is studied numerically by adding several noise levels to the measurements.

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