

ELS-XV-2015 Abstracts
ELS-XV-2015-174
Electromagnetic & Light Scattering XV 2015, Leipzig
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Simultaneous retrieval of hydrometeors and target reflectance from full-wave form 3D-lidar

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Onera, the French aerospace lab, develops and models full-wave form 3D-lidar systems to understand the relevant physical phenomena impacting on their performances. As a consequence, efforts have been done both on the propagation and scattering of a laser-pulse through the atmosphere and on target geometries and their surface properties. These imaging systems operate at night in all ambient illuminations and weather conditions in order to perform the strategic surveillance of the environment for various worldwide operations.

The presence of light-scattering effects due to rain, snow, fog, or haze would affect the classical procedure used to retrieve the target reflectance. In this paper, we propose a systematic methodology to retrieve simultaneously the reflectance of the hydrometeors of interest and the target from the full-wave form 3D-lidar signal. This original approach combines a light scattering study and full-wave signal processing.