Application of the outdoor DIAL lidar system to detect the ozone and aerosol in the boundary layer

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Abstract:
Aerosols are particles in the solid or liquid phase that are suspended in the atmosphere ranging in size (diameter) from a few nanometers to tens of micrometers. Particles may be either primary aerosols or secondary aerosols with sources as either natural or anthropogenic. Aerosol particles can have a great effect on the balance of Earth’s atmospheric radiation system, and also will lead to air pollution problems and undermine human health. Although it is a minor constituent, ozone is present throughout the whole lower atmosphere. But at the surface, ozone is an air pollutant that adversely impacts human health, natural vegetation, and crop yield and quality. Till now, it is still a major problem for the ozone and aerosol in the boundary layer, cause of the lack of knowledge on the observation of the vertical distribution of them in the atmosphere. In this paper, we present a multi-wavelength differential absorption lidar, which is built in the March Of 2018, and with which one can obtain an accurate ozone profile in the boundary layer, as well as aerosol profile. In the lidar system, laser beams at 266nm, 289nm, 299nm, 316nm and 532nm are emitted to the atmosphere, and six signals with aerosol polarization information are received by using six channels. The theoretical analysis and experimental comparisons are carried out during this spring. And one can obtain accurate ozone and aerosol profiles from lidar return signals. Some examples of the experimental results indicate that the proposed method is effective and the performance of lidar system is reliable.