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Scheme selection and parameter simulation of spaceborne and airborne high spectral resolution lidar receiver

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Spaceborne and airborne lidars have been used to measure aerosol distribution and properties in a wide area. In order to get aerosol properties without hypotheses, high spectral resolution lidar is a good choice. For spaceborne and airborne high spectral resolution lidar, the scheme and parameters of high spectral resolution receiver is a key issue.

In this paper, two schemes are compared and a parameter simulation of spaceborne and airborne high spectral resolution lidar receiver is carried out. The two schemes are iodine vapor (I2) absorption filter scheme and Fabry–Pérot interferometric filter scheme. Fabry–Pérot Interferometric filter scheme has been selected due to high efficiency and capability of being tuned to any desirable laser wavelength.

In order to find optimal parameters for the high spectral resolution receiver, a parameter simulation has been done. In this simulation, several environmental factors have been considered, including atmospheric temperature, pointing accuracy of spaceborne and airborne platform, aerosol concentration range, the machining defects of Fabry–Pérot interferometric filter, etc. A typical vertical distribution of atmospheric aerosol optical properties is entered and the received signals of high spectral channels are simulated. According the simulated signals, aerosol optical properties are retrieved and deviation relative to the input value is obtained. Under the conditions of given environmental factors, the relationship between parameters of high spectral resolution receiver and relative error of retrieved aerosol optical properties is carried out. The best parameters of high spectral resolution receiver are obtained when the relative error of retrieved aerosol optical properties is lower than given value and signal to noise ratio of high spectral receive channel is highest.

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