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Spectral Characteristics of Polluted Gases and Their Detection by

Mid-infrared Differential Absorption Lidar

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Abstract: The absorption characteristics of three types of trace gases (sulfur dioxide, nitrogen dioxide and nitric oxide) were simulated through line-by-line integral algorithm utilizing the HITRAN2012 database. The effect of temperature, pressure, and other interfering gases were analyzed in the mid-infrared band (2–5 μm) and suitable sets of wavelengths were proposed for the mid-infrared differential absorption lidar (MI-DIAL). The absorption spectrum of one typical trace gas was measured and it was found to be reasonably consistent with that of the simulated one. The lidar system simulated results showed that the selected sets of wavelength can be used in MI-DIAL to detect the polluted gases.

Keywords: mid-infrared; differential absorption lidar; absorption spectrum

1. Introduction

The environmental pollution resulting from industrial and economic development has a negative effect on human beings and on social activities. Industrial pollution forms the major

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