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Jedol Dayou
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Ground-Based Aerosol Optical Depth Measurement Using Sunphotometers

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Chapter 1

Introduction

Abstract The study of aerosol in atmospheric science has become an essential issue due to its ever-rising effects both in climate and human health. Continuous measurement of aerosol is hence necessary in order for better grasp of the effects. One of the practical methods to measure and monitor the aerosol content in atmosphere is by using sunphotometers. To embark on the issues surrounding the measurement using this device, some general knowledge regarding aerosol is first discussed in this chapter including some definitions related to aerosol, the importance of its measurement and monitoring, and the challenge faces the measurement using the device.

Keywords Airborne radiometer • Convective cloud • Manmade aerosol • Primary and secondary aerosols • Solar terrestrial radiation

1.1 Aerosol Basic

Aerosols are small solid particles or liquid droplets suspended in air or other gases environment. They can be naturally produced or manmade generated. Natural aerosols are emitted into the atmosphere by natural processes such as sea spray, volcanoes eruptions, windblown dust from arid and semi-arid regions, terrestrial biomass burning and others. Meanwhile, manmade aerosol are generated from combustion or emission from industrial, welding, and vehicle exhaust or produced intentionally for commercial uses (i.e. flame reactor aerosol that produces nanoparticles). They have very limited life time of about a few days to one week. Despite their relatively short life times, they regularly travel over long distances via air trajectories. The transport pathways may vary seasonally and interannually depending on the air-mass altitude (Paul et al. 2011).

Aerosols have irregular shapes (i.e. aggregated, spherical, fibrous, and others), categorizing them is often based on the diameter of an idealized sphere, or better known as particle size. These sizes range from few nanometers to several tens of micrometers. More specifically, the aerosol particles with diameters $d \leq 0.1 \mu\text{m}$