Satellite Remote Sensing of Air Quality over Australia and New Zealand

Sundar A. Christopher*, Michael A. Box and Gail P. Box
School of Physics
University of New South Wales
Sydney, Australia
Email: sundar@nsstc.uah.edu

Abstract (295 words)

Particular matter (PM), or aerosol, is the general term used for a mixture of solid particles and liquid droplets found in the atmosphere. Monitoring natural (e.g. dust) and anthropogenic aerosols (biomass burning smoke, industrial pollution) has gained renewed attention because they influence cloud properties, alter the radiation budget of the earth-atmosphere system, and cause changes in surface temperature and precipitation. Aerosols also reduce visibility and induce respiratory diseases when sub-micron sized aerosols penetrate the lungs, thereby affecting air quality and health. Although several ground-based networks are currently in operation to monitor aerosols for different purposes they are essentially point measurements and are inadequate to provide health alerts on large spatial scales. On the other hand, satellite imagery due to their large spatial coverage and reliable repeated measurements, provide another important tool to monitor aerosols and their transport patterns. One common aerosol parameter retrieved from satellite sensors is aerosol optical thickness (AOT) where a higher AOT value generally indicates higher column aerosol loading and therefore lower visibility. Although several studies have attempted to use the AOT retrieved from satellite imagery to monitor aerosol loading and the associated air quality effects, until recently, the use of satellite remote sensing data for air quality studies has been hampered largely due inadequate spatial, radiometric and spectral resolutions. However, new data sets from the recently launched MODIS (on NASA’s Terra and Aqua satellites) provide an unprecedented opportunity to monitor aerosol events and examine the role of aerosols in the earth-atmosphere system. In this paper we will explore the potential of using the MODIS AOT product for air quality studies over Australia and New Zealand. Several case studies will be presented; quantitative comparisons between ground-based PM$_{2.5}$ and MODIS AOT will be made and the uncertainties in this approach will be discussed.

* Gordon Godfrey Visiting Fellow
Permanent affiliation: University of Alabama in Huntsville, Huntsville, AL, USA