SUNPHOTOMETER NETWORK FOR MONITORING AEROSOL PROPERTIES IN THE BRAZILIAN AMAZON.

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Abstract. Satellite platforms have provided a methodology for regional and global remote sensing of aerosols. New systems will significantly improve that capability during the Eos era however the voluminous 20 year record of satellite data has produced only regional snapshots of aerosol loading and have not yielded a data base of the optical properties of those aerosols which are fundamental to our understanding of their influence on climate change. The prospect of fully understanding the properties of the aerosols with respect to climate change is small without validation and augmentation by ancillary ground based observations. Sun photometry has been demonstrated to be an effective tool for ground based measurements of aerosol optical properties from fire emissions. Newer technology has

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expanded routine sun photometer measurements to spectral observations of solar aureole and almucantar allowing retrievals of size distributions, scattering phase function, and refractive index. A series of such observations have been made in Brazil's Amazon basin from a network of six simultaneously recording instruments deployed in September 1992. The instruments were located in areas removed from local aerosol sources such that sites are representative of regional aerosol conditions. The overall network was designed to cover the counter clockwise tropospheric circulation of the Amazon basin. Spectral measurements of sun, aureole and sky data for retrieval of aerosol optical thickness, particle size distribution and scattering phase function as well as measurements of precipitable water were made during non cloudy conditions. Early results from the network clearly show the aerosol optical thickness to vary regionally and diurnally. The wavelength exponent also varied according to the aerosol loading. Under background conditions the exponent was approximately 0.5 which is the response to the stratospheric aerosols layer form Mt. Pinatubo but the values increased to approximately 2.0 for fresh smoke. Fresh smoke and aged smoke to be indentified as two distinct populations of the wavelength exponent in which the aged smoke nominally older than a day had a value approximately. 3 lower than the fresh smoke. This is in agreement with the coagulation processes that occur as smoke ages. Volume size distribution were retrieved from inversion of aureole radiances and showed a tri-modal distribution including an accumulation mode less than 0.1 mm, a Pinatubo mode around 0.6 mm and a coarse particle mode centered around 3 mm. The tri-modal distributions have been observed elsewhere since the eruption of Mt. Pinatubo. The scattering phase function will be retrieved and investigated with respect to aerosol loading events. The retrieved optical properties of the atmosphere were modeled using the Bird approximation for total SW down welling irradiance on a hazy and clear day. Comparison with simulations measurements from an eppley pyranometer showed good agreement but was sensitive to changes in the model single scattering albedo which is not measured by sunphotometry. By fitting the modeled data with the real data the prospects of estimating the single scattering albedo merits further study. The sun photometer network will greatly add to our characterization of atmospheric properties by development of an aerosol climatology and facilitate model development and selection for accurate modeling of the impacts of aerosols from biomass burning on remote sensing. The instrument will be re-deployed to seven Amazonian sites in Brazil beginning in May 1993 and will operate through the dry season. Further data collection will depend upon funding sources.