ing fractional cloud cover, precipitable water vapor, long-term weather patterns, prevailing winds, atmospheric seeing and turbulence profiles, geologic activity, local climate variability, light pollution, among others. Mexico's National Astronomical Observatory (OAN) site is at San Pedro Mártir (SPM), located 31°02′40″ N and 115°28′00″ W, some 100 km east of the West Coast of Baja California, Mexico. Astronomical characterization studies of SPM since the 1980's have been reported in a dedicated volume edited by Cruz-González, Ávila, & Tapia (2003), and in a collection of progress reports: Cruz-González et al. (2004), Tapia, Cruz-González, & Ávila (2007), Tapia et al. (2007).

Among the concepts related to geophysical properties that have been recently introduced in astronomical site testing is the role played by aerosols (e.g., Varela et al. 2007; Varela et al. 2008). These authors argue that ambient aerosol content characterization in a site is important because aerosols may produce more stable condensation nuclei, delay precipitation and affect extraterrestrial radiation by extinction, absorption, diffusion and reflection.

We present a study of the optical depth of the atmospheric aerosol in the SPM astronomical site. The observation period considered corresponds to the years 2000 to 2008. The data were obtained from the *Moderate Resolution Imaging Spectroradiometer* (MODIS) instrumentation on board the NASA satellites *Aqua* and *Terra*. We studied the seasonal, monthly and annual behavior of the atmosphere aerosol optical thickness, AOT, at the wavelengths 470, 550, 660 and 2130 nm. This paper's content is as follows: In § 2 we present basic observational atmospheric solar radiation techniques; followed by a description of the satellites and instrumentation presented in § 3. The characteristics of the data are given in § 4 and the methodology is described in § 5, followed by results and analysis description in § 6. Finally, our conclusions are presented in § 7.

2. OBSERVATIONAL ATMOSPHERIC SOLAR RADIATION TECHNIQUES

Atmospheric solar radiation techniques consider both terrestrial and spatial observations. Terrestrial observations of direct radiation have been used to evaluate the optical depth τ_λ of atmospheric aerosols at different wavelengths λ of the electromagnetic spectrum, through the relation given by Iqbal (1983):

$$I(\lambda) = I_0(\lambda) e^{-\tau_\lambda m}\,, \tag{1}$$

where I_λ is the measured irradiance (W m^{-2}), $I_0(\lambda)$ is the atmospheric top irradiance (W m^{-2}), τ_λ is the optical depth (adimensional), m the air mass (adimensional) and λ is the wavelength (nm).

On the other hand, spatial observations of reflected solar radiation have been used to evaluate the optical depth τ_λ of atmospheric aerosols using sophisticated modeling (e.g., Toon & Pollack 1976). The details of the algorithm and the theoretical basis of aerosol data retrieval from the MODIS Collection 5 data base are presented in Remer et al. (2005) and Remer, Tanré, & Kaufman (2006). These authors point out that the ambient aerosol optical depth (AOD) is proportional to the aerosol total loading in the vertical column. They show that the upward reflectance (normalized solar radiance), at the top of the atmosphere (TOA), is a function of successive orders of radiation interactions, within the coupled surface-atmosphere system. The TOA angular (for θ_0, θ, and ϕ = the solar zenith, view zenith and relative azimuth angles) spectral reflectance given by $\rho_\lambda(\theta_0, \theta, \phi)$ at a wavelength λ results from the contribution of scattering of radiation within the atmosphere without interaction with the surface, known as the "atmospheric path reflectance", the reflection of radiation off the surface that is directly transmitted to the TOA ("surface function"), and the reflection of radiation from outside the sensor's field of view ("environment function"). They argue that if the environment function is neglected, the TOA angular spectral reflectance, $\rho^*_\lambda(\theta_0, \theta, \phi)$ can be approximated by (c.f. equation 8 in Remer et al. 2006):

$$\rho^*_\lambda(\theta_0, \theta, \phi) \;=\; \rho^a_\lambda(\theta_0, \theta, \phi) + \frac{F_\lambda(\theta_0) T_\lambda(\theta) \rho^s_\lambda(\theta_0, \theta, \phi)}{1 - s_\lambda \rho^s_\lambda(\theta_0, \theta, \phi)}\,, \tag{2}$$

where ρ^a_λ is the atmospheric path reflectance, F_λ is the normalized downward flux for zero surface reflectance, T_λ represents the upward total transmission into the satellite field of view, s_λ is the atmospheric back-scattering ratios, and ρ^s_λ is the angular spectral surface reflectance. They show that except for the surface reflectance, each term on the right hand side of this equation is a function of the aerosol type and loading, including aerosol optical depth (AOD) and the fine weighting (FW) of the ambient undisturbed aerosol. Assuming that a small set of aerosol types and loadings can describe the range of global aerosol, they have obtained a look-up table that contains their simulations of these aerosol conditions. The goal of their algorithm is to use this look-up table (c.f. their § 4.3) to determine the conditions that best mimic the MODIS-observed spectral reflectance ρ^m_λ, to retrieve the associated aerosol