TABLE 6

SAN PEDRO MÁRTIR, BAJA CALIFORNIA (MEXICO) AEROSOL OPTICAL DEPTH CLIMATOLOGY FROM MODIS FOR 2000–2008

Wavelength (nm)	Number of AOT Measurements	AOT 2000-2008
470	1055	0.147 ± 0.103
550	1054	0.128 ± 0.090
660	1076	0.115 ± 0.081
2130	1062	0.087 ± 0.066

TABLE 7

WAVELENGTH DEPENDENCE OF SEASONAL AEROSOL OPACITY OVER SPM FROM MODIS FOR 2000–2008

Season	$\alpha_{\rm OIR}$	$\alpha_{\rm OP}$
spring	0.31 ± 0.06	0.73 ± 0.07
summer	0.31 ± 0.06	0.69 ± 0.07
autumn	0.27 ± 0.05	0.62 ± 0.11
winter	0.35 ± 0.07	0.81 ± 0.05
Average 2000–2008	0.31 ± 0.06	0.72 ± 0.08

AOT results for a collection of 26 locations in Sidney, Delhi, Hong Kong, New York City and Switzerland that cover urban populated to rural areas. The results of the rural areas in Australia and Switzerland compare quite well with the SPM results; at 550 nm they show mean annual values of 0.10 ± 0.08 and 0.16 ± 0.10, respectively, compared to our results that range from 0.10 to 0.15 in the period studied. On the other hand, Varela et al. (2008) show that in the Canarian Observatories site the AOT values found have a much wider range than the SPM values, with some dusty periods that produce a collection of MODIS AOT values at 550 nm above 0.40. But they show that, at this observatory site, most of the time the AOT have values between 0.02 and 0.20 (see Figures 12 and 13 in Varela et al. 2008). From their data in Figures 12 and 13 their average value is probably ∼0.15, reaching values as large as ∼0.7, but no average values are estimated in their work.

6.6. *AOT Spectral Slopes*

In Table 7 we present linear regression fits to the seasonal AOT values assuming that aerosols have a power-law behavior with wavelength of the form

$$AOT \equiv \tau_A(\lambda) \propto \lambda^{-\alpha}\,. \tag{3}$$

As is shown by Junge (1963) if the aerosol refractive indices are constant, aerosol particles with power-law size distributions given by $dN(r) \propto r-(\beta+1)$ produce wavelength-dependent optical depths of the form

$$\tau \;\propto\; \lambda^{-(\beta-2)}\,. \tag{4}$$

So the slope α above corresponds to the slope $\beta - 2$ of these models.

We have calculated α values, assuming $\tau_\lambda \propto \lambda^\alpha$, for the wavelengths 4700, 5500, 6600 and 21300 Å which are labeled OIR (optical to near-infrared) and for the visible region 4700, 5500 and 6600 Å labeled OP, with linear fits to the average seasonal AOT values presented in Tables 3 and 6. The results are presented in Table 7 and graphically in Figure 6. Note that $\alpha_{\rm OIR}$ has values between 0.27 (autumn) and 0.35 (winter) while $\alpha_{\rm OP}$ has values from 0.62 (autumn) to 0.82 (winter). We conclude that for periods with higher atmospheric transparency the spectral slope α is smaller and steepens for periods with higher opacity.

We have also used the average values for the years 2000–2008 (c.f. Table 6) which yield $\alpha_{\rm OIR} \sim 0.31 \pm 0.06$ ($\tau_\lambda \sim 0.0061\lambda^{-0.31}$) and $\alpha_{\rm OP} \sim 0.72 \pm 0.08$ ($\tau_\lambda \sim 0.0001\lambda^{-0.72}$) for the San Pedro Mártir location.

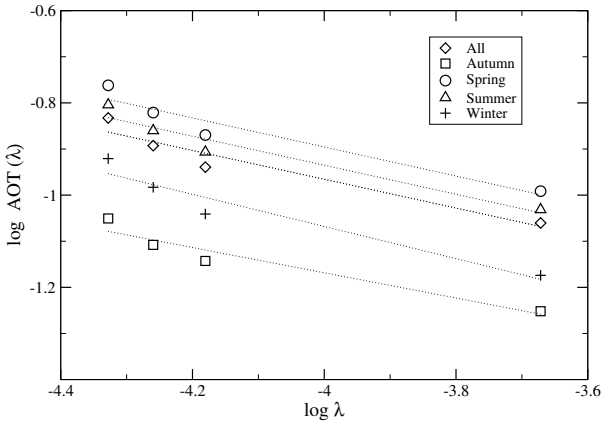

Fig. 6. Spectral dependence of aerosol optical depth obtained from MODIS data for San Pedro Mártir. Seasonal data are shown as follows: spring (circle), summer (triangle), autumn (square) and winter (plus), together with mean values for the 2000–2008 period (diamond). The dotted lines represent the linear regression fits to the data (c.f. slope values in Table 7). The color figure can be viewed online.