Understanding Climate-Fire-Ecosystem Interactions Using CESM-RESFire and Implications for Decadal Climate Variability

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Supplement

The AERONET network did not provide AOT measurements at 550 nm wavelength. For direct comparison with the model results, we estimated AERONET AOT at 550 nm by interpolating the measurements at two closest wavelengths at 500 nm and 675 nm. Specifically, the optical thickness of aerosols and the wavelength of light satisfies the power law (Ångström, 1929) in Eq. (S1):

$$\frac{\tau_\lambda}{\tau_{\lambda_0}} = \left(\frac{\lambda}{\lambda_0}\right)^{-\alpha}, \text{(S1)}$$

where τ_λ is the optical thickness at wavelength λ, τ_{λ_0} is the optical thickness at the reference wavelength λ_0, and α is the Ångström exponent.

We first calculated the Ångström exponent based on the optical thickness measured at 500 nm and 675 nm, then estimated the optical thickness at 550 nm using Eq. (S1) and AOT at 500 nm as the reference. The estimation equation is shown in Eq. (S2):

$$\tau_{550} = \tau_{500}\left(\frac{550}{500}\right)^{-\alpha},\ where\ \alpha = -\frac{log\frac{\tau_{675}}{\tau_{500}}}{\log\frac{675}{500}}, \text{(S2)}$$

Reference

Ångström, A.: On the Atmospheric Transmission of Sun Radiation and on Dust in the Air, Geografiska Annaler, 11, 2, 156–166. doi:10.1080/20014422.1929.11880498, 1929.