Response to Editor's comments

Thank you for your careful review of our second-round revision and for these helpful suggestions. We have accordingly made additional clarifications regarding single-AAE extrapolation and the distinction between particle-size effects and coating-related lensing in the revised manuscript. Our point-by-point responses are provided below (in blue).

Comment 1: Single-AAE extrapolation. I appreciate your added uncertainty analysis. However, the fundamental physical concern remains: coated aerosol absorption is a mixture of BC, BrC, other species, and the total lensing effects, each with different spectral behavior. While you acknowledge this as a limitation, perhaps it can be made more explicit in the Conclusions that the use of a single AAE_{coated} for spectral extrapolation could affect the derived spectral shape of lensing, particularly so at short wavelengths (which would decrease the impact/amount of BrC).

Response: We appreciate this insightful comment. We agree that the coated-aerosol absorption spectrum reflects the combined contributions of BC, BrC, other absorbing species, and coating-related lensing, which need not share the same spectral dependence. Therefore, representing this mixture with a single AAE_{coated} can introduce uncertainty into the extrapolated coated-aerosol absorption spectrum and, consequently, into the derived spectral shape of lensing, especially at wavelengths far from the directly measured 870 nm channel. We have therefore made this limitation more explicit in the Conclusions as follows:

"*Another source of uncertainty arises from the spectral retrieval procedure. Specifically, representing the mixed coated-aerosol absorption with a single* AAE_{coated} *for spectral extrapolation may bias the extrapolated coated-aerosol absorption spectrum and hence the derived spectral shape of lensing, particularly at short wavelengths. Because BC, BrC, other absorbing species, and coating-related lensing need not share the same spectral dependence, this approximation may also affect the inferred role of BrC-related processes in the short-wavelength apparent lensing signal; this interpretation is therefore treated cautiously.*" (Lines 535–542)

Comment 2: Size effects vs. lensing. Recent work published in ACP (Masoom et al., 2026; Tiwari et al., 2026) demonstrates that size changes could be confused with lensing effects. Masoom et al. (2026) demonstrated that large accumulation-mode particles can produce concave spectral curvature in AOD, highlighting the importance of particle size in shaping spectral optical properties. Tiwari et al. (2026) further showed that BC microphysical evolution drives nonlinear regional contrasts in optical properties, underscoring the need to distinguish between microphysical changes and lensing effects. Perhaps a brief mention acknowledging that the present method does not distinguish, and that future work combining size-resolved measurements would be valuable.

Response: We appreciate this valuable suggestion. We agree that particle size and other microphysical changes can modify aerosol spectral optical properties independently of, or together with, coating-related lensing. Consequently, spectral features attributed to lensing may in part reflect microphysical evolution that the present framework does not explicitly resolve. Following your suggestion, we have cited Masoom et al. (2026) and Tiwari et al. (2026) and revised the Conclusions to make this limitation explicit:

"*Recent studies further show that particle microphysics can alter spectral optical behavior. Masoom et al. (2026) attributed concave spectral curvature in AOD to unusually large accumulation-mode particles, while Tiwari et al. (2026) demonstrated nonlinear optical and radiative responses to changes in BC microphysics and column loading. Such size- and microphysics-driven effects may overlap with spectral signatures attributed to coating-related lensing; because the present PAX-ISS framework does not explicitly distinguish these contributions, the inferred lensing spectrum should not be interpreted as uniquely determined by coating effects alone.*" (Lines 520–528)

We also clarified that the simultaneously measured SMPS size-distribution data provided in the accompanying data set were not incorporated into the present optical decomposition (Lines 530–535), and we strengthened the future-work statement to recommend integrating size-resolved measurements and multi-component

characterizations (Lines 545–549).

Thank you again for these constructive suggestions. We believe that these revisions have improved the discussion of methodological uncertainties and clarified the scope and limitations of the proposed approach.