S36a How does the polar dust affect the correlation between dust covering factor and Eddington ratio in type 1 quasars selected from the SDSS DR16?

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We revisit the dependence of the covering factor (CF) of dust torus on physical properties of active galactic nuclei (AGNs) by taking into account an AGN polar dust emission. The CF is converted from a ratio of infrared (IR) luminosity contributed from AGN dust torus ($L_{\rm IR}^{\rm torus}$) and AGN bolometric luminosity ($L_{\rm bol}$), by assuming a nonlinear relation between luminosity ratio and intrinsic CF. We select 37,181 type 1 quasars at $z_{\rm spec} < 0.7$ from the Sloan Digital Sky Survey (SDSS) Data Release (DR) 16 quasar catalog. Their $L_{\rm bol}$, black hole mass ($M_{\rm BH}$), and Eddington ratio ($\lambda_{\rm Edd}$) are derived by spectral fitting with `QSFit`. We conduct spectral energy distribution decomposition by using `X-CIGALE` with a clumpy torus and polar dust model to estimate $L_{\rm IR}^{\rm torus}$ without being affected by the contribution of stellar and AGN polar dust to IR emission. For 5752 quasars whose physical quantities are securely determined, we perform a correlation analysis on CF and (i) $L_{\rm bol}$, (ii) $M_{\rm BH}$, and (iii) $\lambda_{\rm Edd}$. As a result, anticorrelations for CF–$L_{\rm bol}$, CF–$M_{\rm BH}$, and CF–$\lambda_{\rm Edd}$ are confirmed. We find that incorporating the AGN polar dust emission makes those anticorrelations stronger compared to those without considering it. This indicates that polar dust wind probably driven by AGN radiative pressure is one of the key components to regulate obscuring material of AGNs (Toba et al. 2021a, ApJ, 912, 91).