## Understanding day-night differences of dust activities over the dust belt of North Africa, the Middle East, and Asia

Jacob Zora-Oni Tindan<sup>1</sup>, Qinjian Jin<sup>1</sup>, Bing Pu<sup>1</sup>

<sup>1</sup>Department of Geography and Atmospheric Science, University of Kansas, Lawrence, KS, USA

5 Correspondence to: Jacob Zora-Oni Tindan (jtindan@ku.edu)

## **Supplementary Figures**



Figure S1: Seasonal cycle of AERONET solar (blue) CAOD and IASI daytime (red) DOD (scaled to 500 nm) over AERONET sites across the dust belt. Time is variable between 2008–2020 depending on the number of records available at individual AERONET sites.



Figure S2: Same as Fig. S1. but for IASI and AERONET nighttime observations.



Figure S3: Annual mean (Ann) and seasonal mean climatology (2008–2019) of CALIOP DOD at (a–e) daytime, (f–j) nighttime and (k–o) day-night difference. Areas where day-night differences of DOD do not pass the 95% confidence level (t-test) in (i–l) are masked out in grey.



Figure S4: Same as Fig. S3. but for dust plume height (km) from CALIOP



Figure S5: Annual (Ann) and seasonal mean surface winds climatology (2008–2020) at (a–e) daytime (9:30 a.m.), (e–h) nighttime (9:30 p.m.) and (k–o) day-night difference from MERRA-2 (unit: m s<sup>-1</sup>). Shading shows wind speed, and vectors denote wind directions. Areas where day-night differences of wind speed do not pass the 95% confidence level (t-test) in (i–l) are masked out in grey. Only differences in wind vectors significant at the 95% confidence level are shown.



Figure S6: Annual (Ann) and seasonal mean climatology (2008–2020) of (a–e) daytime (9:30 a.m.), nighttime (f–j) (9:30 p.m.) and (l–o) day-night difference of dust uplift potential calculated based on constant wind velocity threshold of 7 m s<sup>-1</sup> following Bergametti et al. (2017) and using wind speed from ERA5. Areas where day-night differences of dust uplift potential do not pass the 95% confidence level (t-test) in (l–o) are masked out in grey.



Figure S7: Annual (Ann) and seasonal mean climatology (2008–2020) of precipitation rate from IMERG 2 hours prior to IASI passing time at (a–e) daytime (7:30 a.m.), (f–j) nighttime (7:30 p.m.) and (l–o) day-night difference. Areas where day-night differences in precipitation rate do not pass the 95% confidence level (t-test) in (l-o) are masked out in grey.



Figure S8: Annual (Ann) and seasonal mean climatology (2008–2020) of planetary boundary layer (PBL) height at (ae) daytime (9:30 a.m.), (f-j) nighttime (9:30 p.m.), and (k-o) day-night differences from MERRA-2. Areas where daynight differences of PBL height do not pass the 95% confidence level (t-test) in (k-o) are masked out in grey.



Figure S9: Annual (Ann) and Seasonal mean climatology (2008–2020) of 850 hPa vertical velocity at (a)–(e) daytime (9:30 a.m., a–e), (f)–(j) nighttime (9:30 p.m.), and (k)–(o) day-night differences from the ERA5 (unit: Pa s<sup>-1</sup>). Areas where day-night differences of vertical velocity do not pass the 95% confidence level (t-test) in (k–o) are masked out in grey.