

Figure 1. The map of mean bowen ratio during the period 2003-2013 shows significant regional difference of surface property over Africa landmass.

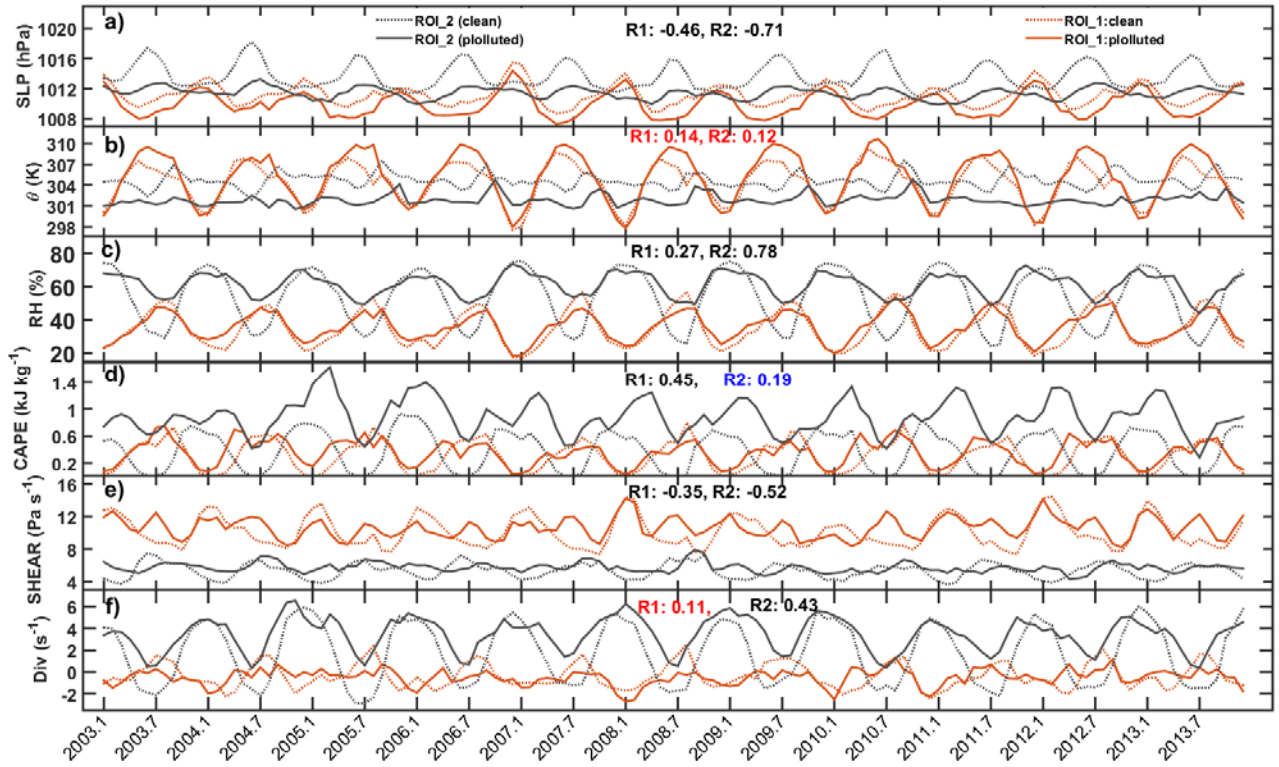


Figure 2. The time series of a) sea level pressure (SLP), b) potential temperature (θ), c) mean relative humidity (RH), d) convective available potential energy (CAPE), e) vertical wind shear (SHEAR), and f) 200 hPa divergence (Div) in ROI_1 (in orange) and ROI_2 (in black) under polluted (in solid lines) and clean (in flash lines) conditions, all of which are calculated by taking 3-month running average over monthly ECMWF ERA-Interim dataset on a $1^\circ \times 1^\circ$ grid [Dee et al., 2011]. Note that θ is calculated from air temperature at 2m above ground level. RH is the mean value of 700 and 500 hPa levels. And SHEAR is calculated from 925 hPa and 500 hPa daily horizontal wind field. Also shown are Pearson correlation coefficients (R) between the AOD differences and meteorology differences under clean (R1) and polluted (R2) conditions, of which R is shown in black (blue) while they pass the statistical significance test at 99% (95%) confidence level, and R in red indicates that it fails the test at 95% confidence level.

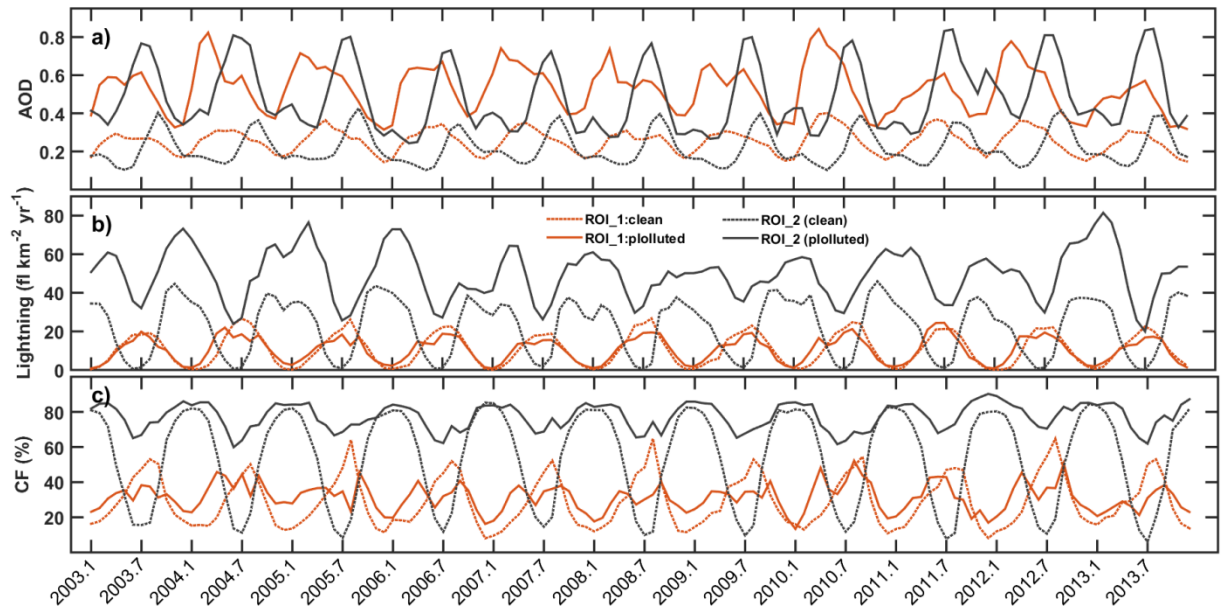


Figure 3. The time series of a) AOD from MODIS/Aqua, b) lightning flashes from LIS/TRMM, c) cloud fraction (CF) from MODIS/Aqua in ROI_1 and ROI_2 under polluted (in orange) and clean (in black) conditions, all of which are calculated by taking 3-month running mean.

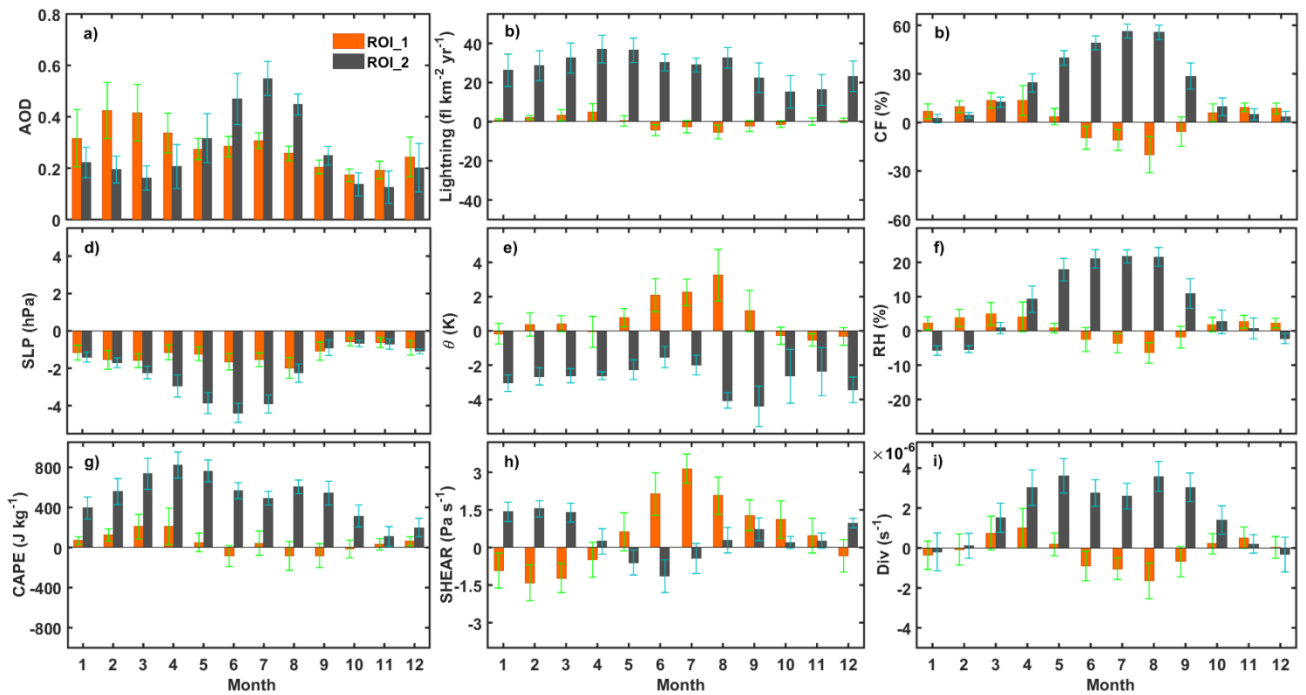


Figure 4. Differences (polluted minus clean subsets of data) of (a) AOD, (b) Lightning flashes, (c) Cloud Fraction (CF), (d) sea level pressure (SLP), (e) potential temperature (θ), (f) mean relative humidity of 700, 500 hPa levels (RH), (g) convective available potential energy (CAPE), (h) vertical wind shear (SHEAR), (i) 200 hPa divergence (Div) in ROI_1 (in orange) and ROI_2 (in black). Note that, the top third of AOD is labeled as polluted case and the bottom third is labeled as clean case. Vertical error bars represent one standard deviation.

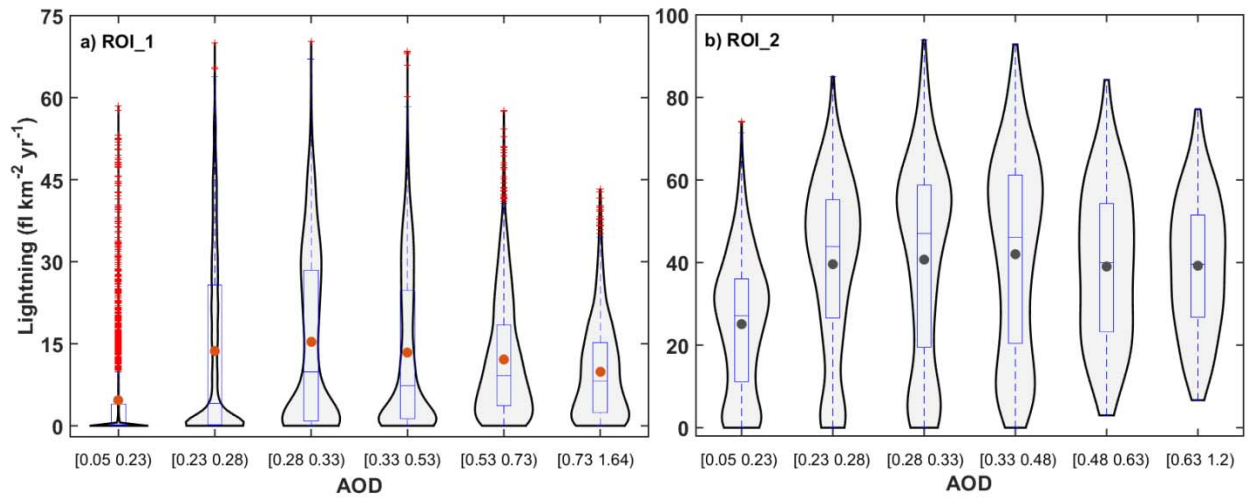


Figure 5. Violin plots showing lightning dispersion in six bins of aerosol loadings in ROI_1 (a) and ROI_2 (b). The interpretations of the boxplots and density traces are referred to the caption of Fig. 9.