Figure S1. Snapshots of non-dust aerosol simulation and the bias-corrected observations during severe dust event 1 (SD1) at March 15. Row (a) shows the non-dust PM$_{10}$ simulation (column 1) simulated by LOTOS-EUROS and bias-corrected dust surface concentration (column 2) at 10:00 CST. Similar, row (b-c) show the non-dust AOD simulation (colomn 1) and bias-corrected dust AOD (column 2) at 10:00 (b) and 12:00 (c).
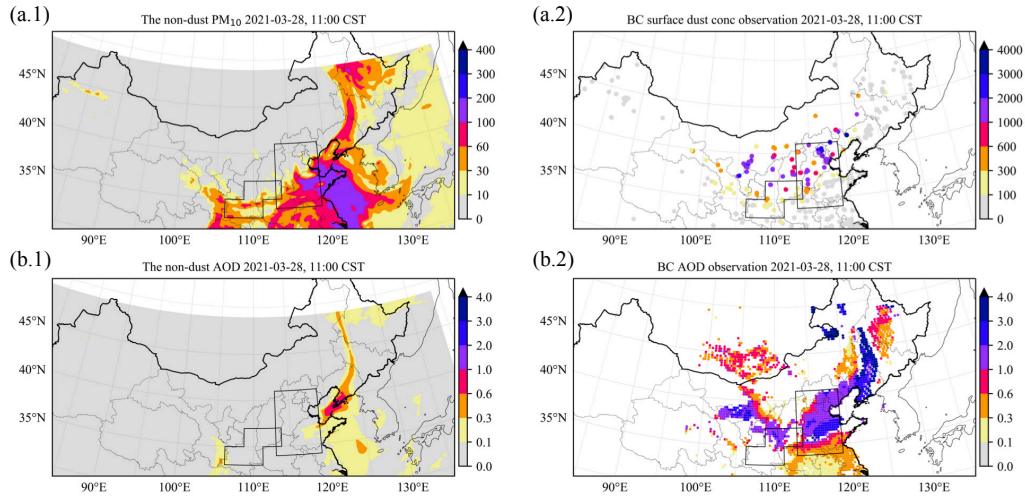
Figure S2. Snapshots of non-dust aerosol simulation and the bias-corrected observations during severe dust event 2 (SD2) at March 28. Row (a) shows the non-dust PM$_{10}$ simulation (column 1) simulated by LOTOS-EUROS and bias-corrected dust surface concentration (column 2) at 11:00 CST. Similar, row (b) show the non-dust AOD simulation (colomn 1) and bias-corrected dust AOD (column 2) at 11:00.
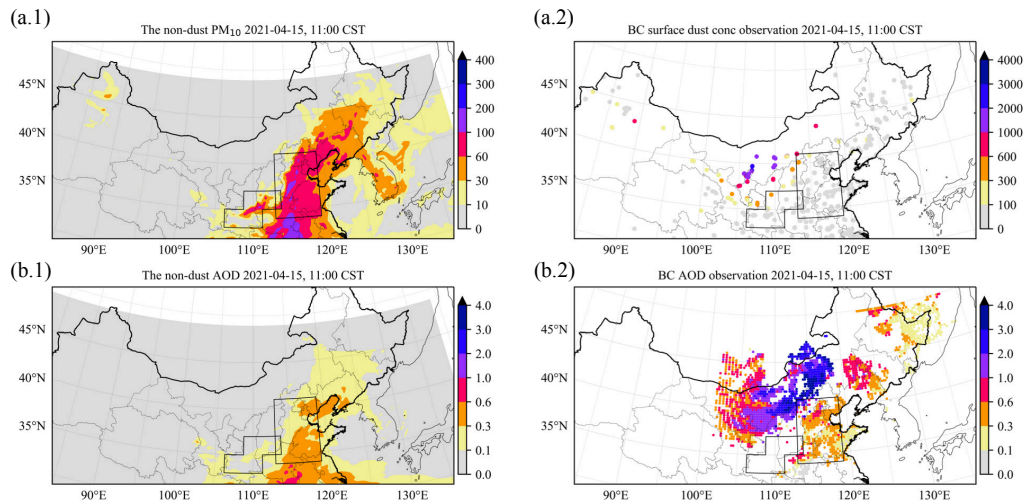

Figure S3. Snapshots of non-dust aerosol simulation and the bias-corrected observations during severe dust event 3 (SD3) at April 15. Row (a) shows the non-dust PM$_{10}$ simulation (column 1) simulated by LOTOS-EUROS and bias-corrected dust surface concentration (column 2) at 11:00 CST. Similar, row (b) show the non-dust AOD simulation (colomn 1) and bias-corrected dust AOD (column 2) at 11:00.