

Supplementary material

Aerosol Atmospheric Rivers as Drivers of Extreme Poor Air Quality Events and Record

PM_{2.5} Levels

Sudip Chakraborty^{1*}, Bin Guan^{1,2}, Duane E. Waliser¹, Arlindo M. da Silva³, Jonathan H Jiang¹

¹Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA

²Joint Institute for Regional Earth System Science and Engineering, University of California, Los Angeles, CA, USA

³ Global Modeling and Assimilation Office, NASA/Goddard Space Flight Center, Greenbelt, MD, USA

*Corresponding Author email: sudip.chakraborty@jpl.nasa.gov

Supplementary Figures and Table:

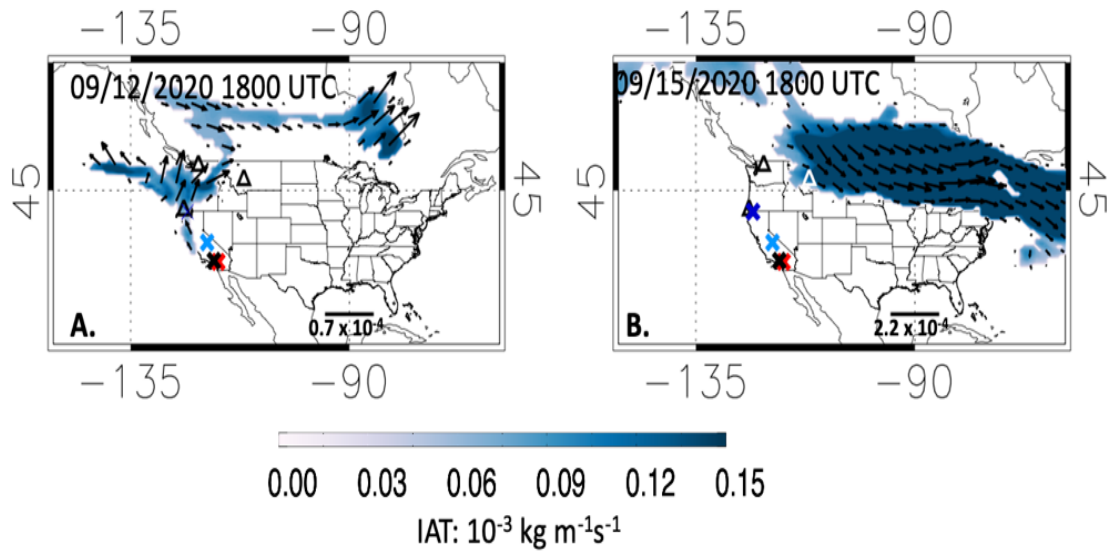


Figure S1. Same sulfate river as in Figure 1 on 09/12/2020 at 1800 UTC and (B) 09/15/2020 at 1800 UTC. Shading shows the IAT values and the arrows represent the vectors.

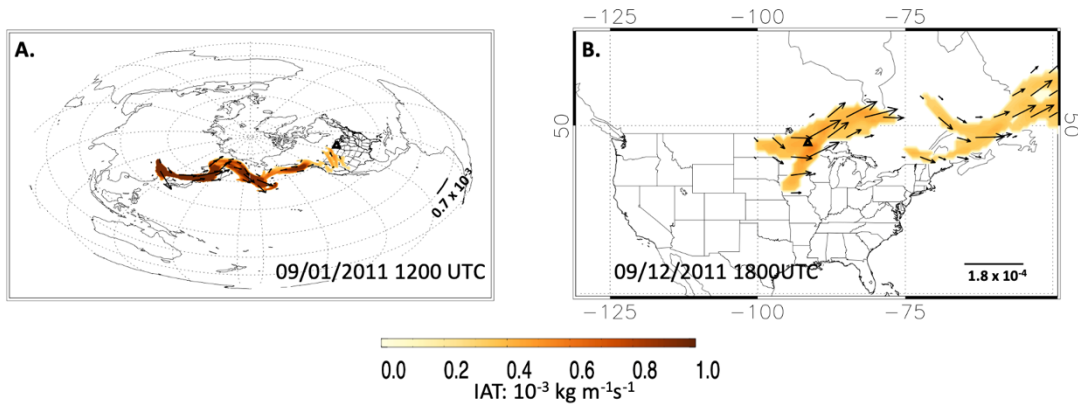


Figure S2. Same dust river as in Figure 1 on 09/01/2011 at 1200 UTC and (B) 09/12/2011 at 1800 UTC. Shading shows the IAT values and the arrows represent the vectors.

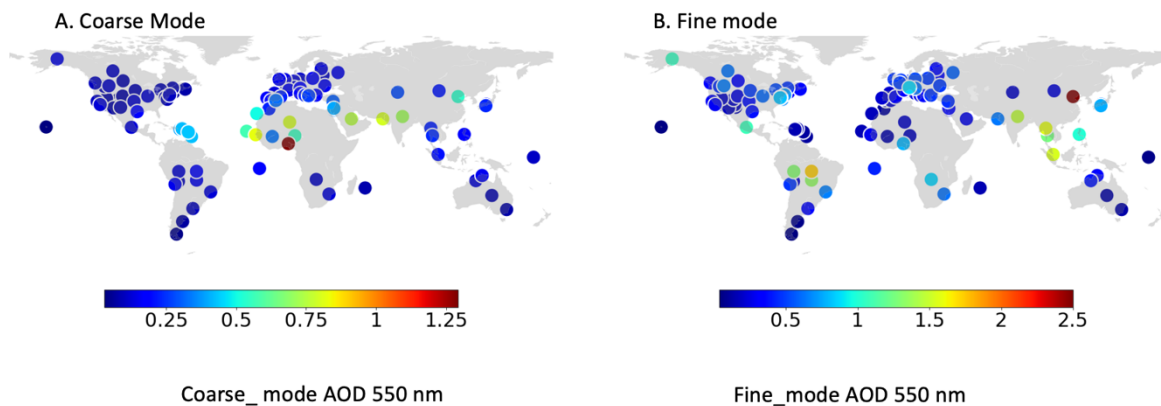


Figure S3. 98th percentile thresholds of (A) coarse mode and (B) fine mode AOD at 550 nm from AERONET stations. Each station has a minimum of 10 years of data.

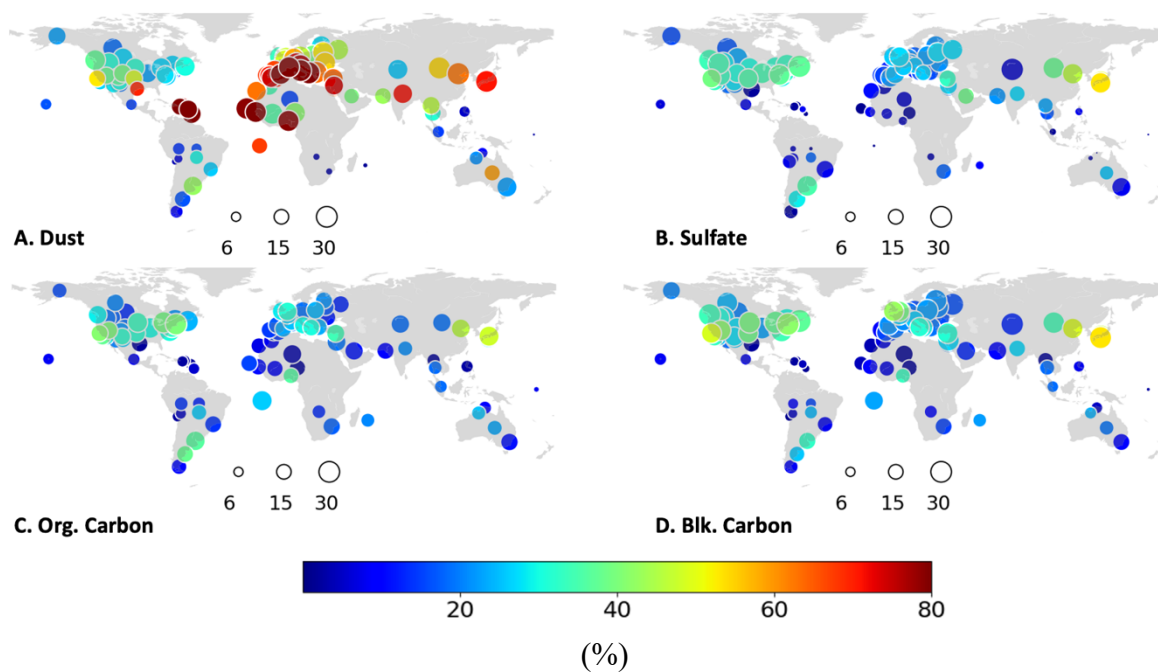


Figure S4. Same as in Figure 4 for AAR-AOD association, but for the coarse mode.

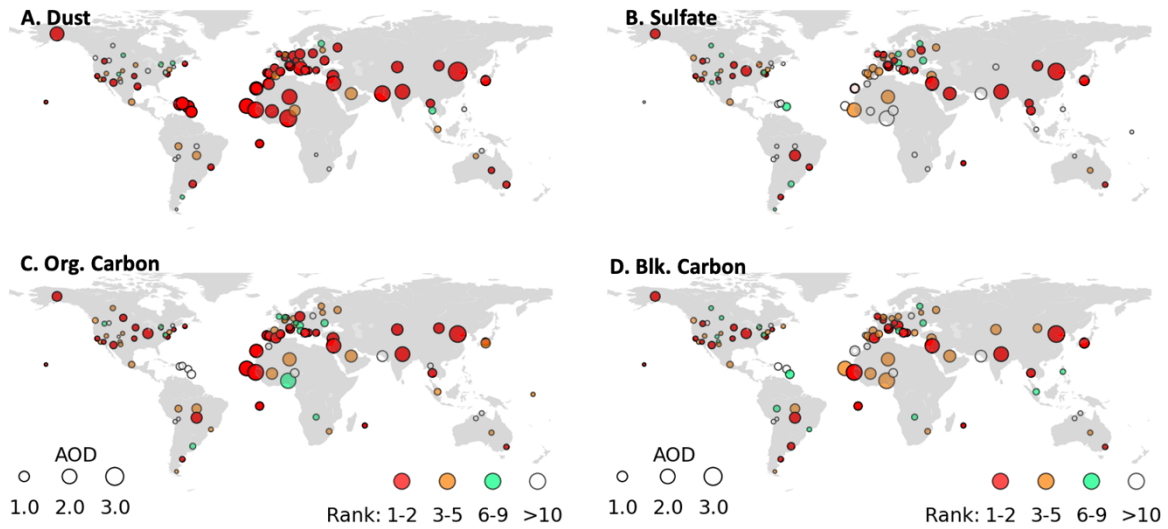


Figure S5. Same as in Figure 4 for AAR-AOD rank, but for the coarse mode.

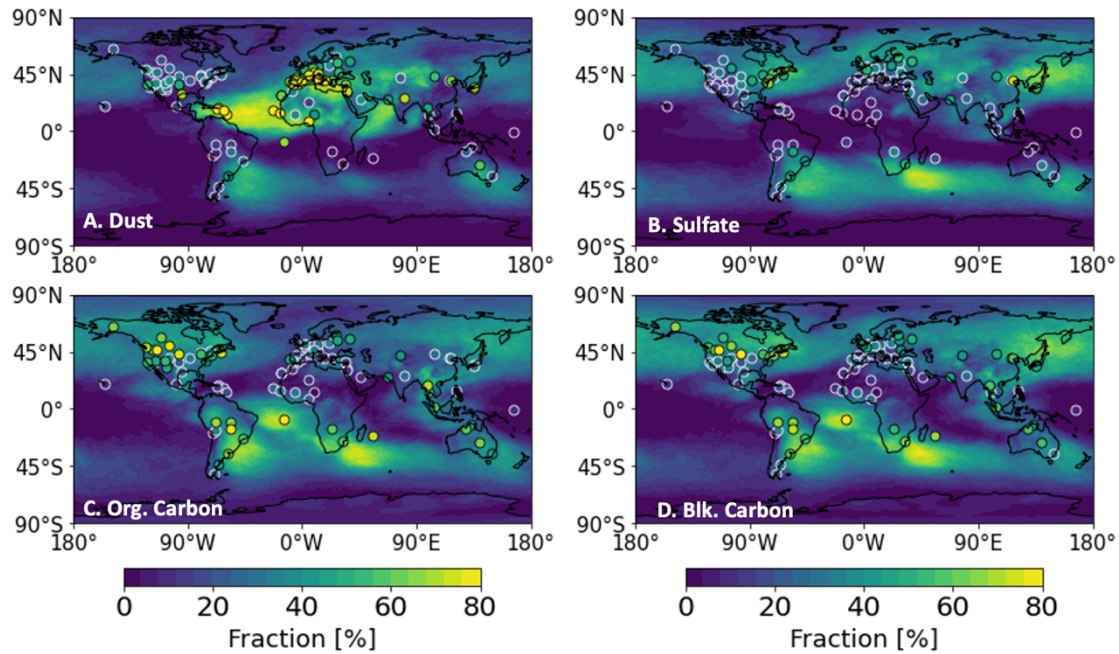


Figure S6. Fraction of extreme AOD values (AOD > 98th percentile between 1997-2020) associated with AAR events (shading, %) from MEERA-2 data between 1997-2020 for (A) Dust, (B) Sulfate, (C) Organic Carbon, and (D) Black Carbon AARs. The bubbles show the association between AARs and extreme AOD values from the AERONET stations from

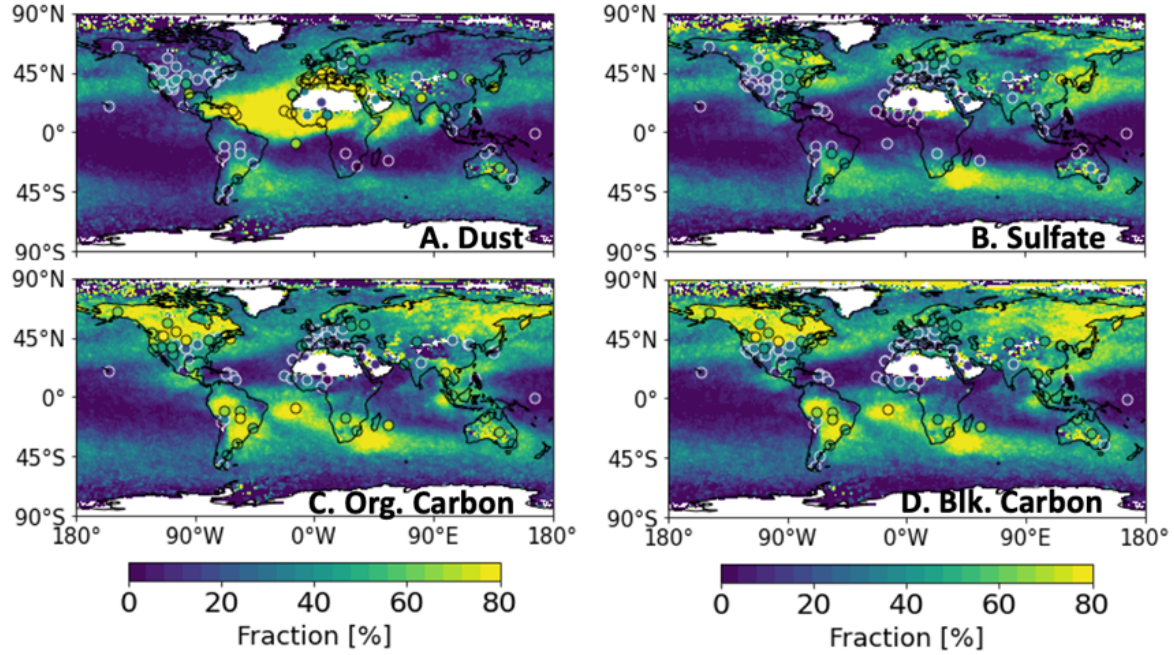


Figure S7. Same as in Figure S6 for AAR-AOD rank, but for MODIS AOD data between 2002-2020.

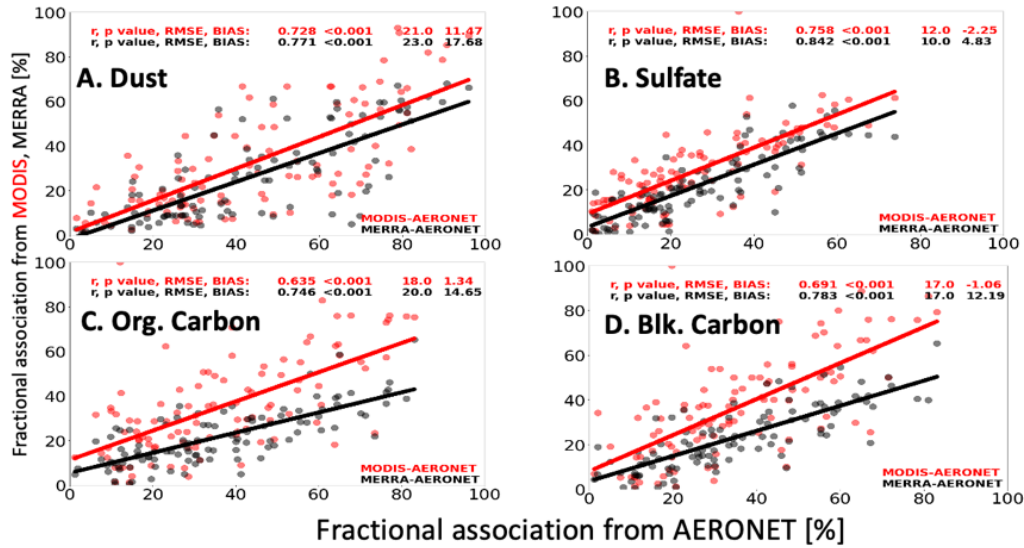


Figure S8. Scatterplots of AAR-AOD association using AERONET AOD data (X axis) and MERRA-2 / MODIS data (Y axis) over the AERONET stations. AARs association with AOD values from AERONET-MODIS (MERRA-2) are shown in red (black) color. For dust, coarse mode AOD data from AERONET stations have been used. For other species, fine mode AOD data have been used.

Supplementary Table S1: List of datasets used.

Data set	Parameter	Resolution	Version / Links to the datasets
MODIS	AOD	$1^{\circ} \times 1^{\circ}$	Daily, Level 3 MOD08 data
MERRA-2	AOD	$0.625^{\circ} \times 0.5^{\circ}$	inst3_2d_gas_Nx: 2d, 3-Hourly, Instantaneous, Single-Level, Assimilation V5.12.4 (M2I3NXGAS, https://disc.gsfc.nasa.gov/datasets/M2I3NXGAS_5.12.4/summary)
AAR data base	AAR location and shape	$0.625^{\circ} \times 0.5^{\circ}$	https://doi.org/10.25346/S6/CXO9PD
IMPROVE network	PM _{2.5}	Stations	http://views.cira.colostate.edu/fed/
AERONET data	Coarse and fine mode AOD	Stations	Version 2, https://aeronet.gsfc.nasa.gov/cgi-bin/webtool_aod_v3