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Supporting Information for

Aerosols in the Energy Exascale Earth System Model (E3SM) version 1: New developments and their impacts on radiative forcing

Hailong Wang^{1*}, Richard Easter¹, Rudong Zhang¹, Po-Lun Ma¹, Balwinder Singh¹, Kai Zhang¹, Dilip Ganguly^{1,2}, Philip Rasch¹, Susannah Burrows¹, Steve Ghan¹, Sijia Lou¹, Yun Qian¹, Yang Yang^{1,3}, Yan Feng⁴, Mark Flanner⁵, Ruby Leung¹, Xiaohong Liu^{6,9}, Manish Shrivastava¹, Jian Sun¹, Qi Tang⁷, Shaocheng Xie⁷, Jin-Ho Yoon^{1,8}

¹Pacific Northwest National Laboratory, Richland, WA
²Indian Institute of Technology (IIT) Delhi, Hauz Khas, New Delhi, India.
³Nanjing University of Information Science and Technology, Nanjing, Jiangsu, China
⁴Argonne National Laboratory, Lemont, IL
⁵University of Michigan, Ann Arbor, MI
⁶University of Wyoming, Laramie, WY
⁷Lawrence Livermore National Laboratory, Livermore, CA
⁸Gwangju Institute of Science and Technology, Gwangju, South Korea
⁹now at Texas A&M University, College Station, TX

*Correspondence to: <u>Hailong.Wang@pnnl.gov</u>

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Figure S1: Horizontal distribution of annual-average SOA column burden from (a) the CTRL simulation (with new SOAG emissions) and (b) the noNewSOA simulation (with old SOAG emissions).



Figure S2: Vertical-meridional distribution of zonal-annual-average SOA mixing ratio from (a) the CTRL simulation (with new SOAG emissions) and (b) the noNewSOA simulation (with old SOAG emissions).



Figure S3: Horizontal distribution of AOD differences between CAM5.3, CTRL (year 2007) and CTRL15 (2000-2014), and observations (OBS) with gray shading in polar regions indicating missing value. Numbers are the corresponding global mean.



Figure S4: same as Fig. S3 but for AOD differences between CTRL and other sensitivity experiments (noNewConvTran, noNewH2SO4, noNewSOA and noNewResusp) with the individual new treatment excluded.



Figure S5: Same as Fig. 16 but for the all-sky total radiative flux (i.e., ERFari+aci, effective radiative forcing due to aerosol-radiation interaction and aerosol-cloud interaction)



Figure S6: change in monthly mean SW radiative flux (W m⁻²) at TOA (a, b) and the surface (c, d) under all sky and clear sky, respectively, (e) surface temperature, TS (K), and (f) snow water equivalent (SWE, mm) due to the new treatment related to BC and dust in snow (NewInSnow)



Figure S7: Map of site location for the OA and SOA measurements used in Fig. 6. Note that some sites contribute to more than one sample point in the scatterplots.