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WRF-Chem simulation of aerosol seasonal variability in the San Joaquin Valley

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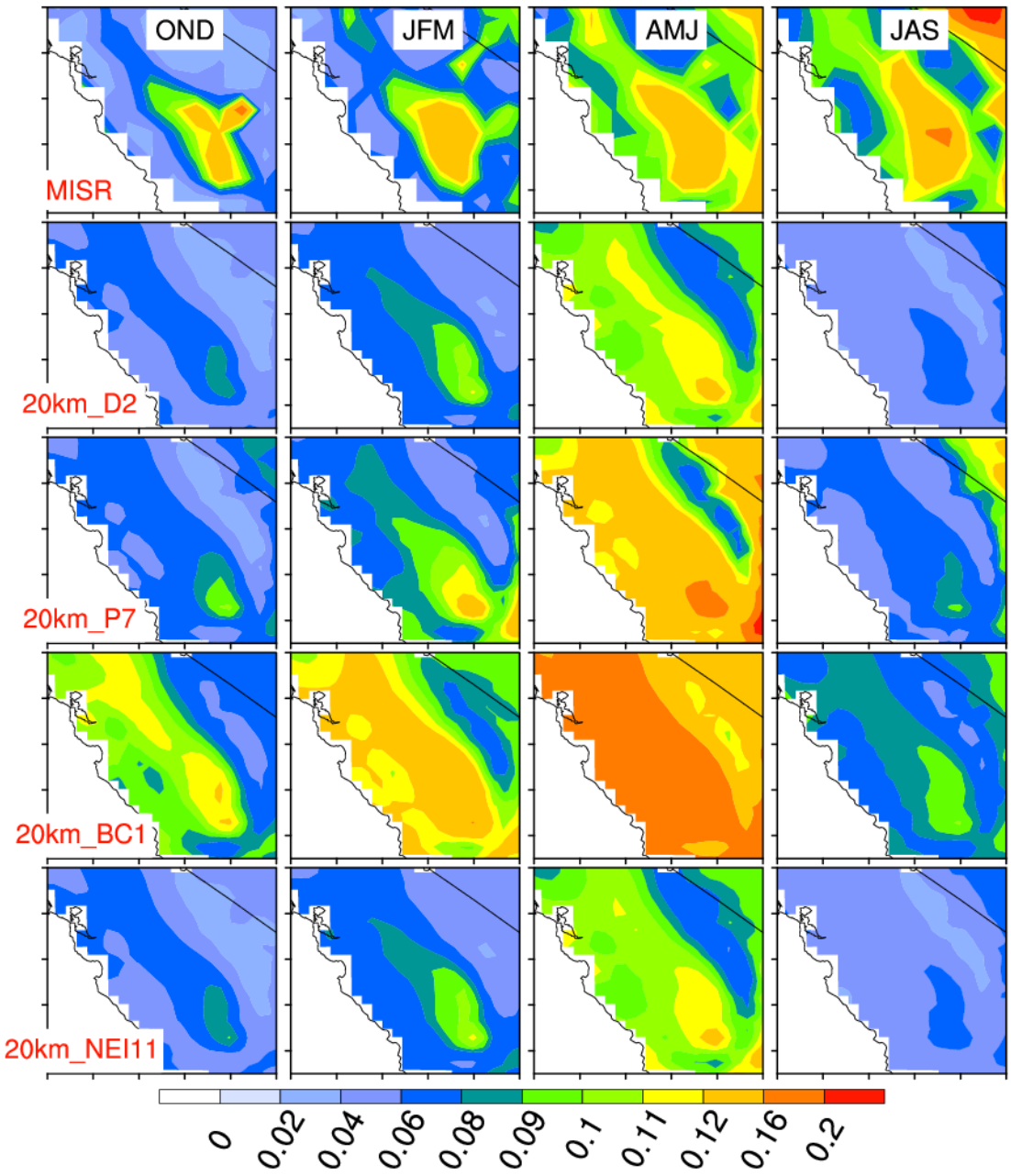
Supplementary Table 1. Correlation with surface observations for meteorological variables at Fresno, CA

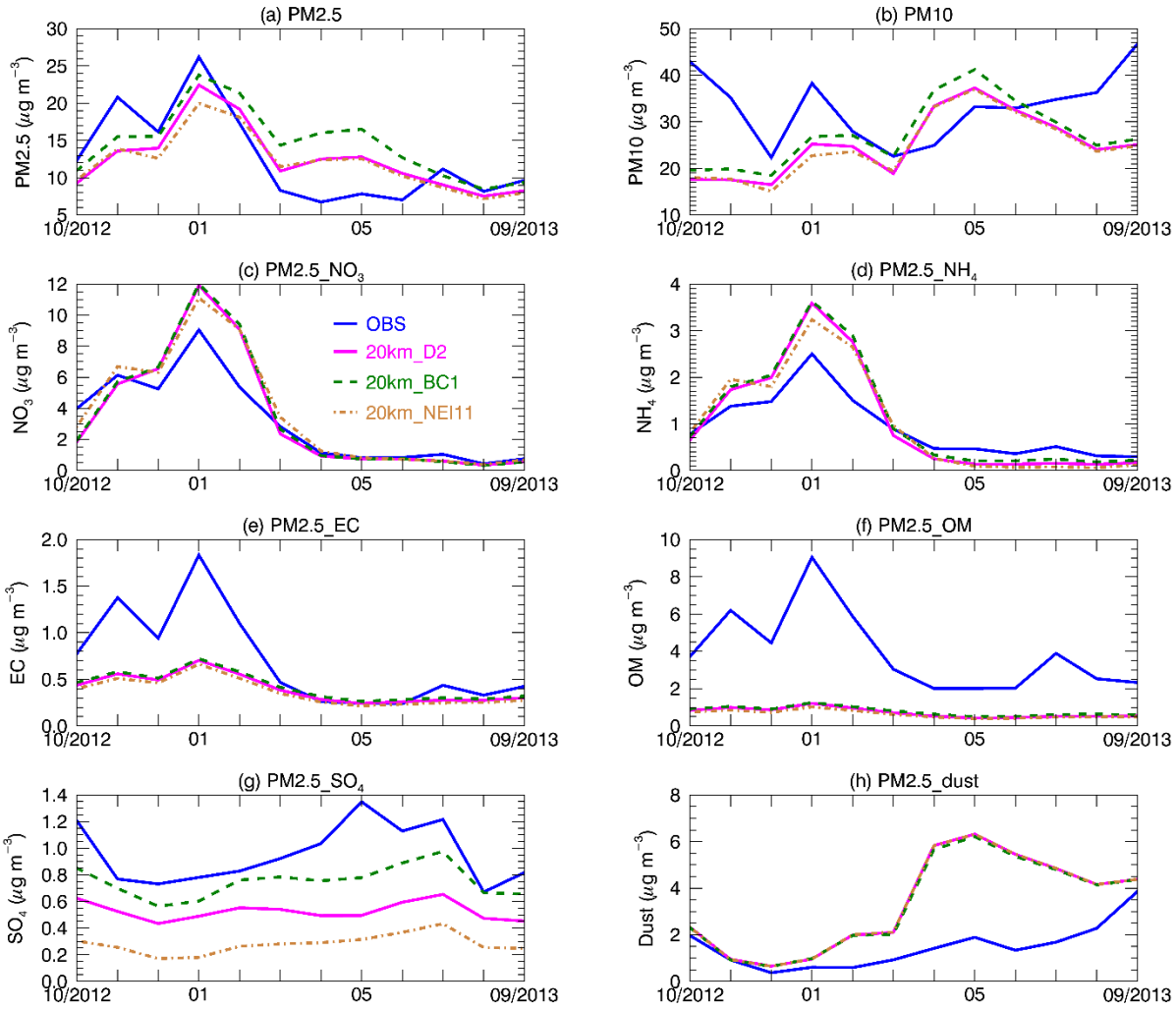
	4km_D2	20km_D2	20km_P7
T	0.94	0.94	0.94
RH	0.98	0.98	0.96
Wind	0.83	0.84	0.85
Rain	0.97	0.97	0.97

Supplementary Table 2. Bias for surface meteorological variables at Fresno, CA

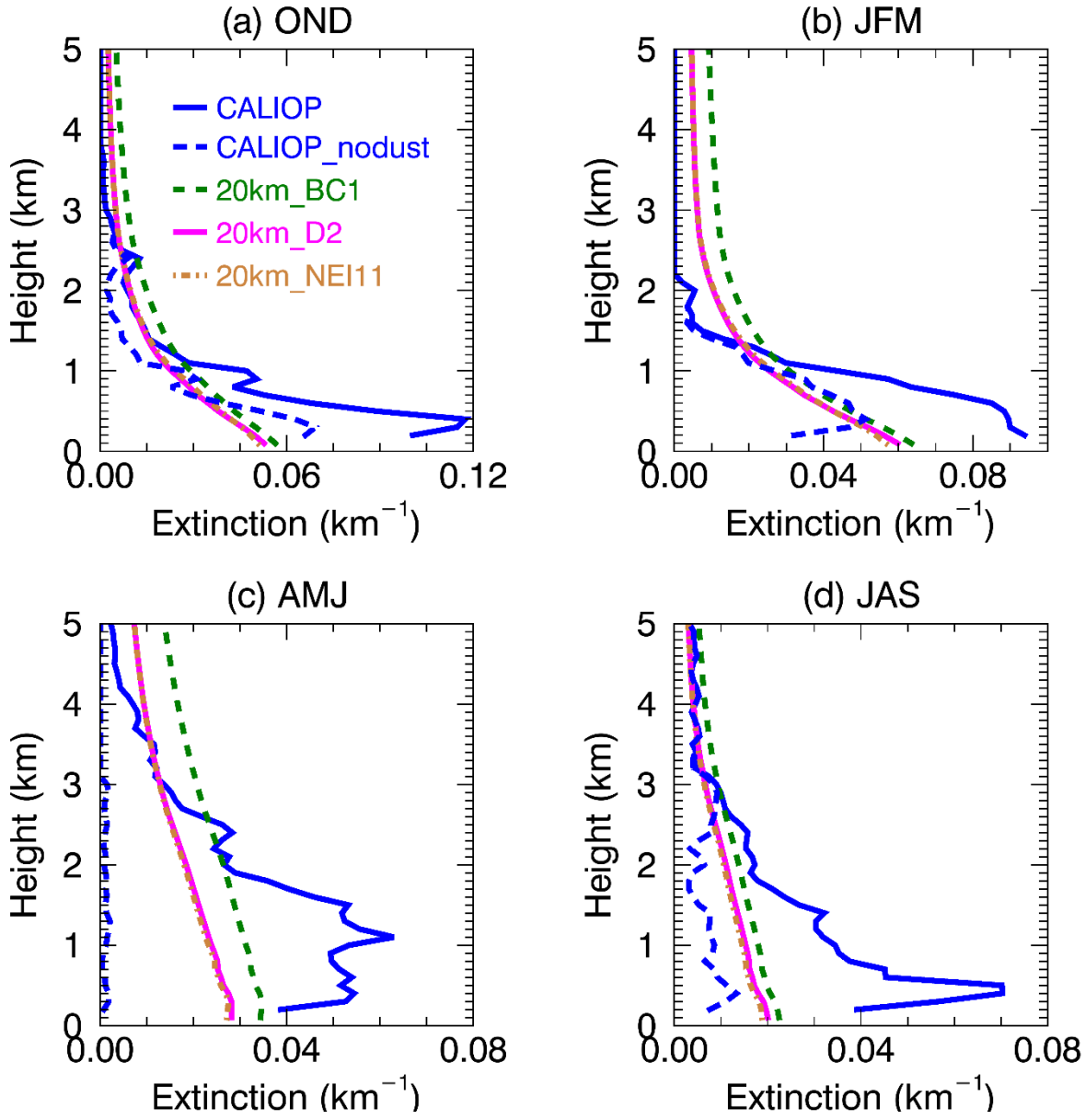
	Cold season			Warm season		
	4km_D2	20km_D2	20km_P7	4km_D2	20km_D2	20km_P7
T (K)	3.89	3.56	3.69	2.44	1.50	1.35
RH (%)	-9.78	-14.55	-19.35	-9.48	-9.32	-11.16
Wind ($m\ s^{-1}$)	-0.67	-1.00	-1.05	0.78	-0.16	-0.49
Rain ($mm\ day^{-1}$)	-0.15	0.14	-0.03	-0.06	-0.03	-0.04



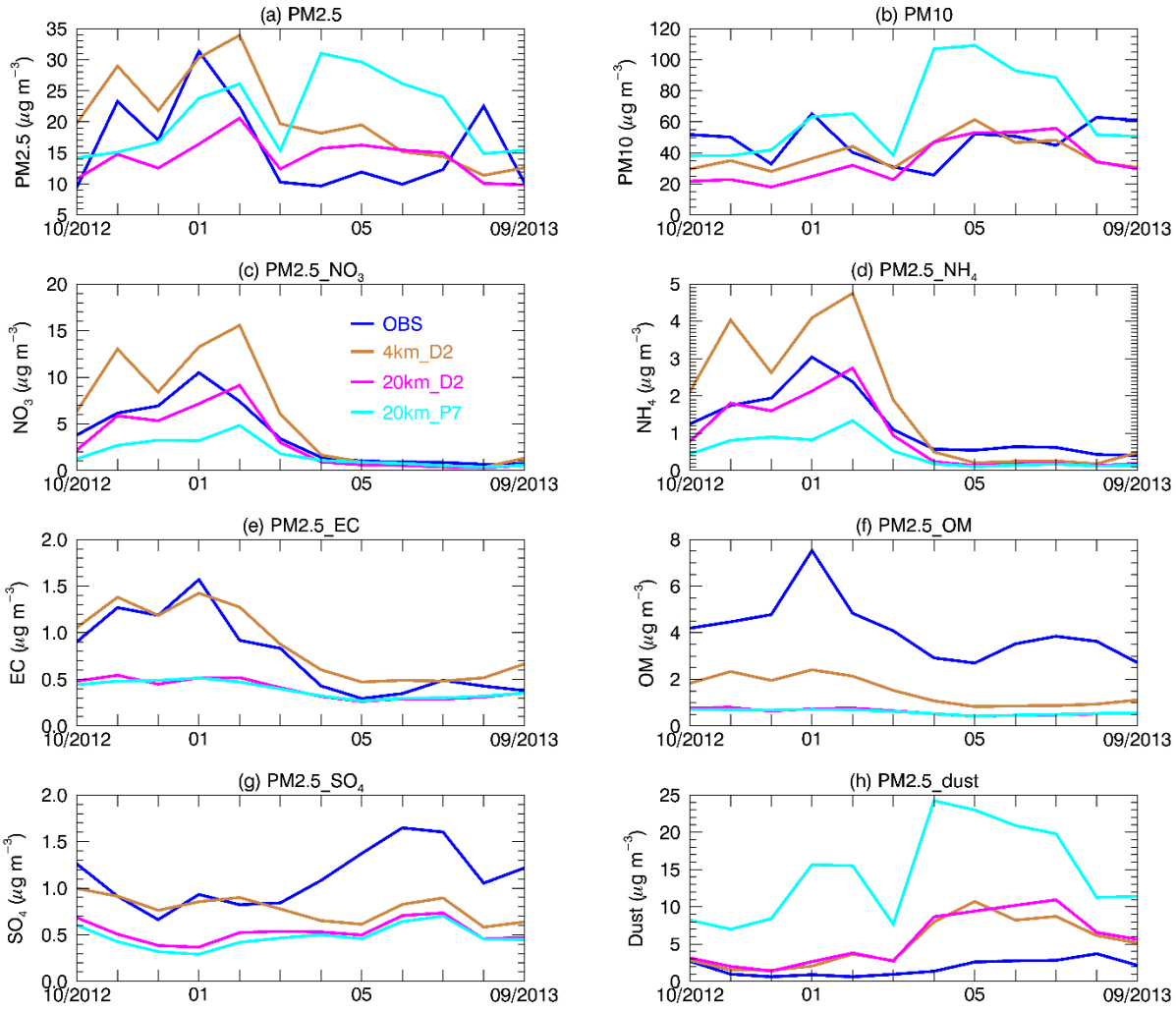
Supplementary Figure 1. Spatial distribution of seasonal mean 550 nm AOD from MISR and the WRF-Chem (20km_D2, 20km_P7, 20km_BC1 and 20km_NEI11) simulations in WY2013. OND: October-November-December; JFM: January-February-March; AMJ: April-May-June; JAS: July-August-September. The 20km_BC1 run is the same as the 20km_D2 run except that chemical boundary conditions use MOZART-4 original data. The 20km_NEI11 run is the same as the 20km_D2 run except with NEI11 anthropogenic emissions.



Supplementary Figure 2. Aerosol mass (μg m^{-3}) for different species from OBS, the 20km_D2, 20km_BC1 and 20km_NEI11 simulations at Fresno, CA. NH_4 observations are from EPA; other observations are from IMPROVE. $PM_{2.5}$_NO_3 represents NO_3 with diameter ≤ 2.5 μm. Similar definition for NH_4, EC, OM, SO_4 and dust in the figures.



Supplementary Figure 3. Vertical distribution of seasonal mean 532 nm aerosol extinction coefficient (km^{-1}) from CALIOP, CALIOP_nodust, and the WRF-Chem (20km_D2, 20km_BC1 and 20km_NEI11) simulations over the red box region in Fig. 1a in WY2013.



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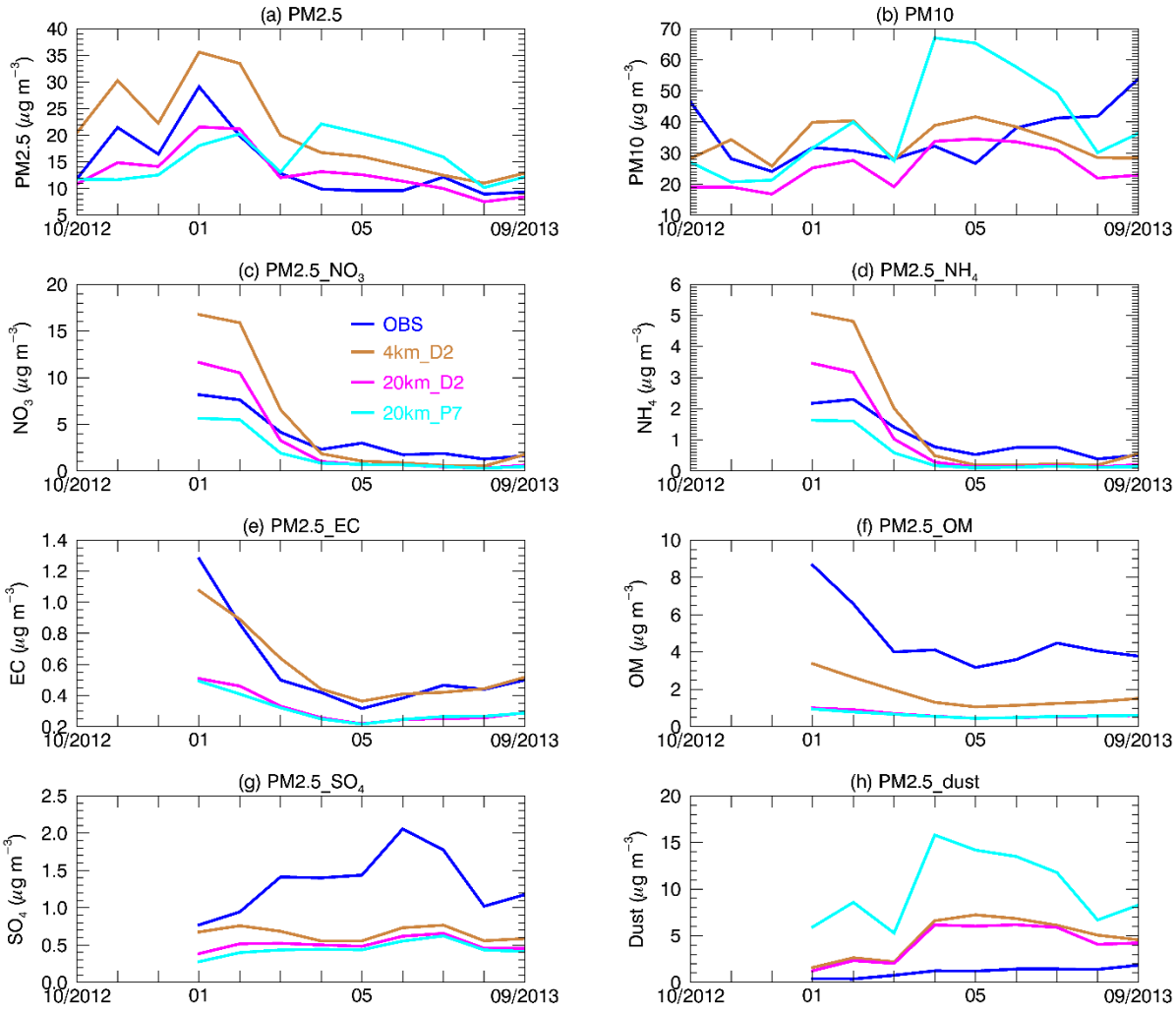
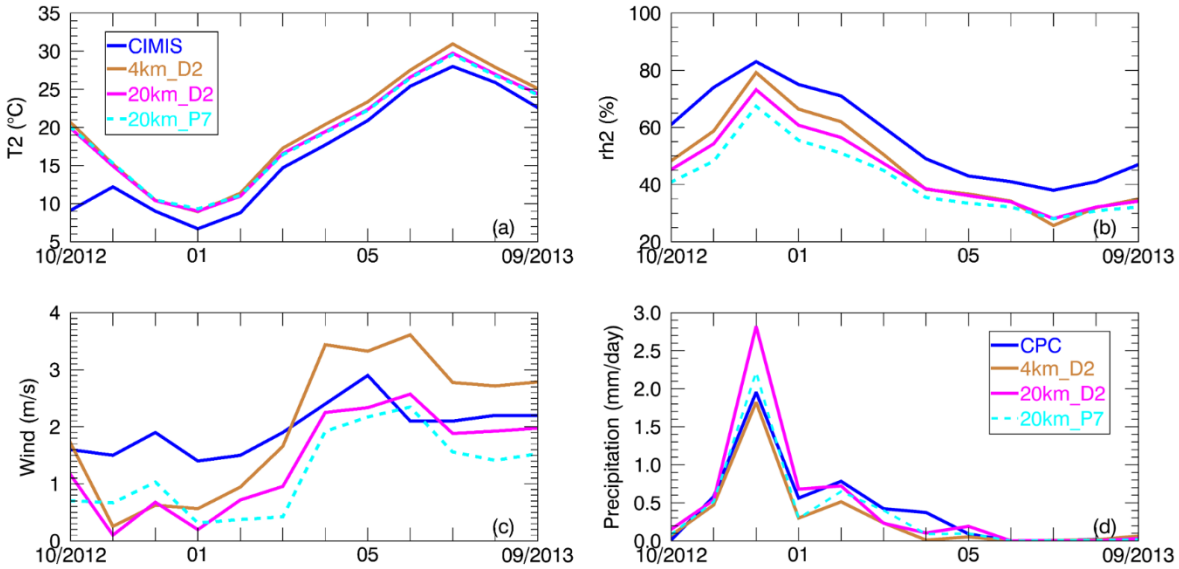
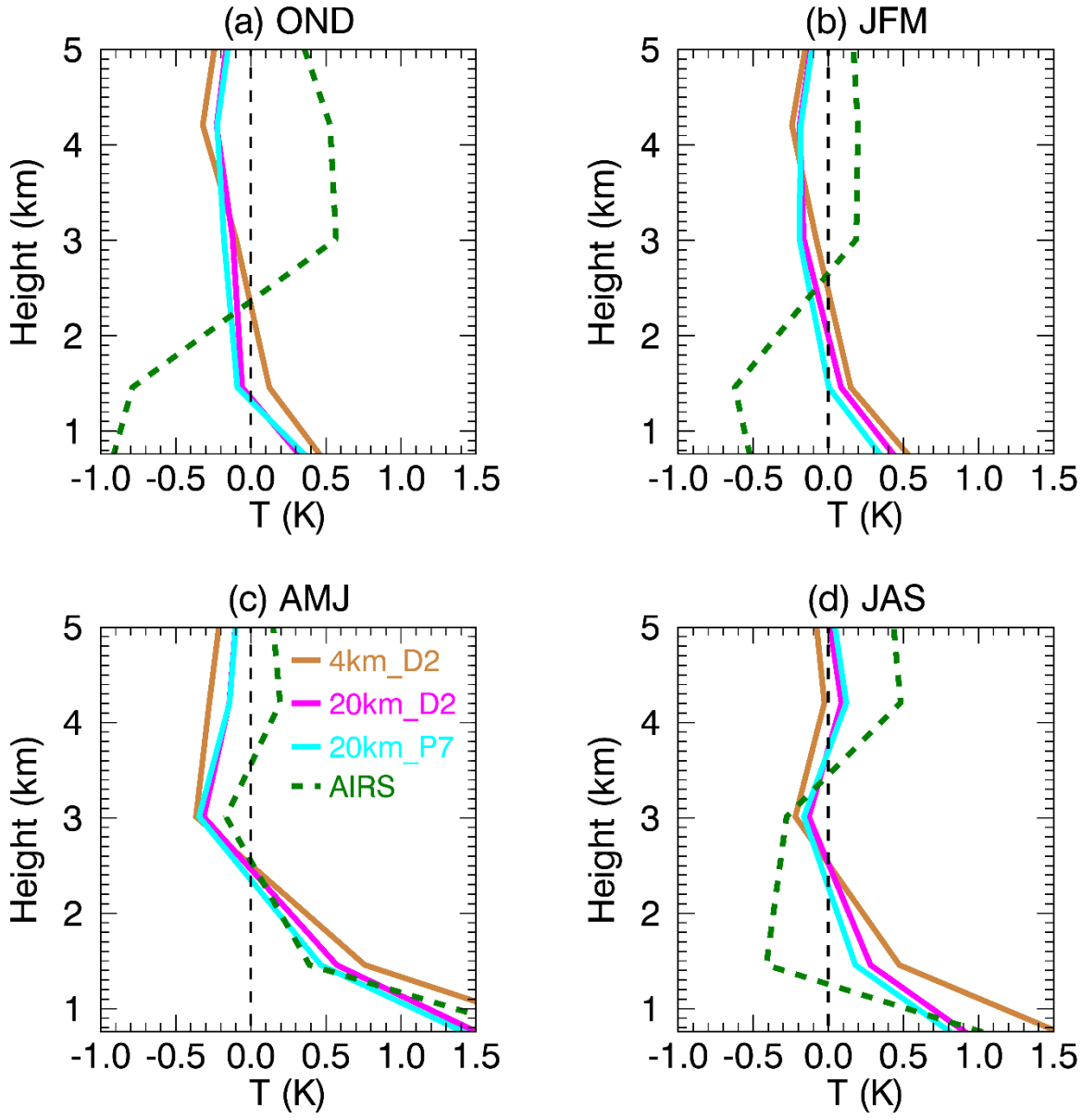
23 Supplementary Figure 4. Aerosol mass (μg m^{-3}) for different species from EPA CSN (OBS), the
24 4km_D2, 20km_D2 and 20km_P7 simulations at Bakersfield, CA. $PM_{2.5}$_NO_3 represents NO_3
25 with diameter $\leq$ 2.5 μm. Similar definition for SO_4, EC, OM, NH_4 and dust in the figures.



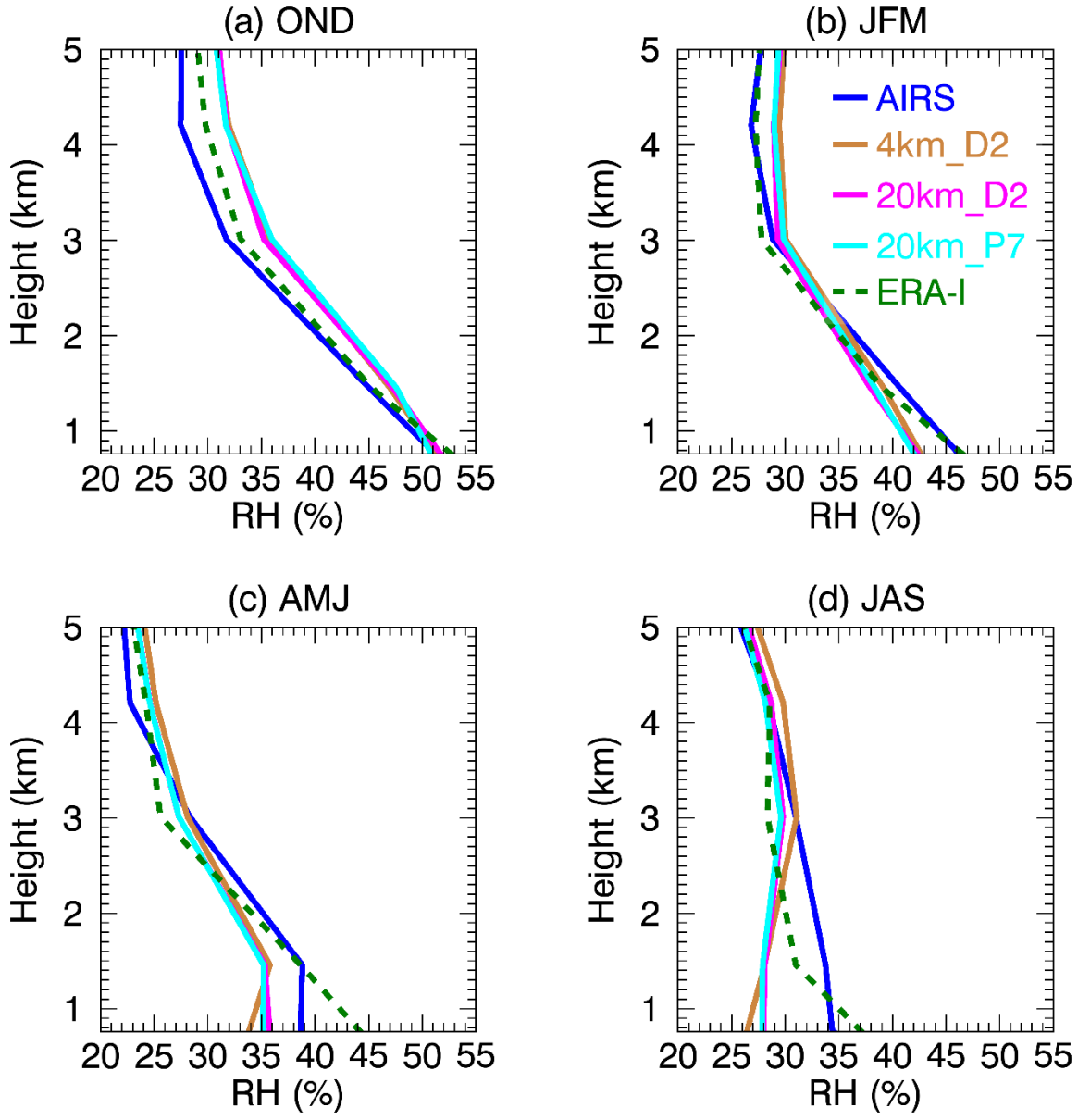
Supplementary Figure 5. Aerosol mass (μg m^{-3}) for different species from EPA CSN (OBS), the 4km_D2, 20km_D2 and 20km_P7 simulations at Modesto, CA.



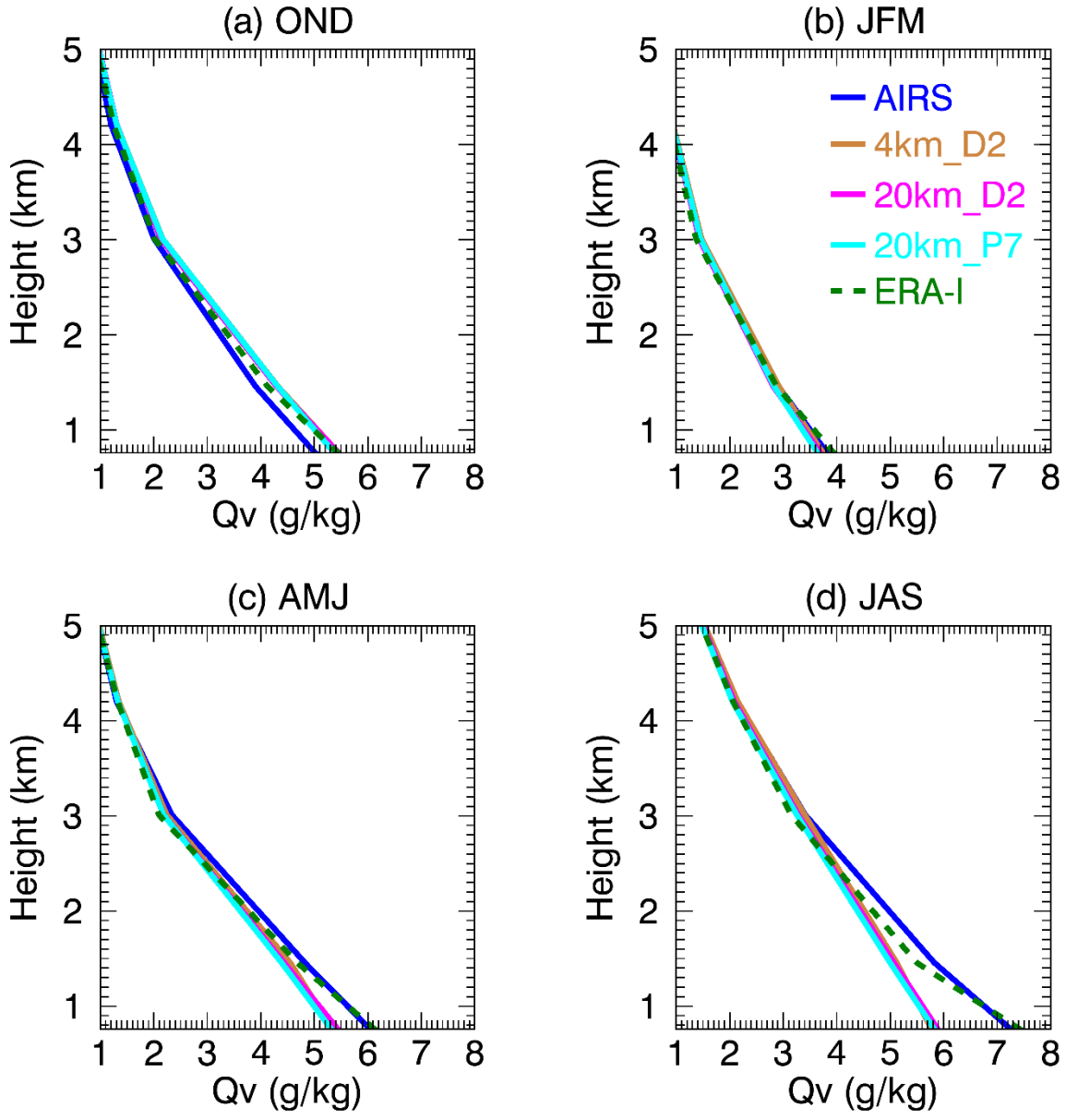
Supplementary Figure 6. Monthly mean of (a) 2-m temperature (°C); (b) 2-m relative humidity (%); (c) 10-m wind speed (m/s); (d) precipitation (mm/day) at Fresno, CA. The 20km (not shown) run is similar to the 20km_D2 run while the 4km (not shown) run is similar to the 4km_D2 run.



Supplementary Figure 7. Vertical profile of seasonal mean temperature (K) bias in the WRF-Chem simulations and AIRS comparing to ERA-Interim. The 20km run (not shown) is similar to the 20km_D2 run while the 4km run (not shown) is similar to the 4km_D2 run.



Supplementary Figure 8. Vertical profile of seasonal mean relative humidity (%) in the WRF-Chem simulations, AIRS and ERA-Interim. The 20km run (not shown) is similar to the 20km_D2 run while the 4km run (not shown) is similar to the 4km_D2 run.



Supplementary Figure 9. Vertical profile of seasonal mean specific humidity (g kg^{-1}) in the WRF-Chem simulations, AIRS and ERA-Interim. The 20km run (not shown) is similar to the 20km_D2 run while the 4km run (not shown) is similar to the 4km_D2 run.