1 Supplementary of:

Chemical characteristics of submicron-particle at the central Tibet Plateau: influence of long-range transport

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18 Model description

19 The 3-D Regional chEmical trAnsport Model (REAM) has a horizontal resolution of 36 km. REAM features 30 20 vertical layers in the troposphere and 5 vertical layers in the stratosphere, with a model top at 10 hpa. Meteorological 21 fields in REAM are from Weather Research and Forecast model (WRF) assimilations, and are updated every 5 22 minutes for convective transport related inputs and every 30 minutes for the others. The WRF model is constrained 23 by National Centers for Environmental Prediction Climate Forecast System Reanalysis (NCEP CFSR, Saha et al., 24 2010) 6-hourly products. The initial and boundary conditions for chemical tracers in REAM are obtained from 25 GEOS-Chem global simulations with a resolution of $2^{\circ} \times 2.5^{\circ}$ (Bey et al., 2001). REAM expands GEOS-Chem 26 standard chemical mechanism (v9-02) with aromatic chemistry (Liu et al., 2010, 2012), including benzene and other 27 reactive aromatics as chemical tracers (toluene, ethyl-benzene, and m/p/o-xylene). REAM implements the 28 Intercontinental Chemical Transport Experiment-Phase B (INTEX-B) anthropogenic emissions inventory for South Asia (Zhang et al., 2009; Li et al., 2014) and a mosaic Asian anthropogenic emissions inventory (MIX, Li et al., 29 30 2015) for other regions in the model domain. For further model descriptions and evaluations, we refer readers to 31 Zhang et al. (2017).





38 Figure S2. The wind dataset during field study. The red marker along the wind represent the high nitrate periods.



41 Figure S3. The field studies conducted at high elevation sites using AMS. The mass concentration of NR-PM₁ and

42 the mass contribution of each species (pie chart) are including in each site.

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45 Figure S4. The comparisons of meteorological conditions between (a) pre-monsoon and monsoon and (b) P1 and P2.



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Figure S5. Scatter plots of (a) predicted ammonium $(NH_4^+_predicted)$ calculated from the stoichiometry of sulfate, nitrate, and chloride vs. measured ammonium $(NH_4^+_measured)$, (b) NH_3^+ vs. NH_2^+ , (c) NH^+ vs. NH_2^+ , and (d) NO^+ vs. NO_2^+ .



56 Figure S6. The diurnal contribution of two class air trojectories arrived at Nam Co during sampling period.



59 Figure S7. The correlation coefficient of time series between OOA factor and ions.



62 Figure S8. Scatter plots between BC and OOA factors.



Figure S9. The mass concentration of REAM-simulated reactive aromatics and the averaged wind data.

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