

1 **Supplementary materials**

2 **O₃ and PAN in southern Tibetan Plateau determined by distinct**
3 **physical and chemical processes**

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7 Atmospheric Composition, Chinese Academy of Meteorological Sciences, Beijing, 100081, China

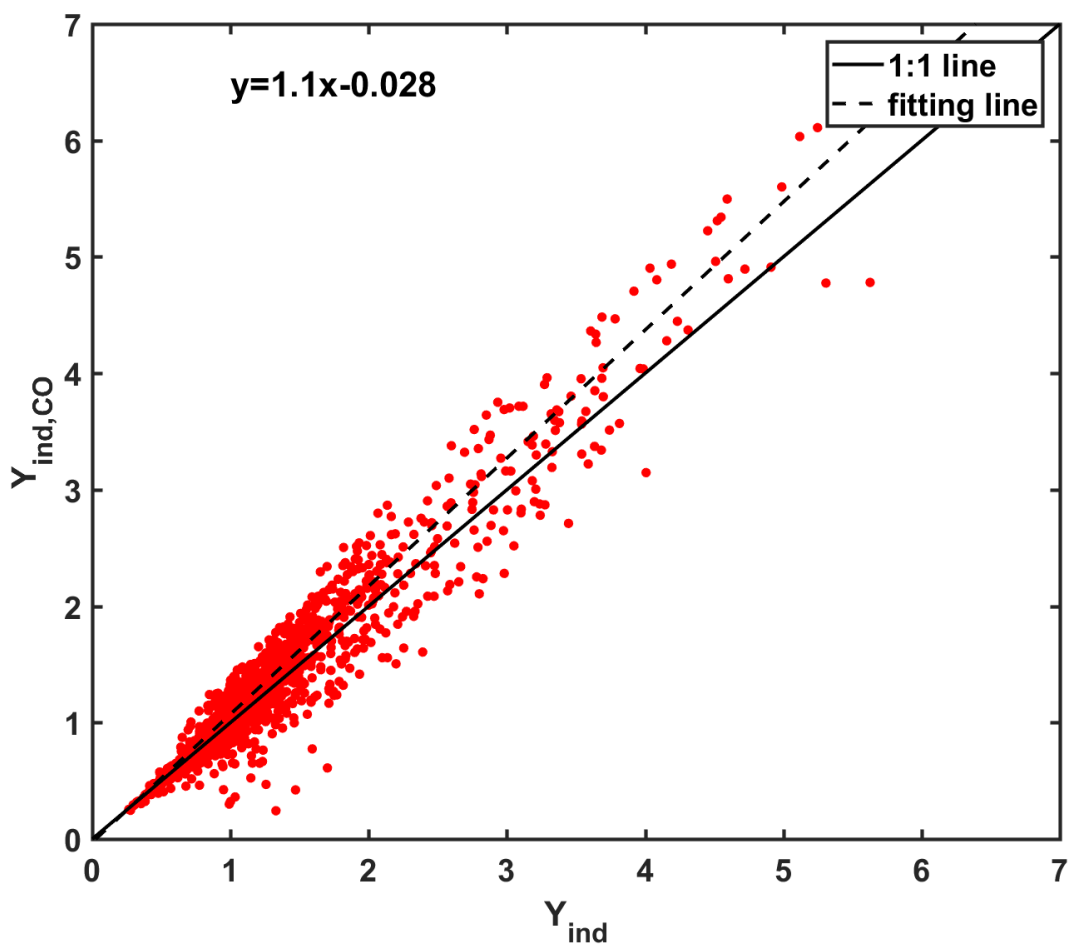
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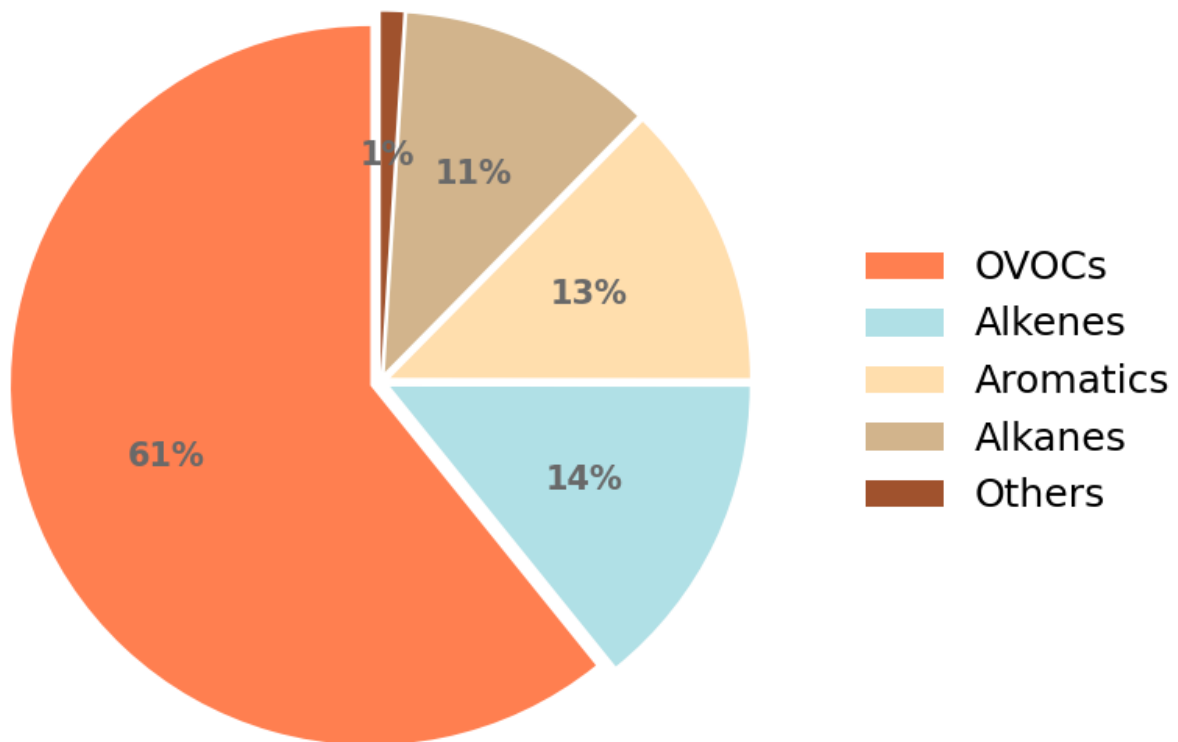
12 *Correspondence to:* Gen Zhang (zhanggen@cma.gov.cn) and Chunxiang Ye (c.ye@pku.edu.cn)



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15 **Figure S1.** Comparison between Y indices calculated using or without using normalized CO
16 concentrations.

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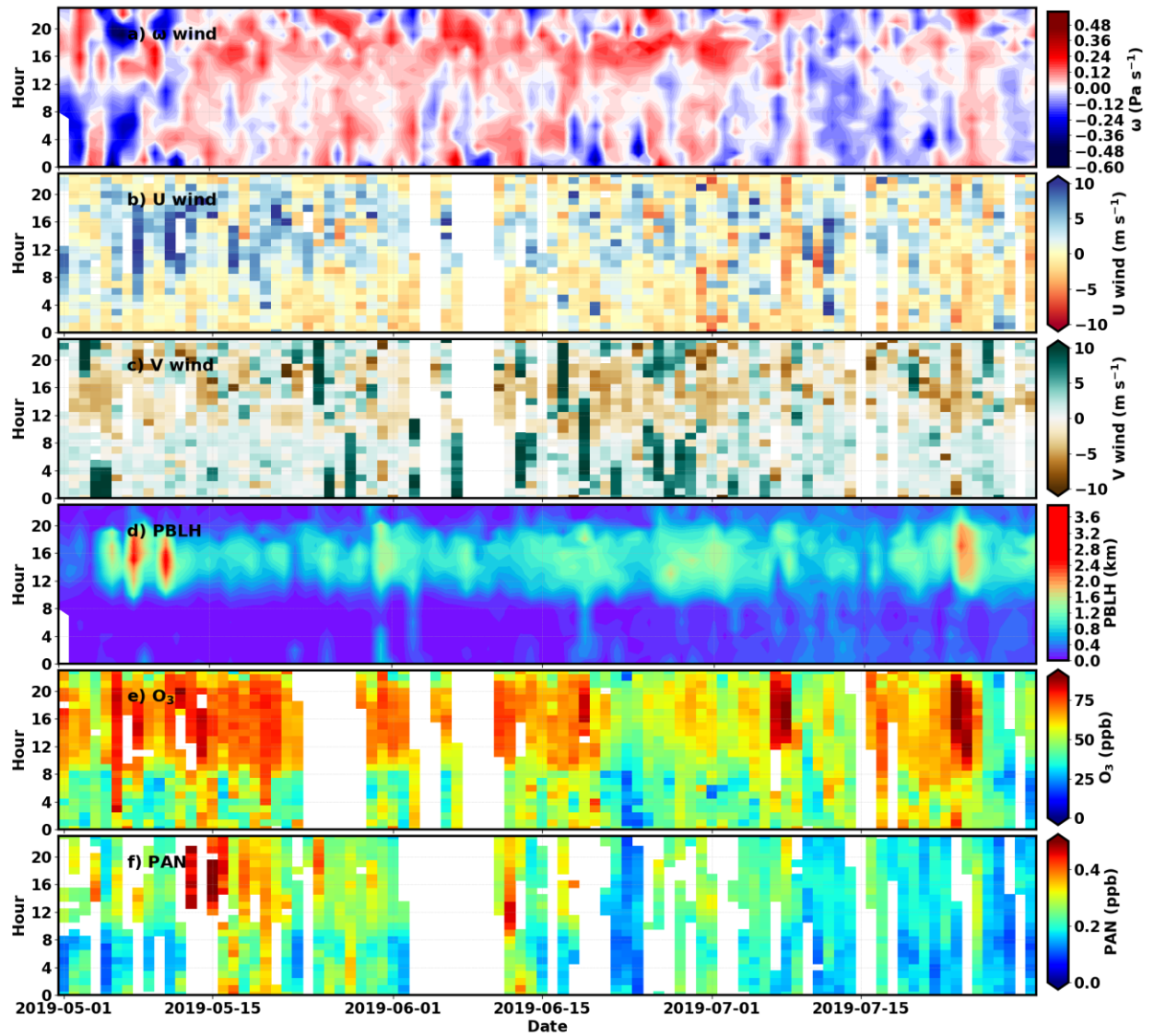


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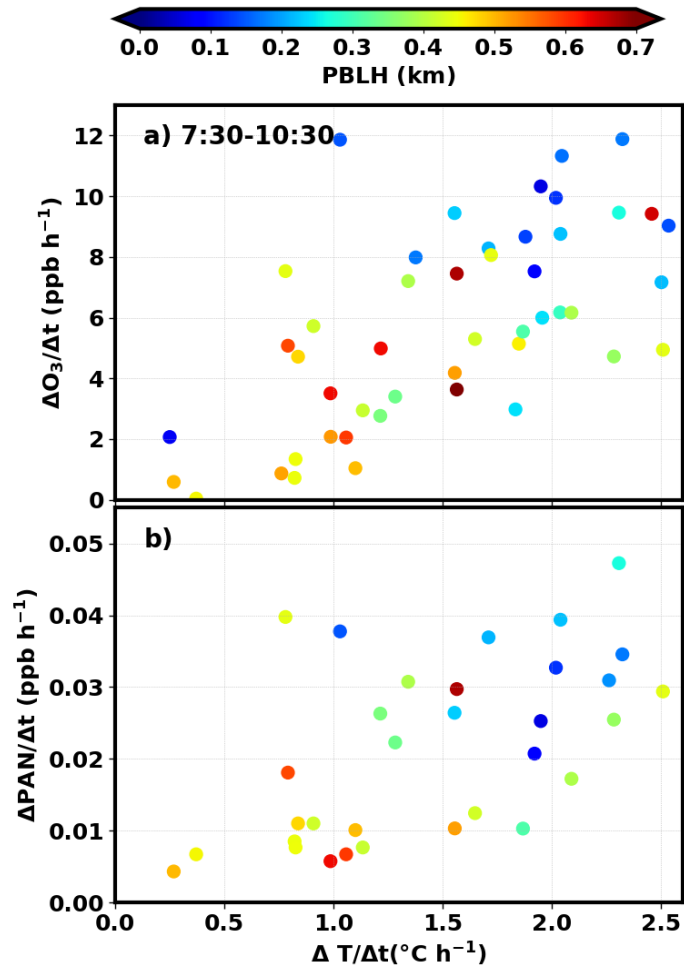
19 **Figure S2.** Contributions of distinct types of VOCs to total concentrations (concentrations in
20 Propy-Equiv. ppbC).

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 24 **Figure S3.** Season-diurnal variations of a) ω wind (ERA5), b) surface U wind, c) surface V
 25 wind, d) PBLH (ERA5), e) surface O_3 and f) PAN between 1 May and 31 Jul 2019 at Nam Co.

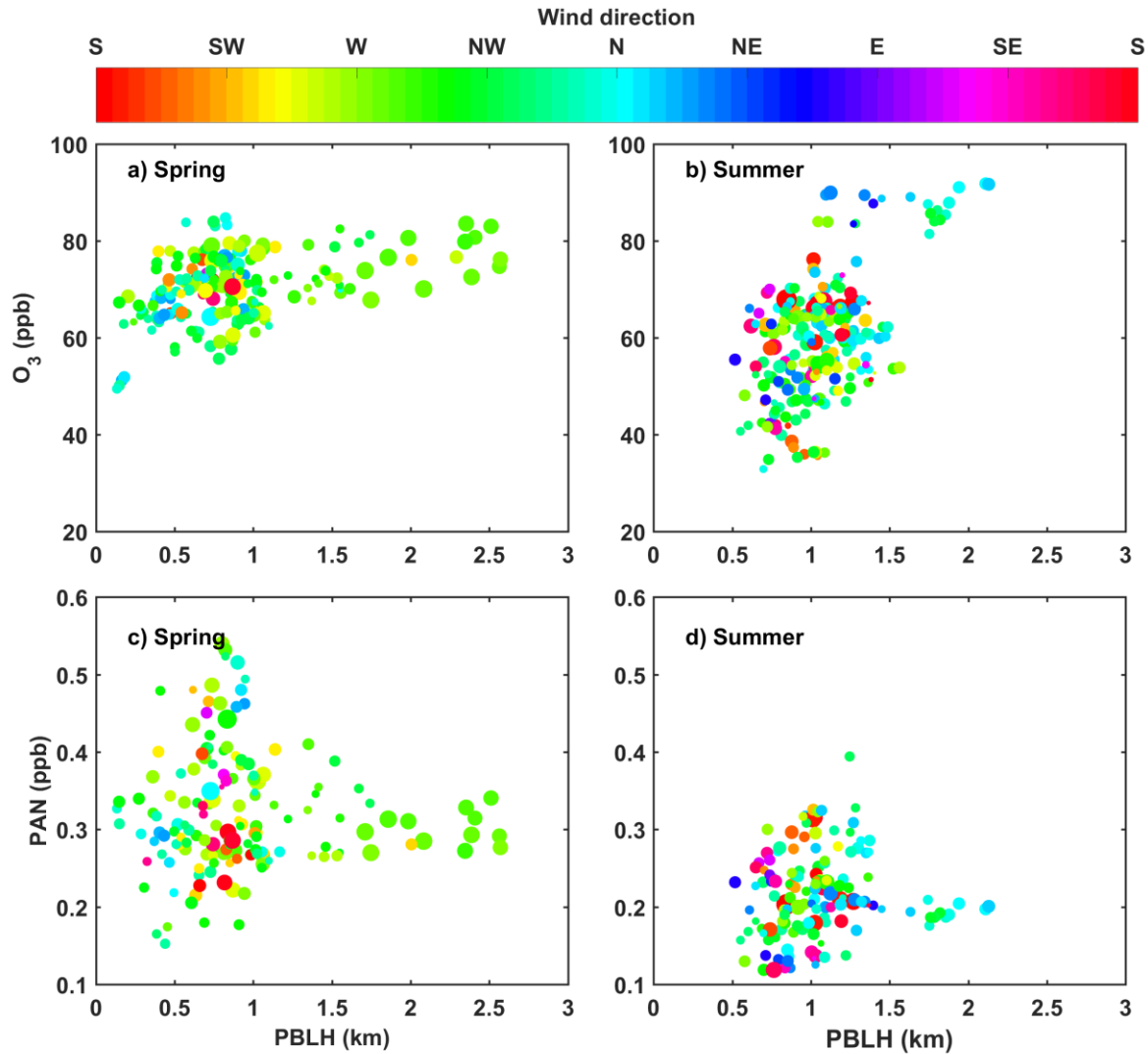


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27 **Figure S4** Variation of the a) O₃ and b) PAN morning (7:30 to 10:30 LT) growth rates with
 28 temperature growth rates, with colors representing morning time averaged PBLH (from ERA5
 29 reanalysis data)

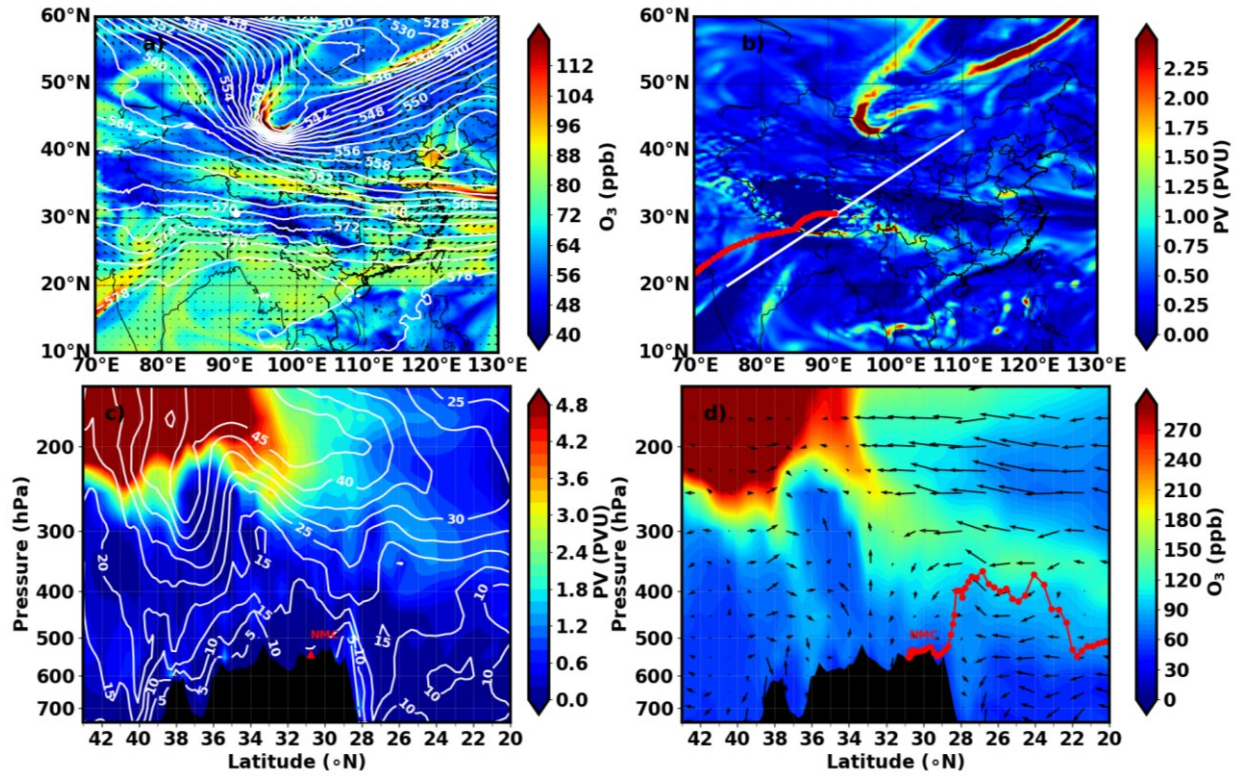
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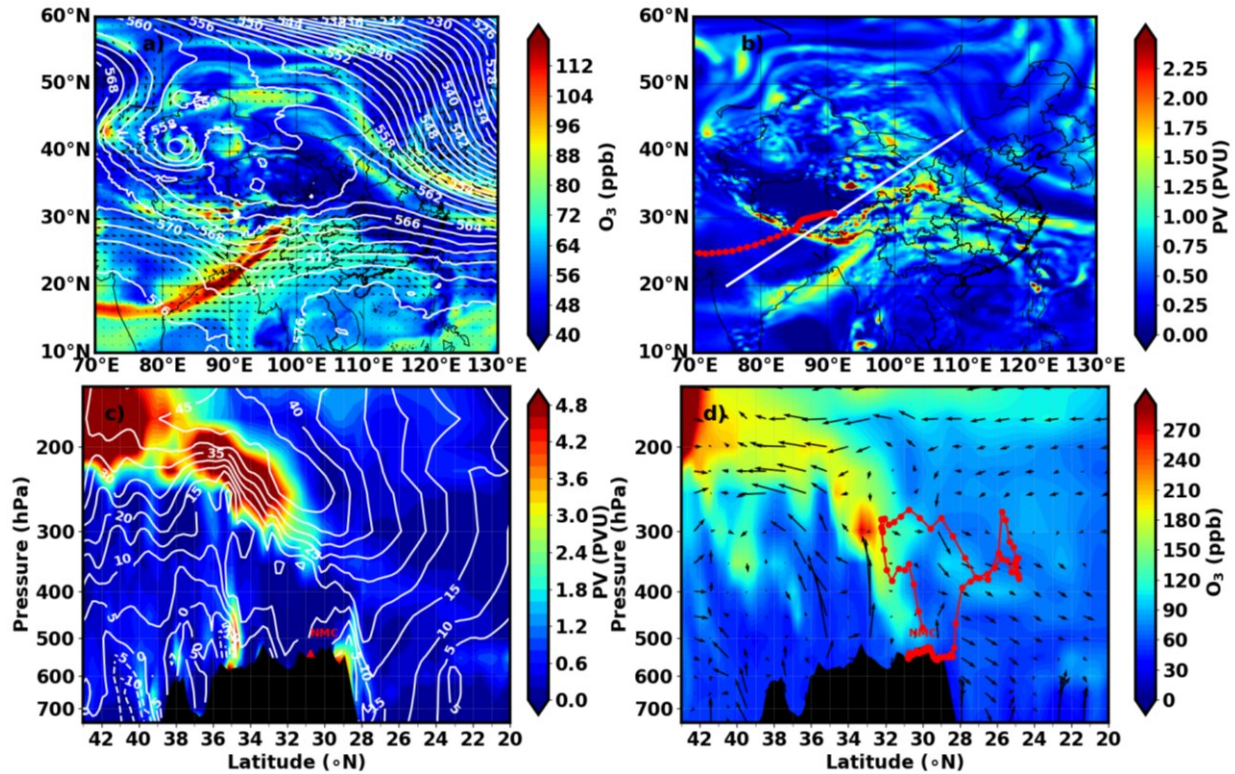


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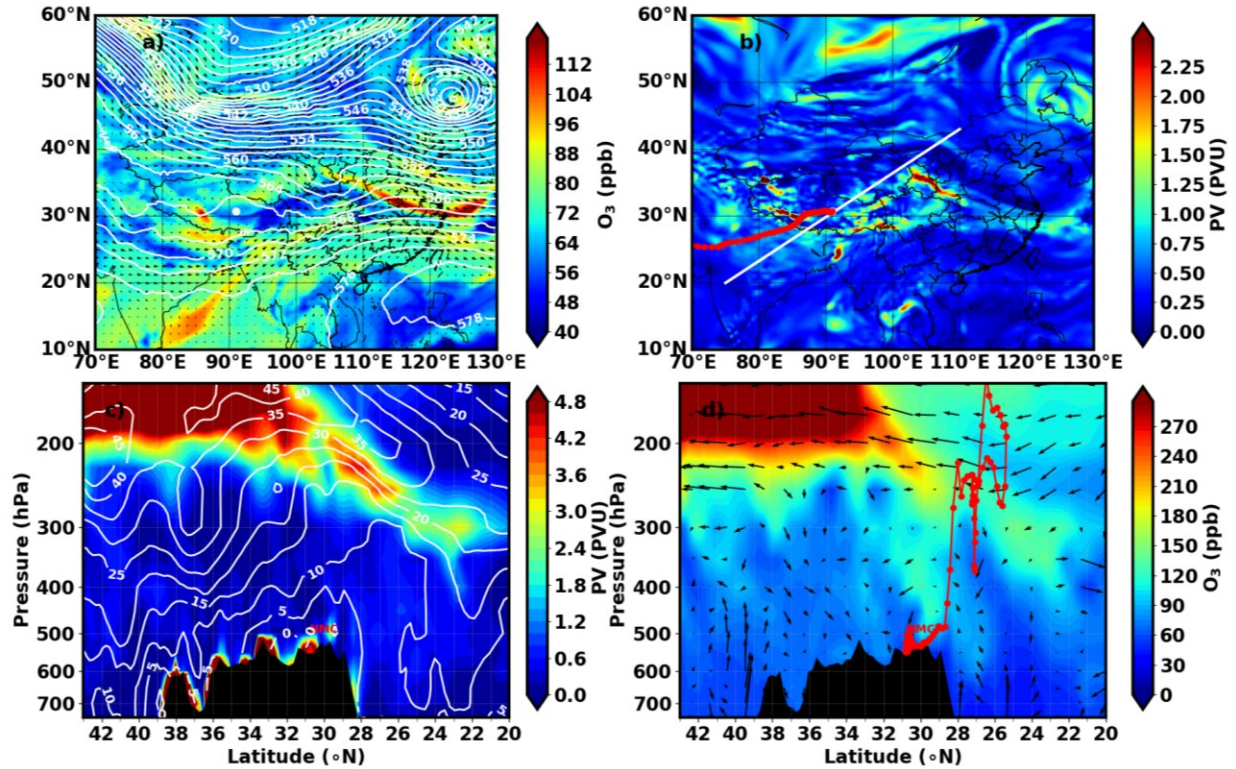
Figure S5. Variation of afternoon (12:00-18:00) O₃ (a,b) and PAN (c,d) with PBLH (from ERA5 reanalysis data) during spring (a,c) and summer (b,d) periods, with wind speeds and directions indicated by sizes and colors of scattered dots (precipitation associated data points excluded).



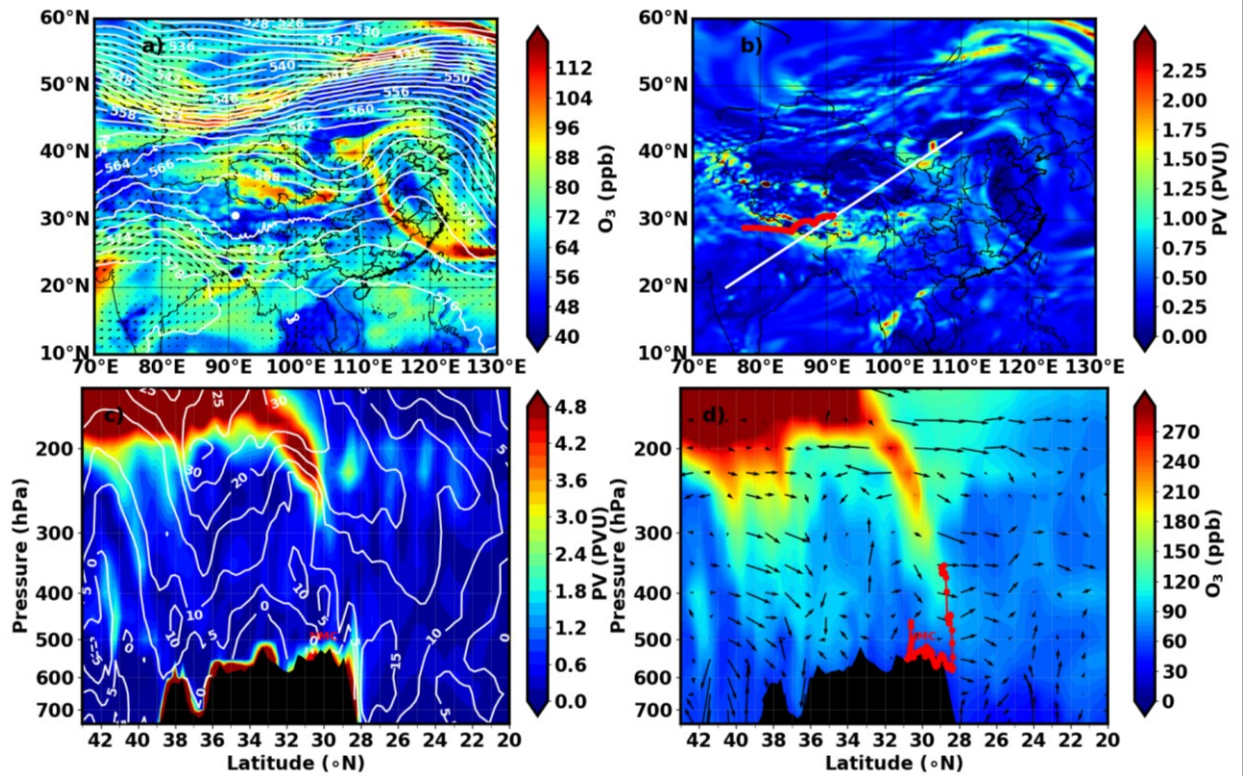
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 41 **Figure S6.** 500hPa ERA5 a) O₃ mixing ratio (shading), geopotential height (white contour lines),
 42 horizontal winds (black arrows), b) potential vorticity (shading), 72h backward trajectory
 43 (starting from Nam Co station, red dotted line), and a white line along which the cross section of
 44 c) potential vorticity, u winds, d) O₃ mixing ratio, v winds and vertical velocity were calculated
 45 for 4:00 LT 11 May 2019
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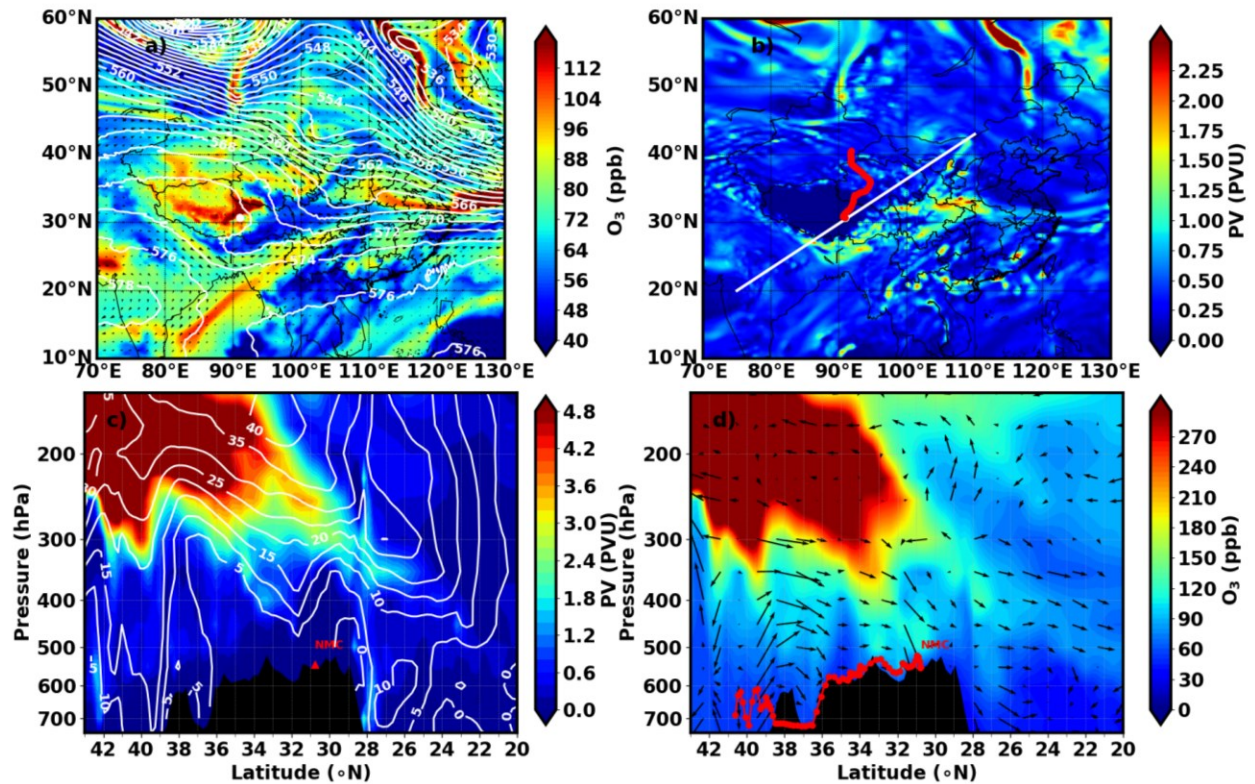
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 48 **Figure S7.** 500hPa ERA5 a) O₃ mixing ratio (shading), geopotential height (white contour lines),
 49 horizontal winds (black arrows), b) potential vorticity (shading), 72h backward trajectory
 50 (starting from Nam Co station, red dotted line), and a white line along which the cross section of
 51 c) potential vorticity, u winds, d) O₃ mixing ratio, v winds and vertical velocity were calculated
 52 for 12:00 LT 6 May 2019



53
 54 **Figure S8.** 500hPa ERA5 a) O₃ mixing ratio (shading), geopotential height (white contour lines),
 55 horizontal winds (black arrows), b) potential vorticity (shading), 72h backward trajectory
 56 (starting from Nam Co station, red dotted line), and a white line along which the cross section of
 57 c) potential vorticity, u winds, d) O₃ mixing ratio, v winds and vertical velocity were calculated
 58 for 23:00 LT 13 May 2019
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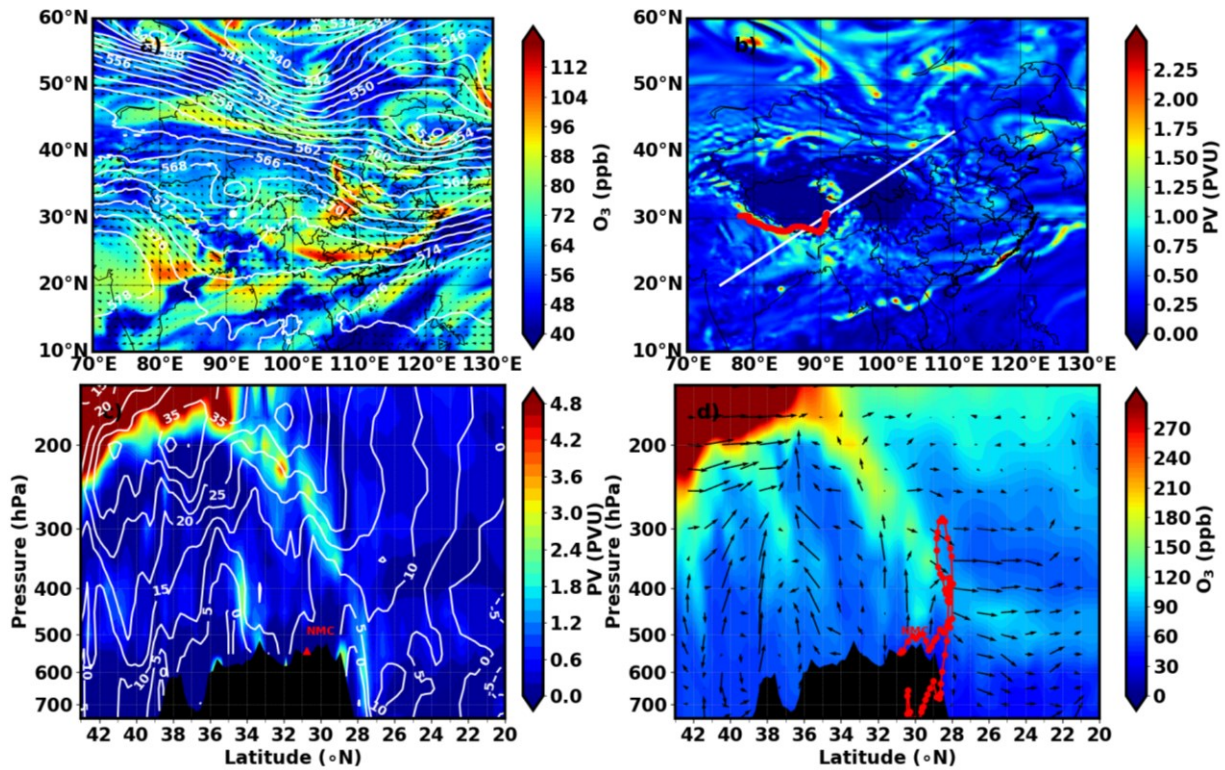


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 61 **Figure S9.** 500hPa ERA5 a) O₃ mixing ratio (shading), geopotential height (white contour lines),
 62 horizontal winds (black arrows), b) potential vorticity (shading), 72h backward trajectory
 63 (starting from Nam Co station, red dotted line), and a white line along which the cross section of
 64 c) potential vorticity, u winds, d) O₃ mixing ratio, v winds and vertical velocity were calculated
 65 for 18:00 LT 23 May 2019
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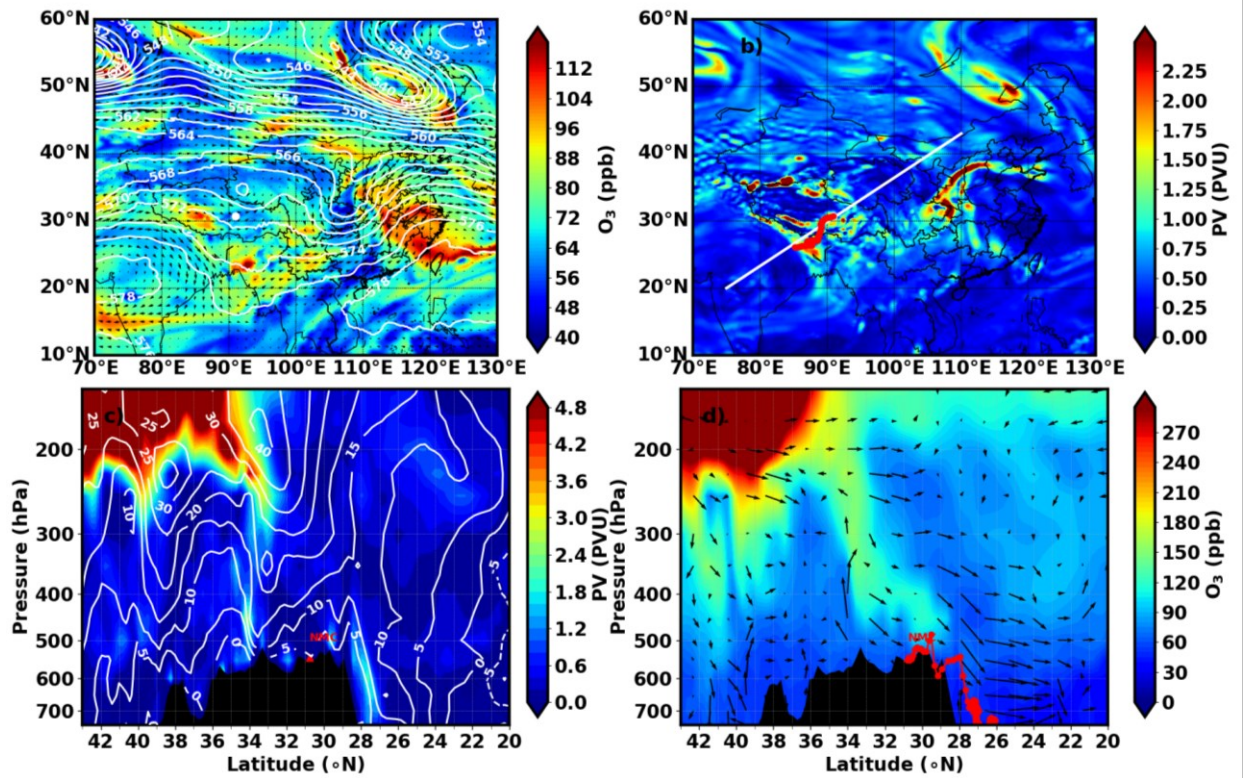


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 68 **Figure S10.** 500hPa ERA5 a) O₃ mixing ratio (shading), geopotential height (white contour
 69 lines), horizontal winds (black arrows), b) potential vorticity (shading), 72h backward trajectory
 70 (starting from Nam Co station, red dotted line), and a white line along which the cross section of
 71 c) potential vorticity, u winds, d) O₃ mixing ratio, v winds and vertical velocity were calculated
 72 for 6:00 LT 31 May 2019

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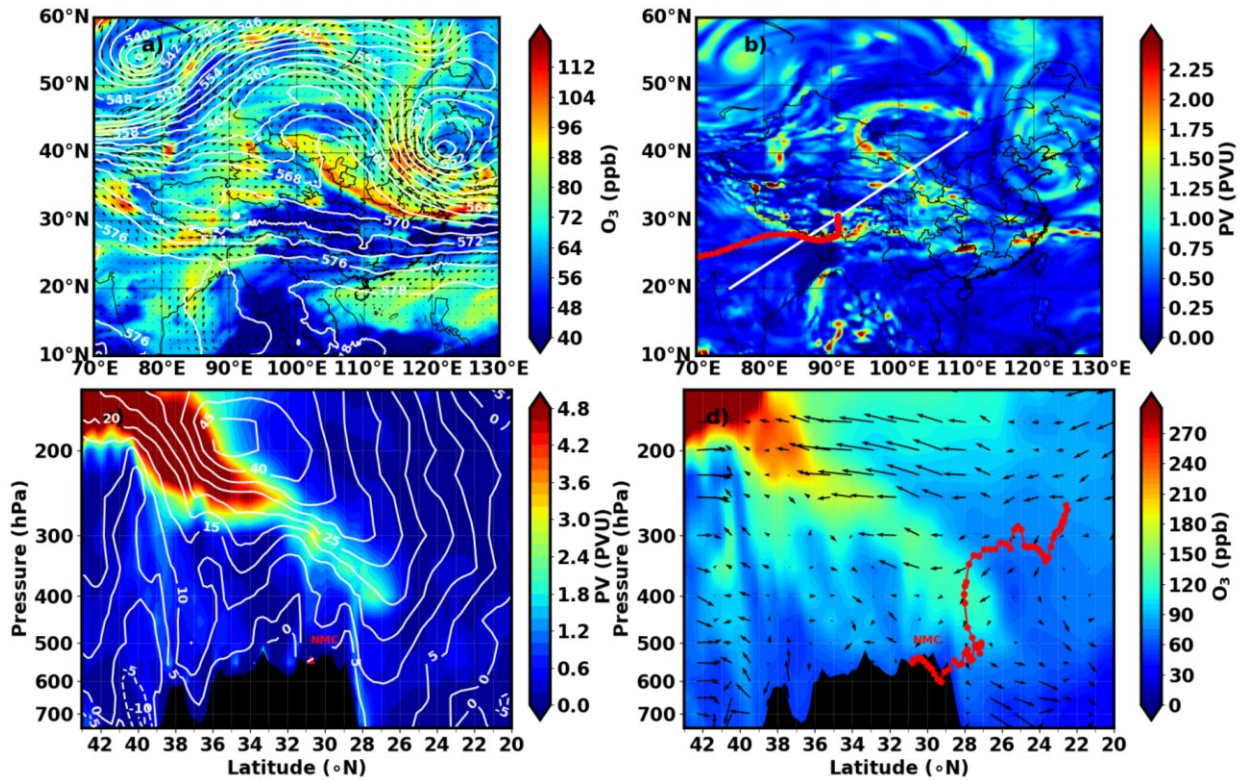
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 75 **Figure S11.** 500hPa ERA5 a) O₃ mixing ratio (shading), geopotential height (white contour
 76 lines), horizontal winds (black arrows), b) potential vorticity (shading), 72h backward trajectory
 77 (starting from Nam Co station, red dotted line), and a white line along which the cross section of
 78 c) potential vorticity, u winds, d) O₃ mixing ratio, v winds and vertical velocity were calculated
 79 for 8:00 LT 3 Jun 2019
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 82 **Figure S12.** 500hPa ERA5 a) O₃ mixing ratio (shading), geopotential height (white contour
 83 lines), horizontal winds (black arrows), b) potential vorticity (shading), 72h backward trajectory
 84 (starting from Nam Co station, red dotted line), and a white line along which the cross section of
 85 c) potential vorticity, u winds, d) O₃ mixing ratio, v winds and vertical velocity were calculated
 86 for 2:00 LT 5 Jun 2019

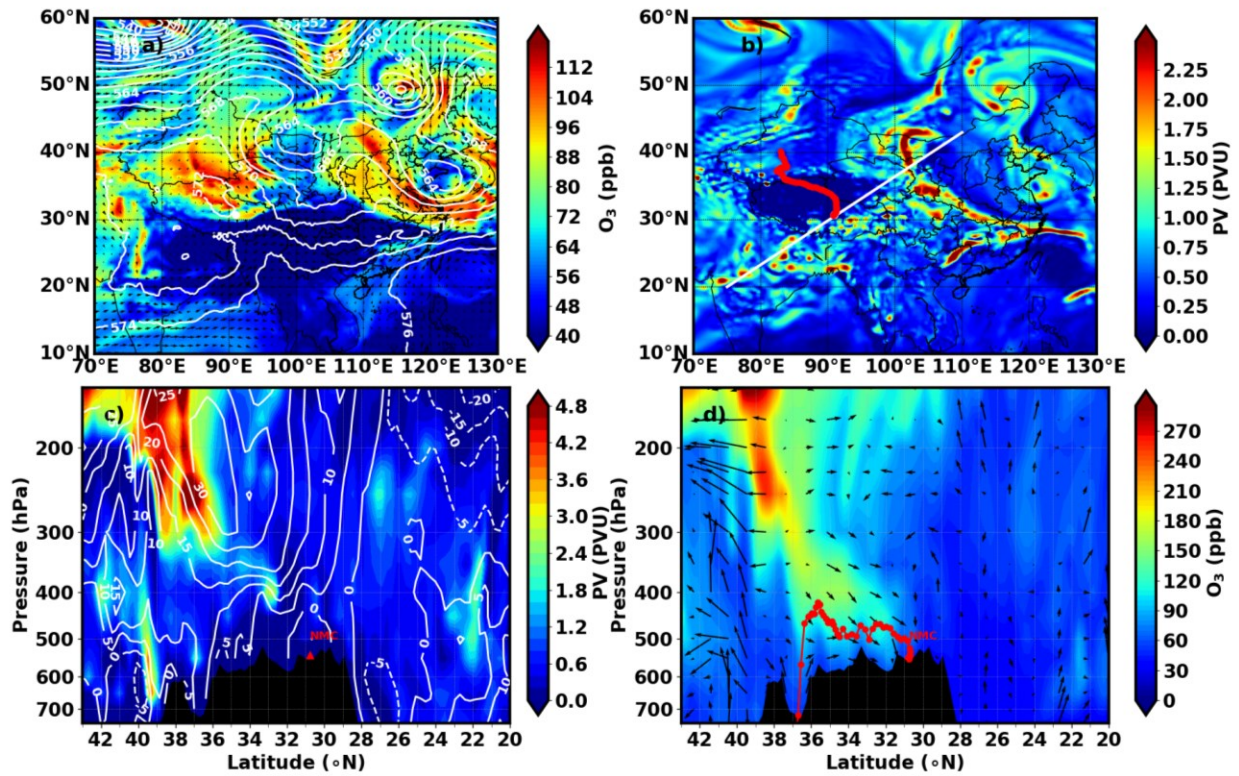
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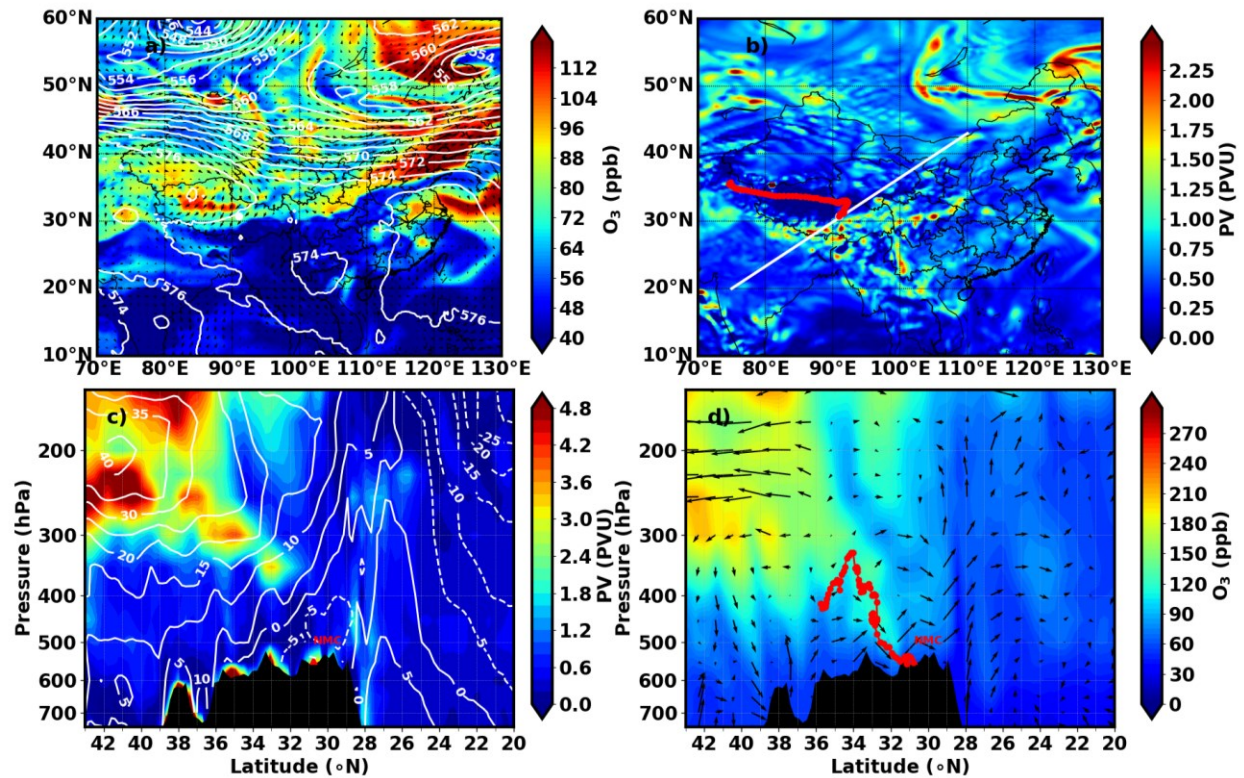
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 90 **Figure S13.** 500hPa ERA5 a) O₃ mixing ratio (shading), geopotential height (white contour
 91 lines), horizontal winds (black arrows), b) potential vorticity (shading), 72h backward trajectory
 92 (starting from Nam Co station, red dotted line), and a white line along which the cross section of
 93 c) potential vorticity, u winds, d) O₃ mixing ratio, v winds and vertical velocity were calculated
 94 for 2:00 LT 9 Jun 2019

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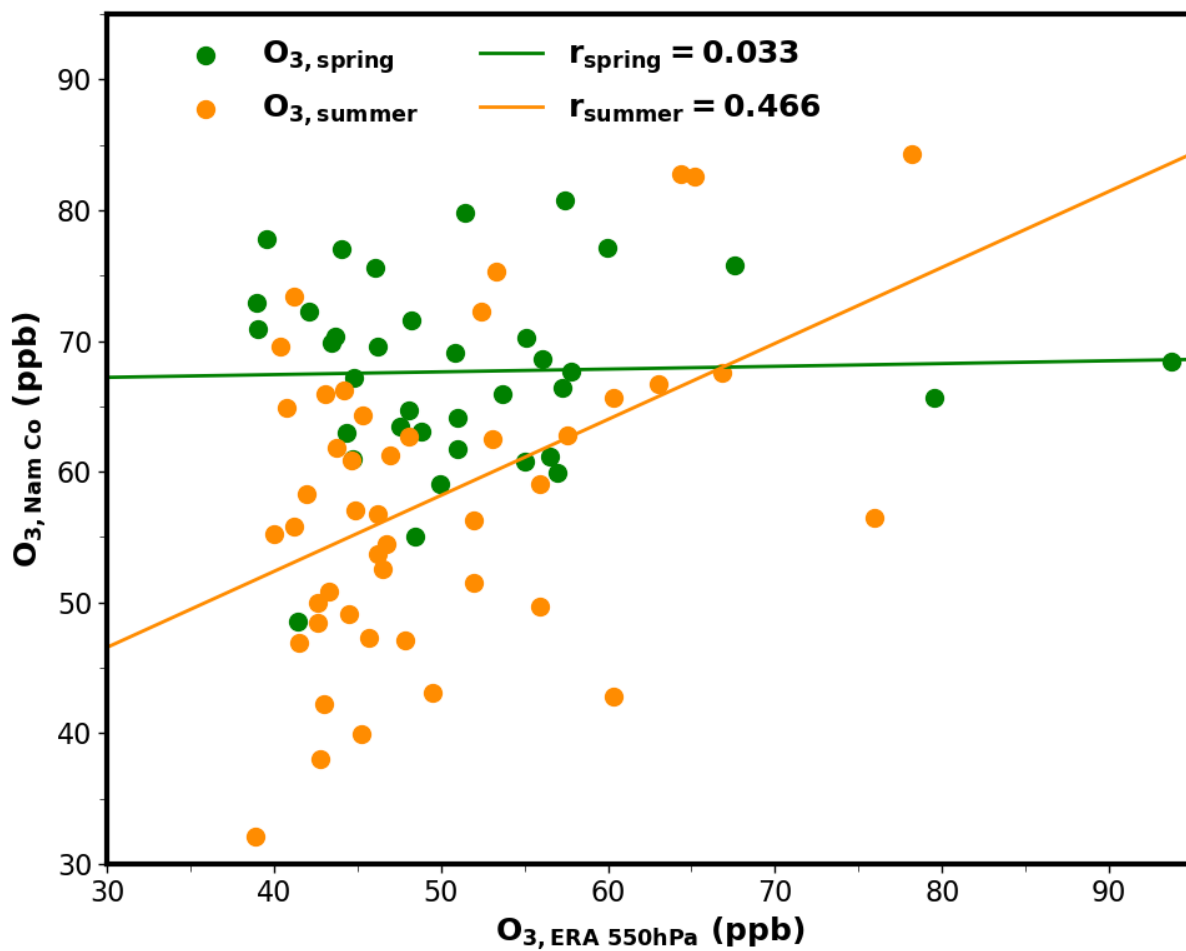
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Figure S14. 500hPa ERA5 a) O₃ mixing ratio (shading), geopotential height (white contour lines), horizontal winds (black arrows), b) potential vorticity (shading), 72h backward trajectory (starting from Nam Co station, red dotted line), and a white line along which the cross section of c) potential vorticity, u winds, d) O₃ mixing ratio, v winds and vertical velocity were calculated for 9:00 LT 7 Jul 2019



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Figure S15. 500hPa ERA5 a) O₃ mixing ratio (shading), geopotential height (white contour lines), horizontal winds (black arrows), b) potential vorticity (shading), 72h backward trajectory (starting from Nam Co station, red dotted line), and a white line along which the cross section of c) potential vorticity, u winds, d) O₃ mixing ratio, v winds and vertical velocity were calculated for 16:00 LT 23 Jul 2019



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 112 **Figure S16.** Correlation between spring (green) and summertime (orange) O₃ observations at
 113 Nam Co (O₃, Nam Co) and O₃ mixing ratio at 550 hPa from the ERA5 reanalysis data