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1 Supporting Information for

2 **Exploring Sources of Ice Crystals in Cirrus Clouds:**
3 **Comparative Analysis of Two Ice Nucleation Schemes in**
4 **CAM6**

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10 **Contents of this file**

12 **Introduction**

13 This supporting information provides additional plots referenced in the paper which are

14 not central to the conclusions of the paper.

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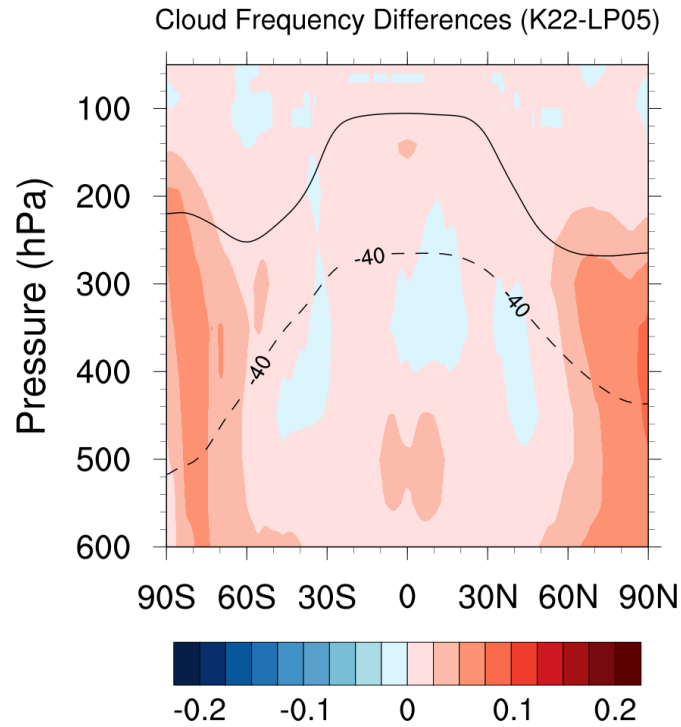
17

18   Figure S1. Annual zonal differences in cirrus cloud frequency between the K22_OGW-

19   Climo and LP05_OGW-Climo experiments. The cirrus clouds are defined as occurring

20   when $T \leq -40$ °C with $N_i \geq 0.01$ L^{-1} and IWC $\geq 1 \times 10^{-5}$ g m^{-3}. Dashed lines indicate the

21   annual mean -40°C isothermal line, and solid lines represent the tropopause in the

22   corresponding simulations.

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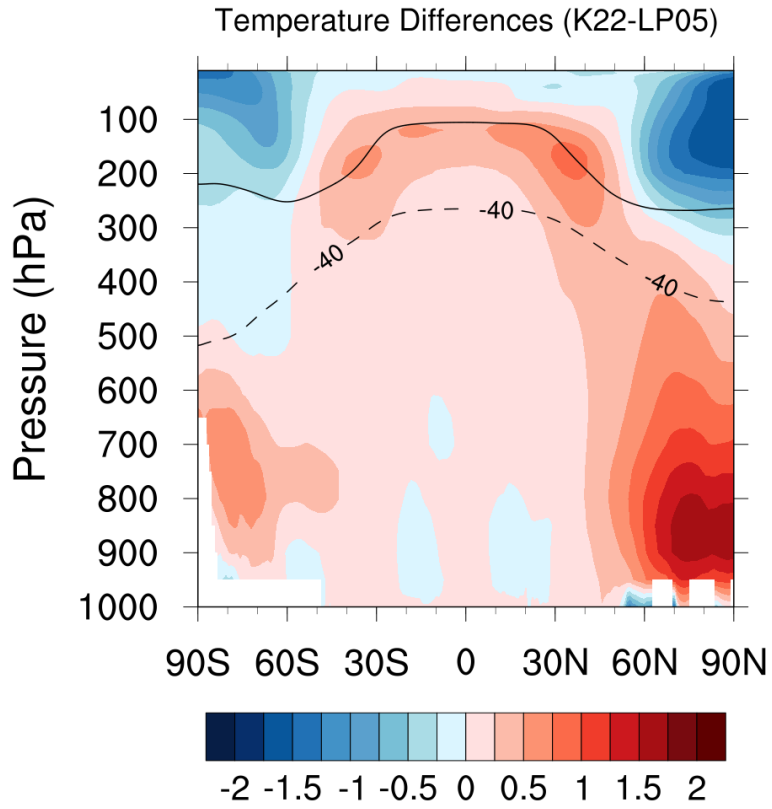
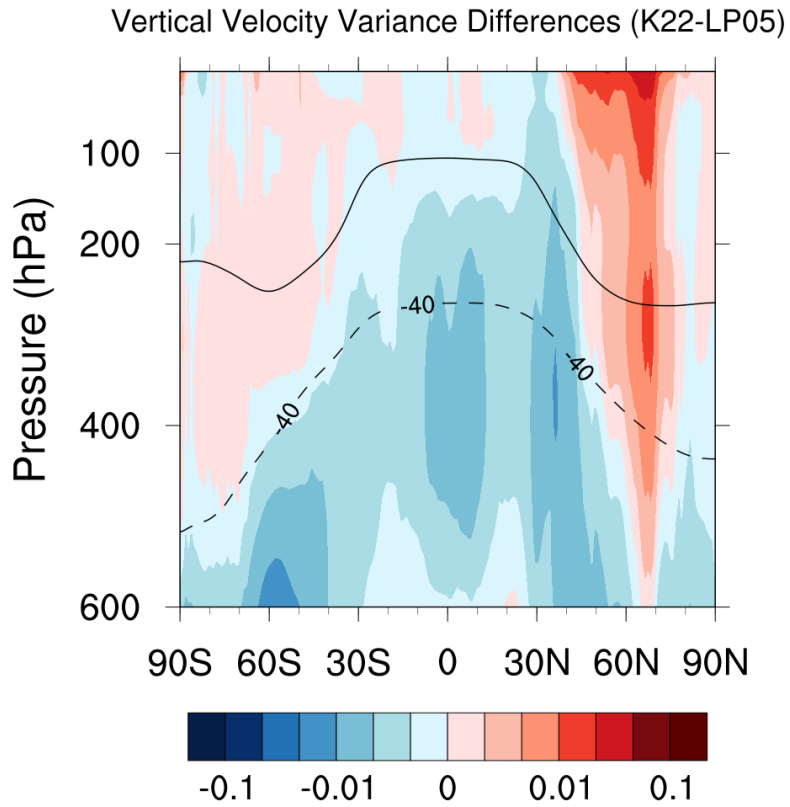


Figure S2. Annual zonal temperature differences (Unit: K) between the K22_OGW-

Climo and LP05_OGW-Climo experiments. Dashed lines represent the annual mean -

40°C isothermal line, and solid lines are the tropopause in the corresponding simulations.

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29 Figure S3. Annual zonal differences in vertical velocity variances for ice nucleation

30 (Unit: m s^{-1}) between the K22_OGW-Climo and LP05_OGW-Climo experiments.

31 Dashed lines represent the annual mean -40 ℃ isothermal line, and solid lines indicate

32 the tropopause in the corresponding simulations.

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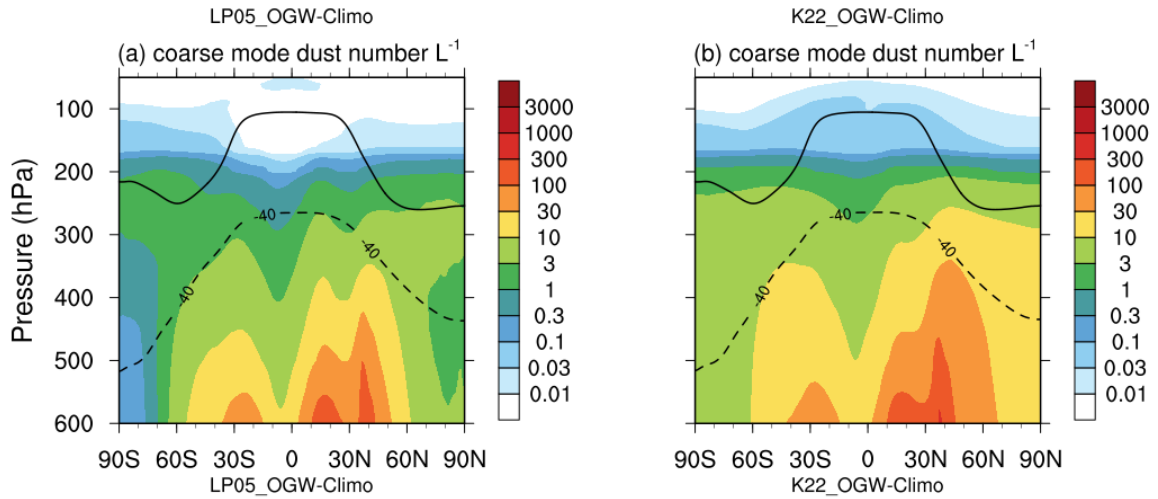
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35   Figure S4. Annual zonal coarse mode dust number concentration from 6-year climatology

36   simulations (the K22_OGW-Climo and LP05_OGW-Climo experiments) in the upper

37   troposphere (above 600 hPa). Dashed lines represent the annual mean -40°C isothermal

38   line, and solid lines indicate the tropopause in the corresponding simulations.

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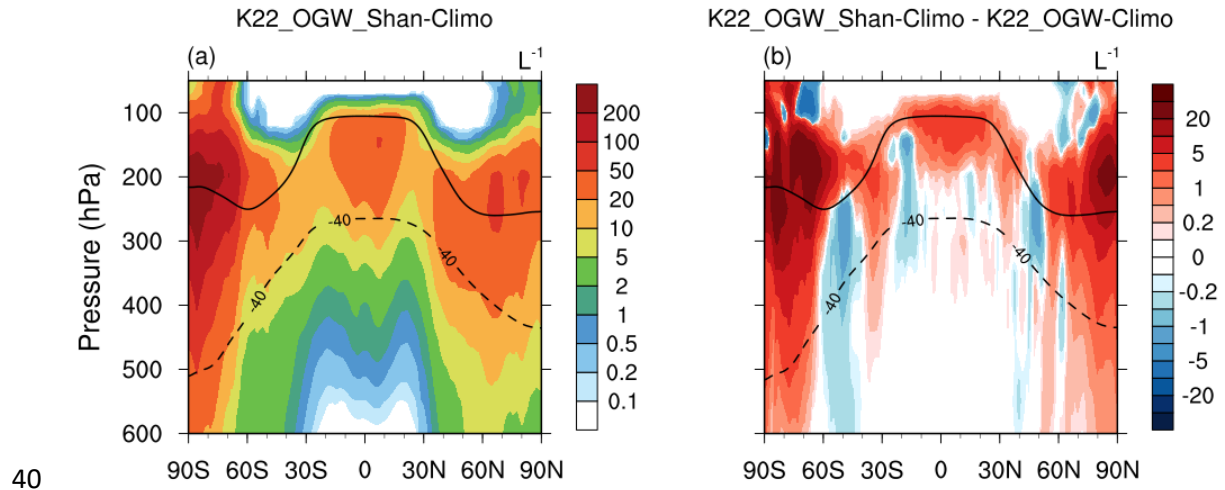
Figure S5. Annual zonal grid-mean ice number concentration (N_i) from 6-year

climatology simulation (K22_OGW_Shan-Climo), and the differences between

K22_OGW-Climo and K22_OGW_Shan-Climo experiments in the upper troposphere

(above 600 hPa). Dashed lines represent the annual mean -40°C isothermal line, and solid

lines indicate the tropopause in the corresponding simulations.

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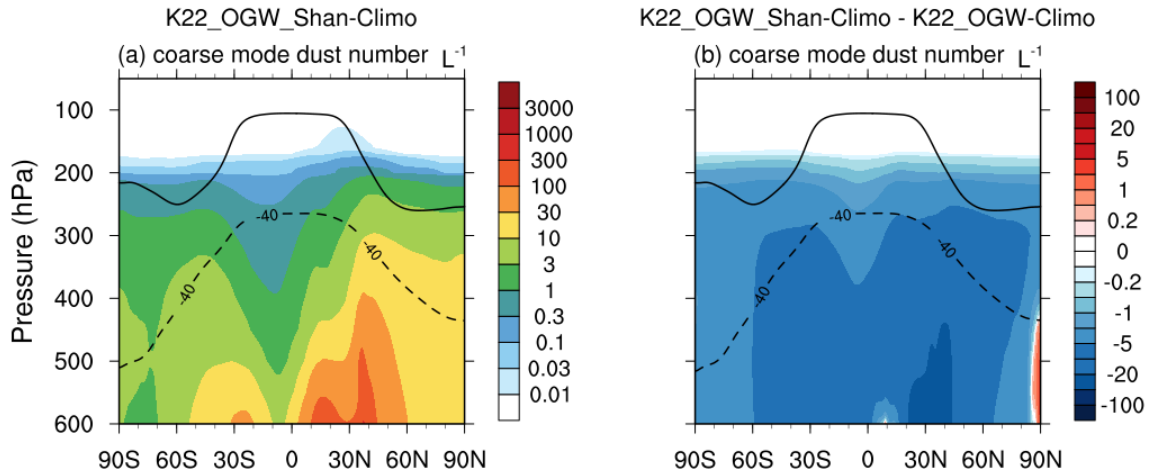
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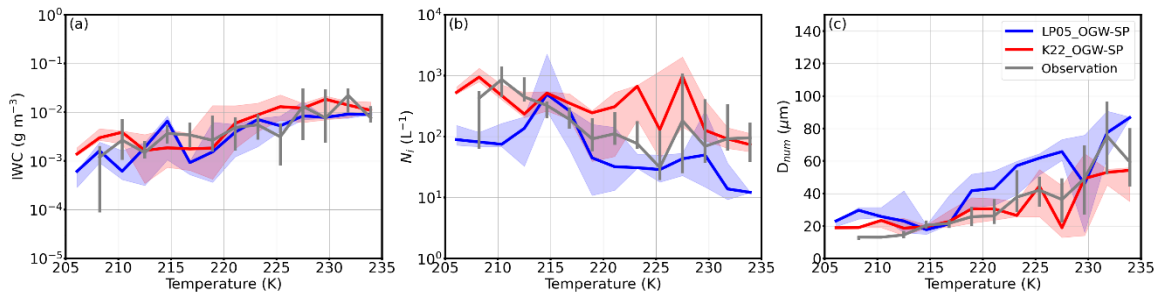
48 Figure S6. Annual zonally coarse mode dust number concentration from 6-year

49 climatology simulation (K22_OGW_Shan-Climo), and the differences between

50 K22_OGW-Climo and K22_OGW_Shan-Climo experiments in the upper troposphere

51 (above 600 hPa). Dashed lines represent the annual mean -40°C isothermal line, and solid

52 lines indicate the tropopause in the corresponding simulations.

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54 Figure S7. Comparison of IWC (a), N_i (b) and D_{num} (c) with respect to temperature

55 between observations, LP05_OGW-SP and K22_OGW-SP experiments for

56 orographic cirrus (5 days) during the SPARTICUS campaign.

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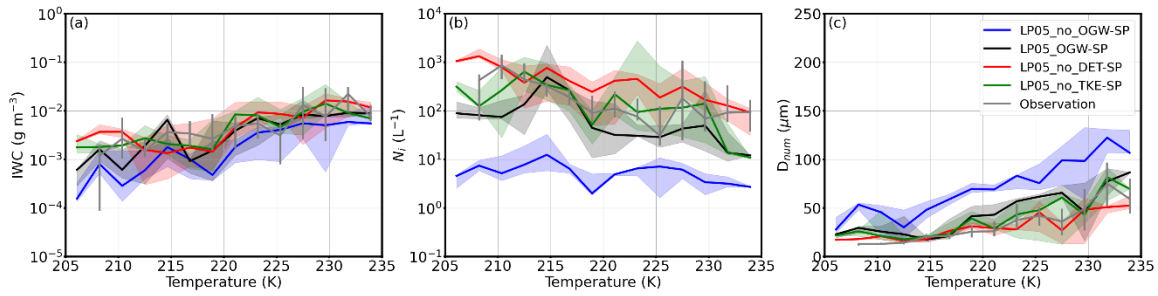
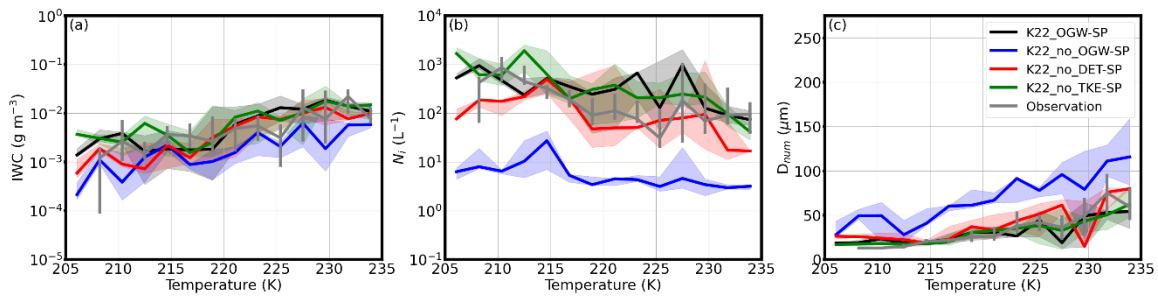

59 Figure S8. Comparison of IWC (a), N_i (b) and D_{num} (c) with respect to temperature

60 between observations, and LP05 experiments (LP05_OGW-SP, LP05_no_OGW-SP,

61 LP05_OGW_no_DET-SP and LP05_ no_TKE-SP).

63 Figure S9. Same as Fig. S8 but between observations and K22 experiments

64 (K22_OGW-SP, K22_no_OGW-SP, K22_no_DET-SP and K22_no_TKE-SP).

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