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Supporting Information for

**Study on the life cycle of ice crystal cloud in Taklimakan desert using muti-source data**

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Figures S1 to S6

**Introduction**

Six figures have been included as supplementary material to support interpretation of the results presented in the manuscript.



Figure S1. Local meteorological data from 5 to 6 February, 2022, local time (UTC+8). (a) atmospheric temperature. (b) relative humidity. (c) horizontal wind speed and horizontal wind direction, the blue arrow and the open circle dotted line represent the wind direction and wind speed, respectively. (d) horizontal visibility. According to the national meteorological standards of China, when horizontal visibility in the desert is below 10 km, it is classified as a dust weather (Classification of sand and dust weather, GB/T 20480-2017).



Figure S2. The Himawari-8 satellite observed changes in cloud type at the study site every 20 minutes from 10:30 to 14:10 LT (UTC+8) on 6 February 2022. The purple circle symbol represents the study site MinFeng. Cloud types are distinguished by different colors. The cloud type of Ci, Cs, Dc, Ac, As, Ns, Cu, Sc, St represent cirrus, cirrostratus, deep convection, altocumulus, altostratus, nimbostratus, cumulus, stratocumulus, stratus, respectively.



Figure S3. The Digital elevation map of the study site Mingfeng



Figure S4. The 24 h HYSPLIT backward trajectory results calculated at 24:00 LT (UTC+8) on 5 February 2022. The starting location is set at 3 km above the study site Minfeng. (a) dust aerosol vertical transport path, (b) dust aerosol horizontal transport path.



Figure S5. The movement of dust aerosol over the Taklimakan Desert in MERRA-2 reanalysis data from 14:30 to 22:30 LT (UTC+8) on 5 February 2022. (a-e) dust dry and wet deposition (DD), (f-j) dust sedimentation (DS), (k-o) dust emission (DE), (p-t) dust convection scavenging (DCS).



Figure S6. The movement of dust aerosol over the Taklimakan Desert in MERRA-2 reanalysis data from 8:30 to 16:30 LT (UTC+8) on 6 February 2022. (a-e) dust dry and wet deposition (DD), (f-j) dust sedimentation (DS), (k-o) dust emission (DE), (p-t) dust convection scavenging (DCS).