

Supplementary Materials for
"An investigation of the ice cloud detection sensitivity of cloud radars
using the Raman lidar at the ARM SGP site"

Mingcheng Wang¹, Kelly A. Balmes^{2,3}, Tyler J. Thorsen⁴, Dylan Willick⁵, and Qiang Fu¹

¹Department of Atmospheric Sciences, University of Washington, Seattle, WA, USA

²Cooperative Institute for Research in Environmental Sciences, University of Colorado Boulder,
Boulder, CO, USA

³NOAA Global Monitoring Laboratory, Boulder, CO, USA

⁴NASA Langley Research Center, Hampton, VA, USA

⁵Carleton College, Northfield, MN, USA

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Contents of this file

- Figures S1-S5

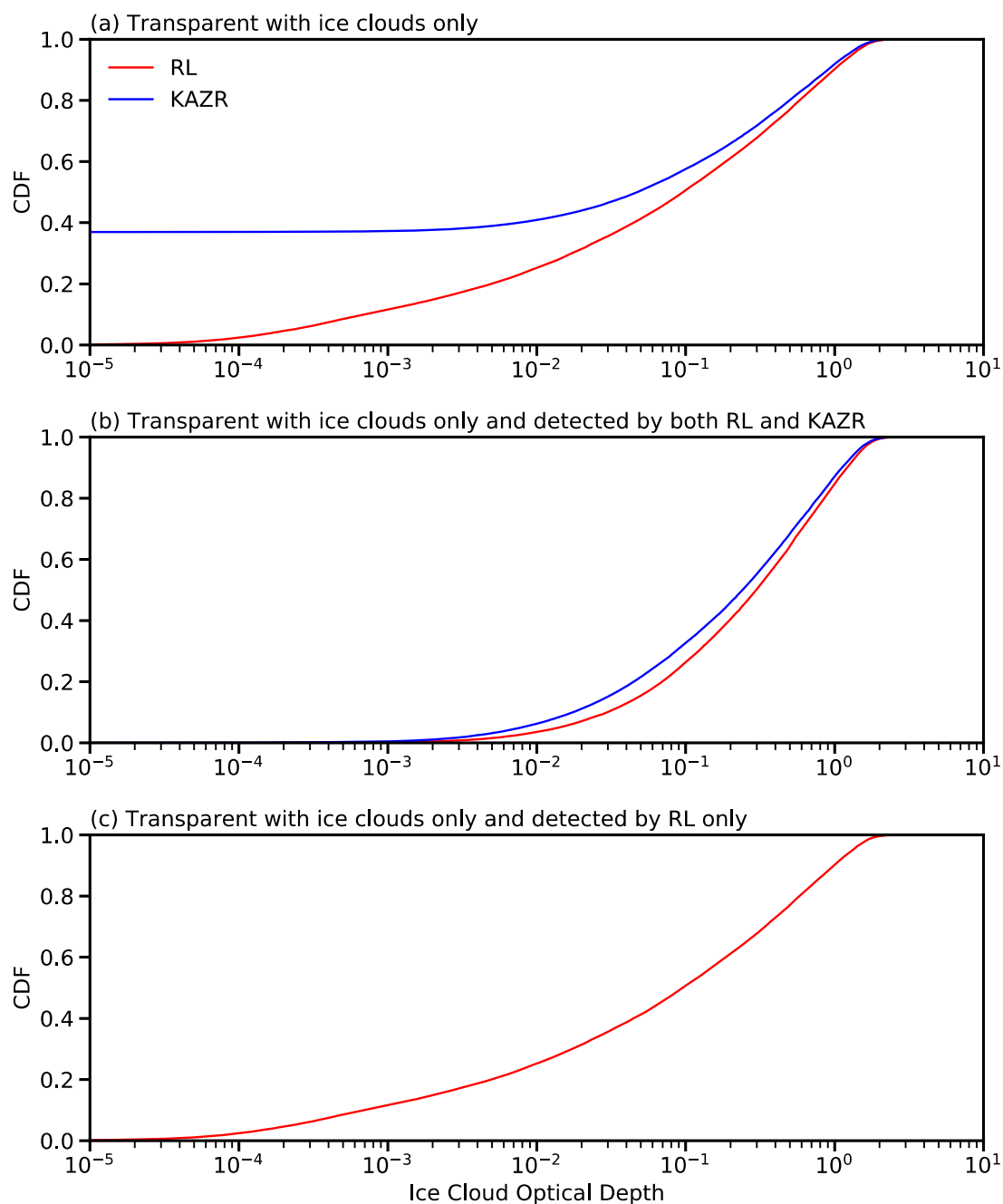


Figure S1. Cumulative distribution functions (CDFs) of ice cloud optical depth from the Raman lidar (RL; red) and Ka-band Zenith Atmospheric Radiation Measurement Program (ARM) radar (KAZR; blue) observations at the Southern Great Plains (SGP) site from January 2011 to December 2014. The observations are shown for profiles that are (a) transparent with ice clouds only, (b) transparent with ice clouds only and detected by both RL and KAZR, and (c) transparent with ice clouds only and detected by RL only. In (c), no ice clouds are detected by KAZR, and thus only the RL result is shown here.

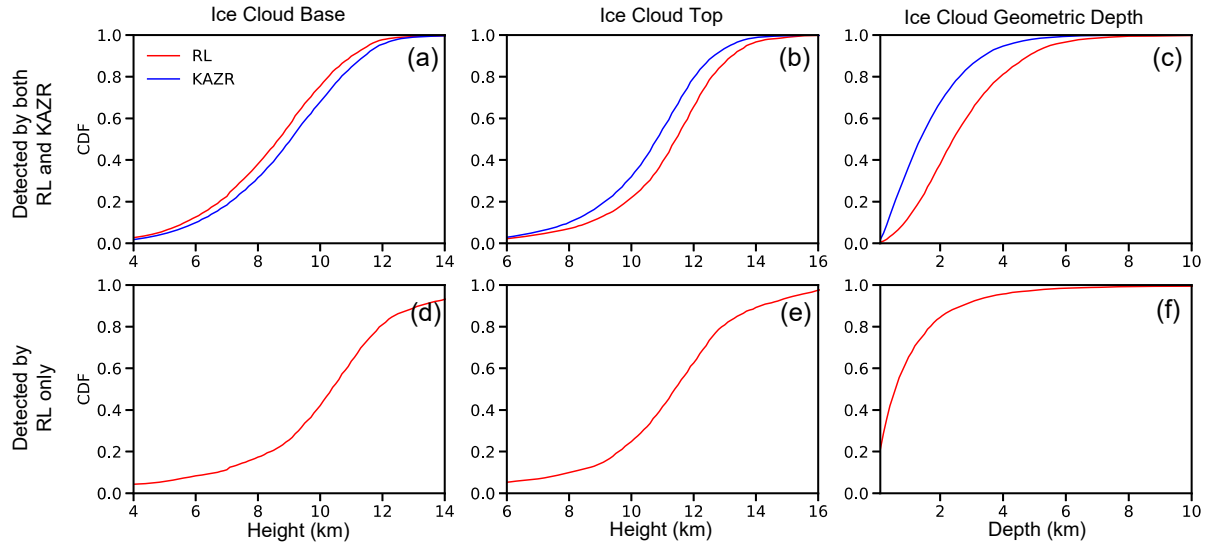


Figure S2. (a-c) Cumulative distribution functions (CDFs) of ice cloud base height (left), cloud top height (middle), and cloud geometric depth (right) (units: km) for transparent profiles with ice clouds only and detected by both Raman lidar (RL; red) and Ka-band Zenith Atmospheric Radiation Measurement Program (ARM) radar (KAZR; blue) at the Southern Great Plains (SGP) site from January 2011 to December 2014. (d-f) CDFs for transparent profiles with ice clouds only that are detected by RL only; thus, only the RL results are shown here.

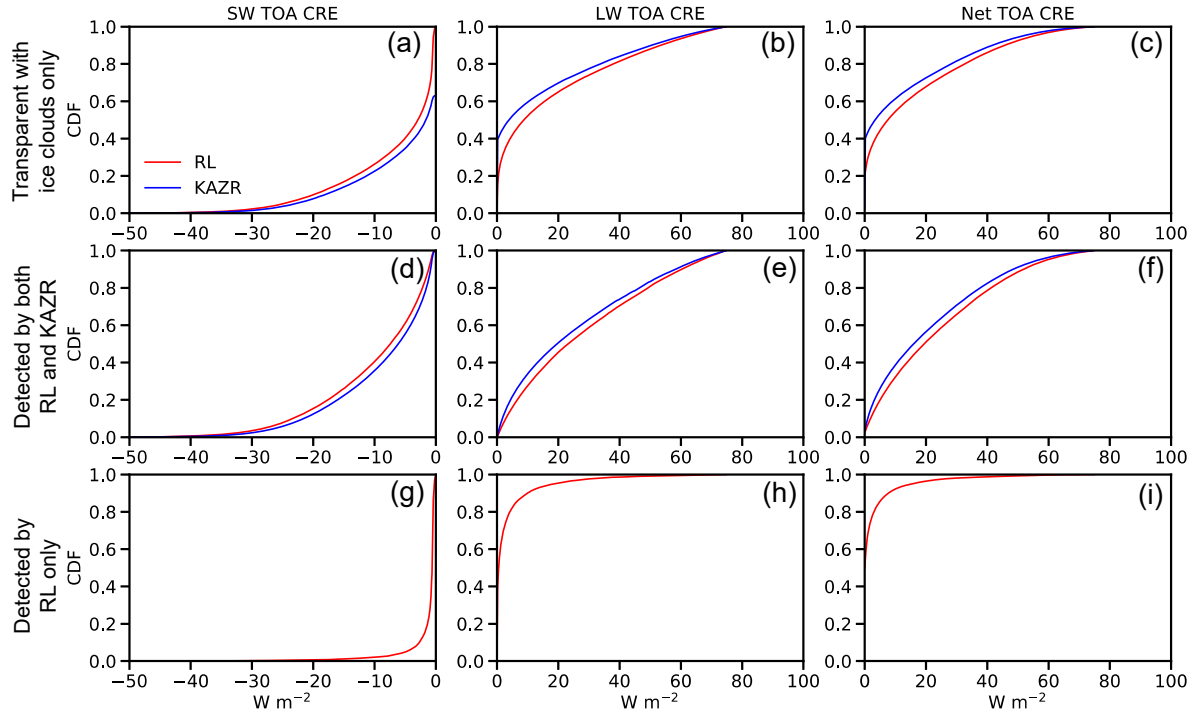


Figure S3. (a-c) Cumulative distribution functions (CDFs) of shortwave (SW) (left), longwave (LW) (middle), and net (right) daily-mean cloud radiative effects (CREs, units: W m^{-2}) at the top of atmosphere (TOA) for transparent profiles with ice clouds only that are detected by the Raman lidar (RL; red) and Ka-band Zenith Atmospheric Radiation Measurement Program (ARM) radar (KAZR; blue) at the Southern Great Plains (SGP) site from January 2011 to December 2014. (d-f) CDFs for transparent profiles with ice clouds only and detected by both RL and KAZR. (g-i) CDFs for transparent profiles with ice clouds only that are detected by RL only; thus, only the RL results are shown here.

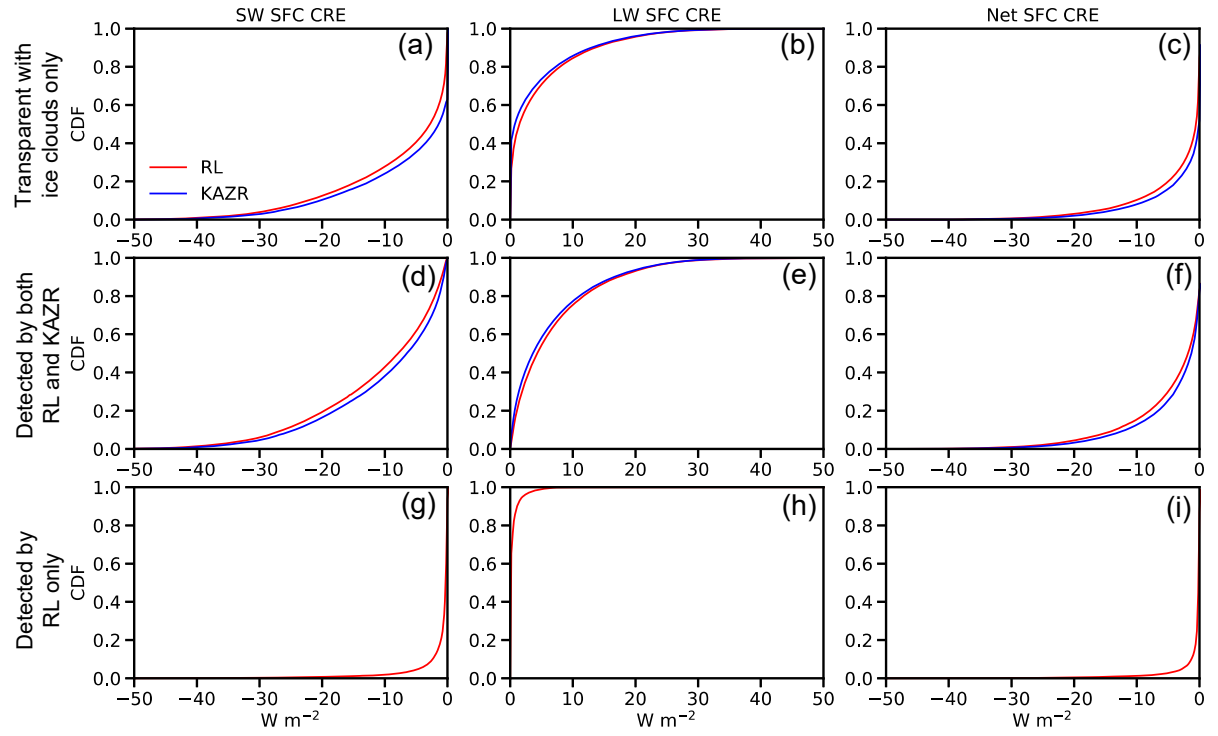


Figure S4. Same as Figure S3, but for the daily-mean cloud radiative effects (CREs) at the surface (SFC).

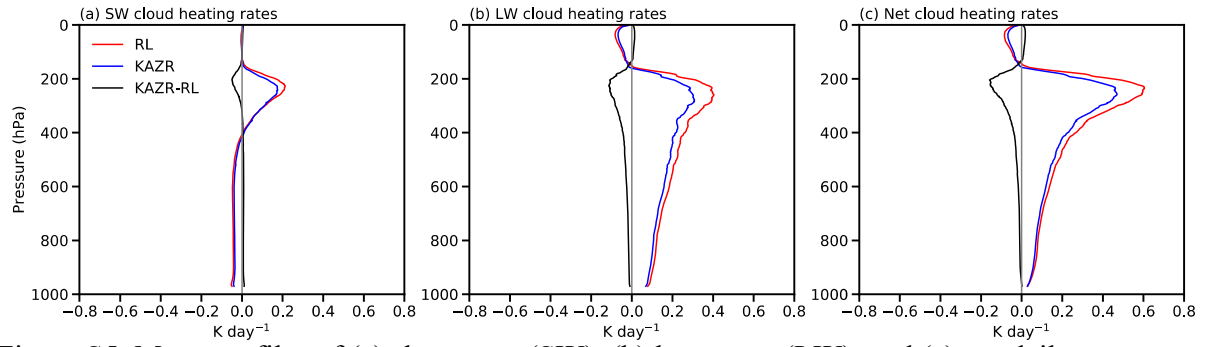


Figure S5. Mean profiles of (a) shortwave (SW), (b) longwave (LW), and (c) net daily-mean cloud heating rates (K day⁻¹) based on the Raman lidar (RL; red) and Ka-band Zenith Atmospheric Radiation Measurement Program (ARM) radar (KAZR; blue) observations for transparent profiles with ice clouds only, and their differences (KAZR - RL; black) at the Southern Great Plains (SGP) site from January 2011 to December 2014.