



Observational evidence of changes in water vapor, clouds, and radiation at the ARM SGP site

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Characterizing water vapor and cloud effects on the surface radiation budget is critical for understanding the current climate because water vapor is the most important greenhouse gas in the atmosphere and clouds are one of the largest sources of uncertainty in predicting potential future climate change. Several studies have shown that insolation over land declined until 1990 then increased until the present. Using 8 years of data collected at the ARM Southern Great Plains (SGP) surface site, we found that the insolation increased from 1997 to 2000, but significantly decreased from 2001 to 2004, changes that exactly mirror the variation in the second-order fit of cloud fraction. Under clear-sky conditions, the rates of change of water vapor, insolation and downwelling longwave (LW) flux are -0.0166 cm/yr, 0.48 Wm⁻²/yr, and -1.16 Wm⁻²/yr, respectively, indicating that water vapor changes are more important for LW flux than for insolation.