



Statistical Information of Locally Normalized Relative Humidity Profile and Its Use for Improving Upper Tropospheric Humidity Estimation

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Statistical information of locally normalized relative humidity profile was obtained from 10-year NCEP/DOE re-analysis data. Those obtained statistics were included in the UTH retrieval algorithm based on a linear relationship between logarithm of upper tropospheric temperature (UTH) and water vapor channel temperature (TB_{wv}). In doing so, geographically dependent regression coefficient was obtained by running radiative transfer calculation for the given temperature profile by using artificial set of moisture profiles, which quantitatively reflect various atmospheric humidity profiles. Regression analysis indicated that explained variance (R^2), mean bias, and fractional error shown between observed UTH and retrieved UTH are 0.94, -2.25%, and -7.76%, respectively. In contrast to the previous UTH retrieval using fixed profile of relative humidity, the new method significantly improves the performance of UTH estimation especially over mid-latitude regions. It has been demonstrated that vertical structure of humidity significantly affects the UTH retrieval accuracy under dry and cold atmospheric conditions. Results also indicate that retrieved UTH over the tropics appears to be more accurate (0.96 of R^2) than that over mid-latitudes (0.87), implying that the normalized vertical profiles used in study less represent in the mid-latitudes.