The paper explores the feasibility of a split window algorithm to create water vapor profiles from downwelling and upwelling irradiance measured by the Solar Spectral Flux Radiometer (SSFR) integrated on a [relatively] high altitude aircraft. Coincident measurements important in the retrieval process included aircraft flight level (FL) vertical profiles of water vapor, static pressure, and temperature (comparable to a dropsonde). The paper is clearly and concisely written with good references. Below are a few "minor" comments.

Scientific visualization for optimal representation of data

1. The Global Hawk (GH) flight lines including the vertical profiling need to be given a geospatial context. I had to pull the GH navigation data to see that the flight lines were over open ocean and within "the tropics." This is also important to the MODTRAN modeling parameters. Suggest either a map with continental boundaries or a lat/lon plot of the ATTREX flight track with the profiling stations indicated.
2. Figure 1 is not mentioned in the text. Consider connecting Figure 1 to a point you would like to emphasize or overplot the average NOAA Water instrument vertical profile to demonstrate how typical a measured winter tropospheric profile compares/contrasts with a full TOA modeled profile.
3. Figure 3. On my 32" monitor, I have all your plots zoomed to 200%. However, I still have difficulty "seeing" specific information in your plots. If you want to make the point on the right transmittance plot, rescale the plot to a minimum of 0.98 to see the differences in the minima of the water vapor "doublets" between 14 and 18 km respectively to TOA.
4. Figures 6 and 7 are a bit of an eye chart. Recommend eliminating the "red traces" for the +/- one standard deviation as they cannot be seen. Recommend rescaling all the left side plots from 0.97 to 1.0 to truly show difference between modeled and measured transmittance as Figure 9 shows this clearly. (Internal "legends" could then be centered even with rescaling in the affected plots.) Recommend right side difference plots to be rescaled -0.01 to 0.01 and an overplot of a 0.00 horizontal "line." Overall, there is too much "white space" in plots when there is valuable information to display.
5. Figure 11. The top left panel of the MODTRAN-modeled solar irradiances does not show any differences between 14-20 km -- suggest doing a log plot. I'm not sure why the solar irradiances were modeled with a nadir view "straight overhead" – why not with the LOS indicated on Figures 6 and 7?

Scientific content

Section 2, line 22.
I believe what is plotted in Figure 2 is the MODTRAN [modeled] water vapor transmittance for MODEL=0 (tropical). Or is it MODEL=6 1976 US standard atmosphere? The "input" water vapor profile is redundant if the former is true. What is important here is the tropical default column integrated amount is 4.11 g cm-2.

Section 4, line 26.

It may be helpful to speculate why the second profile was approximately three times greater than the first profile rather than point out the disparity in Figure 5. Is this variability to be expected seasonally or geospatially? Or is the profile an outlier and should be not considered in your population size? I quickly checked SST anomalies produced by JPL for that area. . .

Section 5, line 11.
It is important to point out that the MMS produces profiles of static pressure in addition to total pressure. The reason for this is that MODTRAN input that you used was equivalent to radiosonde data which uses static pressure.

Section 5, line 19.
"The CO_2 mixing ratios were set to 392 ppmv." Is that the MODTRAN default or did you use the in situ measurements from the Picarro Cavity Ringdown Spectrometer onboard the GH? You make a point in saying that the O_2 and CO_2 absorption features in the NIR "are of little interest to this work other than to note their presence in the spectra" (section 4, line 23). So, is the CO_2 amount important?

Section 5, line 8.
"Computed spectra were convolved with the slit function. . ." If you truly did a FFT convolution then the statement is true. Otherwise, a "spectral convolution" was done on the MODTRAN output.

Section 8, first paragraph.
Perhaps a sentence which ties in the objective of the ATTREX campaign would strengthen the summary.
Suggest: "Monitoring the oceanic water vapor as it enters the TTL at spatial and vertical scales ranging from the micro to macro levels from high altitude aircraft may help understand some of the complexities of climate change. Water vapor profiles at these spatial scales cannot be retrieved from current satellites."

Interactive comment on Referee #1.

1. If there are cirrus clouds (verified by CPL data) in "dive 2," the profile should be excluded from the profiles used in the analyses. While cirrus clouds are the easiest clouds to model in MODTRAN, one still needs additional data (other than from CPL) to determine the cloud height. I believe the paper is better served with retrieving the water vapor profiles from clear skies to demonstrate the feasibility and robustness of the methodology.
2. The marine aerosols in the GH flight track sampling points are typically concentrated within the first two kilometers (ASL) which can be modeled easily with MODTRAN (with or without CPL data as input). What is important is the presence/absence of volcanic aerosols above the GH FL, (aircraft altitude). Again, one would have to verify that the GH FL track was not affected in the temporal or geospatial domain by high[er] altitude aerosols, something that can be easily done.
3. In order for the results to be "reproducible," I agree with Referee #1 that more information on input parameters for the MODTRAN modeling should be described.