

This is a complex paper to read. the authors' effort at presenting a complete view of the ASSIST theory and development is greatly appreciated. In my opinion, the paper would be improved by focusing on those details they consider most important in section 3, but then they are best equipped to make that evaluation. Notwithstanding the statement that a follow-up paper in preparation that describes the performance of ASSIST, this paper would greatly benefit from the presentation of actual ASSIST spectral radiance spectra compared to co-located AERI measurements and also to well known forward models such as LBLRTM. That is still the best way for the reader to evaluate whether or not the considerable effort on the part of the ASSIST team has produced a capable system that accurately measures downwelling radiance. Presenting a pair of cases, one of a warm, wet atmosphere and the second, a cold, dry atmosphere, would nicely span the spectral and environmental performance regime.

Comments/Corrections

Pg 2 line 28 why refer to the signatures of liquid water, ice and aerosols as “spectrally dependent”? Do you perhaps mean that they are broad and don't offer much spectral structure?

Pg 2, lines 40-45 references imply use alongside AERI instruments, however, none of the references checked provide a comparison between the two

pg 3. Section 2.1 Is the ASSIST (the interferometer) an FTS built by LR Tech? It would be a good idea to state so, or otherwise state the origin of the FTS.

Pg 5. line 95 “... move together, in opposite directions relative to the beamsplitter.” What are the “directions relative to the beamsplitter”? Does opposite refer to both moving away from the beamsplitter (as traveling east is opposite from traveling west), or one moving “in” towards the beamsplitter while the other moves “out” away from the beamsplitter?

Pg 5. line 103. So there are two photodetectors, one for each polarization. Is there also a dedicated preamplifier for each photodetector?

Pg 5. line 110 scan velocity of *approximately* 2.0 cm s^{-1} ? Can you specify the physical motion that corresponds to and OPD span of $\pm 1.04 \text{ cm}$?

Pg 5. line 115 Are you saying that essentially the same metrology fringe is typically selected scan after scan? In other words, there is typically no, or minimal, “jitter” in the fringes? How do you determine this?

Pg 6. Figure 3 caption. I would guess that this is actually a filter placed at an angle that reflects wavenumbers below a cutoff and transmits those above? Same comments apply to section 2.3. More detail about the detector and cooler setup would be interesting.

Pg 8. Table 2, spell out entr. Entrance pupil area, what does this refer to? Diameter of the FS? The entrance pupil as described as near the CC apices? Data rate would make more sense as the number of seconds per interferogram. Could easily be stated as both.

Pg 10. Section 2.5. Quite specific information is provided about several of the components in the calibration system, but nothing is specified about the temperature controller. For example, at what rate does the controller monitor the BB readings? There is a 2 minute time constant quote for closed loop

adjustments, how often does the controller fine-tune that adjustment? If ambient conditions change, and the HBB needs to adjust, how is that process monitored and reported?

Pg 11. Section 2.6 Environmental Enclosure. According to various specifications presented, you have an operating range from -25C to 40C, described as “harsh”. This is a subjective evaluation, and these values are rather milder than several use cases in which other instruments are performing adequately.

Pg 14. Line 246. When you say “a low impedance path between chassis and ground” are you referring to the grounding connection for your power supply such that you enact a single point ground for the system?

Pg 15. Figure 9. I would prefer to see a legend on the plot describing the various traces, rather than having to read the caption. If available, a completely independent air temperature reading would also be of interest (ie. not recorded by the ASSIST). Would be useful in particular for understanding the ABB temperatures

Pg 16. Table 4 I would dispense with the use of (-) to denote a dimensionless quantity, or a quantity not having intrinsic units. At least that is what it seems to be for. For the cooler Power up count - what is that? If you track hours of operation that would be useful information. What is the value of the quantity T_A/T_H ? Are you perhaps reporting one of the mean T_A and the mean T_H ? If so, replace the ‘/’ with or. For the hatch status, do you have actual limit switches whose state is read to determine open, closed, or other?

Pg 16, line 270. To clarify, the FOV corrections, resampling and cropping are carried out AFTER averaging forward and reverse scans? Those would seem to be characteristics that could potentially be different in the forward or reverse direction. This could really use more detail.

Pg 19. line 336, do you perhaps need to move the commas? For example:

Fitted values of the factor $2a_2V_{0,Hd}$, for HBB views normally associated to the highest photon irradiance for a dozen ASSIST instruments, are distributed around 0.10 with extreme values reaching 0.04 and 0.16.

pg 19. line 238 remove the () around the reverse scan description and write it as a stand-alone sentence.

Pg 25/26 and figure 16. As no two days are the same, and no two sites the same, is there any particular relevance to showing these signals evolving over a day? Showing cases near the limits might provide more information.

Pg 26. line 427, something doesn’t make sense in the wording

pg 28. figure 17. I am unsure how to interpret the value of the “first moment”. Is that the median of the area under the curve? Center of mass means what in this context?

Pg 29. Line 464 “... the relative spectral shift is spectrally dependent” ... does this mean that the spectral shift varies with wavelength? Some other characteristic of the spectrum?

Pg 29. Line 472. Perhaps you could comment briefly on the most critical facet of the detector alignment as determined by your new procedure?

Pg 30. Figure 18. Is the radiance represented here actual measurements from the ASSIST-22, or modeled radiance based on the characteristics of ASSIST-22?

Pg 30. Line 492 “typically displays strong out-of-band noise” how is this happening? Are there not optical filters, electronic filters? Or what is being referred to here as out-of-band noise?

Pg 34. Figure 22. Looks like a blue and red curve on my screen. You might want to refer to line type or some other line or plot characteristic to avoid color confusion.