This paper provides a description of a new NRT MISR product being generated at LANCE for intended use in the operations and hazards community. Most of the discussion is rightfully focused on modifications of the product to account for missing upstream inputs to the operational product, most notably for cloud and snow/ice screening. Their conclusion is that for the most part the NRT product is very similar to the operational product, with vernally increased retrieval yield and occasional cloud screening differences. I am sympathetic to and even appreciative of the author's efforts to create this product. MISR has long suffered from its relatively slow processing, and I am sure the team hopes this will enable broader use by the community. Overall, I think this is a paper worthy of publication in that, for the topics they cover, what is there to argue with? They documented their product differences from the operational version quite well and thus, in some ways, it is good to go. However, I would like to point out that the authors do not address many of the topics that the operation community is concerned with. In this regard, I point the authors to "Benedetti, et al., Status and future of numerical atmospheric aerosol prediction with a focus on data requirements, Atmos. Chem. Phys., 18, 10615–10643, https://doi.org/10.5194/acp-18-10615-2018, 2018." Addressing the concerns outlined in Benedetti et al in this paper would improve the value of this paper and will gain the respect of the user community.

Benedetti et al., points specifically towards the necessary principles of availability, low latency, and product characterization required in order to get the attention of the operational community. Availability? In LANCE, check! Low latency? 3 hour delivery, check! Characterization? Hmmmm… In regard to the NRT product baselining against the standard operational product for coverage and cloud screening, they have largely met the requirement. However, whether the NRT product or even the standard product is worthy of assimilation, as is its professed rationale, that is unclear. Operational developers spend more time cleaning up the satellite products than they do working on the assimilation systems themselves. Three months of data (Mar-Apr-May) of 2020 seems a very short evaluation period with a swath as narrow as MISR's, and does not even account for seasonality. The paper leaves further evaluations to the user community, which quite frankly they are unlikely to do. But again, the "out" for the authors is they can say that they are simply baselining to the standard product, with no other guarantees on data quality.

Figures such as #7, when you see speckled differences between products, suggest the evaluation is under sampled. It would also help if there were more images cases such as in figure 6 where the authors could dive deeper into differences. Indeed, cloud masking is probably the user community's number one concern. It is my recollection that v23 did have much tighter cloud screening and improved quality flags, but the retrieval yield for the highest confidence flag was pretty low. I very much would like to see more discussion on this, e.g. what is the probability of, say 15 samples being collected in, for example, a 1 degree box. Even picking a single day, or two or three consecutive days at random and mapping the values and the differences between the products will help the user understand what is going on in terms of yield, differences in products and residual cloud and/or ice masking errors. Indeed, from a NRT point of view, seasonal averages mean little. It is individual passes and retrievals that need to be evaluated.
I also would suggest a little more discussion on what MISR brings to the table relative to other NRT products. For the MISR instrument, you may want to point out where MISR has historically been assimilated in reanalyses. The results are a bit mixed as, on one hand, by its

nature MISR is in the glint region of MODIS. So over water, with MISR+MODIS together, you do get a more full frame during Terra overpasses. But statistically, this does not manifest all that well in RMSE's because of the narrow swath relative to MODIS which swamps the overall signal (Zhang et al., Evaluating the impact of multisensor data assimilation on a global aerosol particle transport model, J. Geophys. Res. Atmos., 119, 4674– 4689, doi:10.1002/2013JD020975, 2014). Playing the game of "adding more AOD data points" to a crowded MODIS, VIIRS, and now geostationary field is unlikely to score MISR big points. But, MISR is superior in products like fine mode fraction, and its ability to semi quantitatively isolate absorption, and identify non-spherical particles has always been MISR's more unique capability. However, these products are not even discussed in this manuscript. I am very curious, does the NRT cloud screening change fine mode fraction or non-sphericity over ocean? Any changes in absorption in biomass burning areas?

Lastly, there are a few things that they could probably do better, although in the context of this paper it is sort of moot. For one, it does not make much sense to use prior year wind speed (I assume this is a monthly average from TASC). This will lead to year by year variability in the product. If you wish to use a climatology, that is fine, but use a static value. For FIRSTLOOK, if the assumption is that the developers want to take into account climate change, they should probably do a 5 year moving window, something that can at least account for ENSO. If operational centers want to make corrections based on their current wind speeds, using the "last year" creates a more difficult moving target. Further, I believe LANCE could use model wind fields. Using a 12 hour wind forecast from GFS would probably help out quite a bit for remote oceans.

Anyways, hope these comments help. My colleagues and I are always grateful when a new NRT product comes into production. Feel free to reach out to me if you wish to discuss further.

Jeffrey S. Reid, US Naval Research Laboratory.

Re: Dr. Jeff Reid, thank you so much for your review, valuable comments, suggestions, and insights. We did our best to include additional analyses in the manuscript based on the data we have available at the moment. Unfortunately, we were not able to extend the evaluation period (March, April, May 2020) with additional months due to the availability of both the NRT and SA datasets. We could include additional months using more recent NRT data, but this would require further delays as the SA product is not yet available for these months. However, per your recommendations, we investigated retrieval yields and particle properties using the available data. This resulted in reorganization of section 5, which now has three subsections:
5.1. Total AOD
5.2. Retrieval yields
5.3. Fractional AOD
We also added a figure showing differences in select particle properties between the SA and NRT products.
For your convenience, we've attached below revised sections 5.2 and 5.3 (new text marked in red). We hope you find our additions valuable.

5.2. Retrieval yields

Figure 8 complements Fig. 7 by showing (a) the SA retrieval count distribution as well as (b) the retrieval count difference between the SA and NRT products.

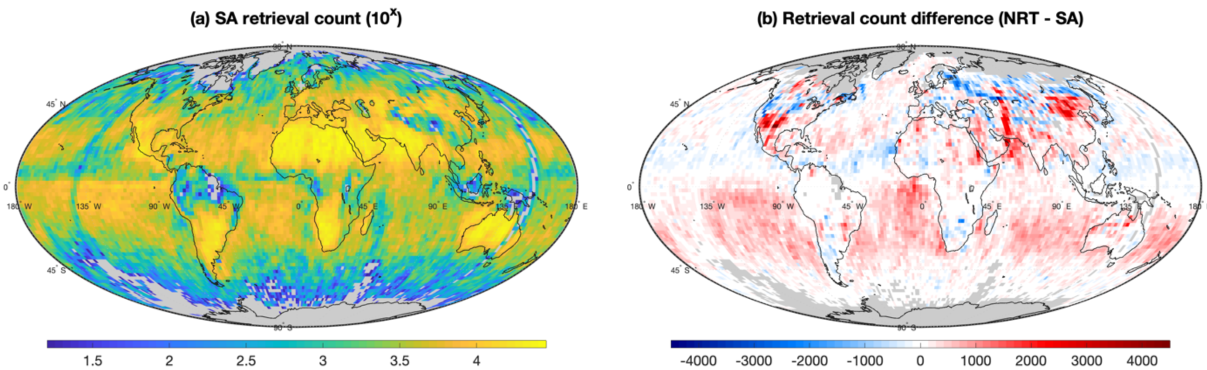

Figure 8 (a) Decimal logarithm of the retrieval count from the SA product in March, April, and May of 2020; (b) retrieval count difference between SA and NRT. Presented values are gridded at 2-by-2-degree spatial resolution and grid points with less than 15 retrievals are excluded.

The highest number of retrievals is found over the subtropical continents where the cloud cover is usually the smallest. Over the subtropical oceans in the Southern Hemisphere the NRT retrieval counts are typically higher than in SA, which results from the absence of upstream cloud classifiers in NRT processing and subsequently fewer subregions being excluded as cloudy. Note that this increase in retrieval count caused by the lack of cloud classifiers is not compensated by the increased ARCI threshold in NRT processing (ARCI≥0.18), which always reduces the number of retrievals when compared to the default SA threshold (ARCI≥0.15). The lack of hemispheric symmetry in this case is likely due to the seasonal variability (only months in northern spring are analyzed here). Over land the lack of upstream cloud classifiers also results in higher number of NRT retrievals in certain regions, but the surface type exclusion rules reverse this pattern, especially at higher latitudes. The conservative cloud logic over snow/ice surfaces in NRT processing often results in the lower number of NRT retrievals in the high latitudes of the northern hemisphere.

A metric relevant to the potential use of the NRT product in data assimilation is the retrieval yield per model grid point. The retrieval yield can be measured as, for example, the number of 1º x 1º grid cells that have at least 15 valid satellite retrievals in them. From this perspective, the NRT product has a retrieval yield that is about 0.7% higher than the SA product, based on the three months of data analyzed in this study.

5.3. Fractional AOD

MISR's multi-angle retrieval approach enables characterization of aerosol optical and microphysical properties, such as fractional AODs associated with particle absorption, nonsphericity, and size (see e.g., Kahn and Gaitley, 2015). This attribute of the MISR SA product has been applied to many climate and air quality studies and inclusion of this capability in the NRT product would benefit data assimilation for numerical prediction of atmospheric aerosols (Benedetti et al., 2018). Consequently, this section provides preliminary statistical comparisons of the SA and NRT absorption AOD along with small-mode, large-mode, and nonspherical AOD. The results shown in Fig. 9 indicate that the probability density functions of these aerosol properties in the NRT product are statistically equivalent to the SA product. This assessment reaffirms the consistency of the NRT and SA products. Future studies will examine geographic and statistical differences and other particle properties in more detail.

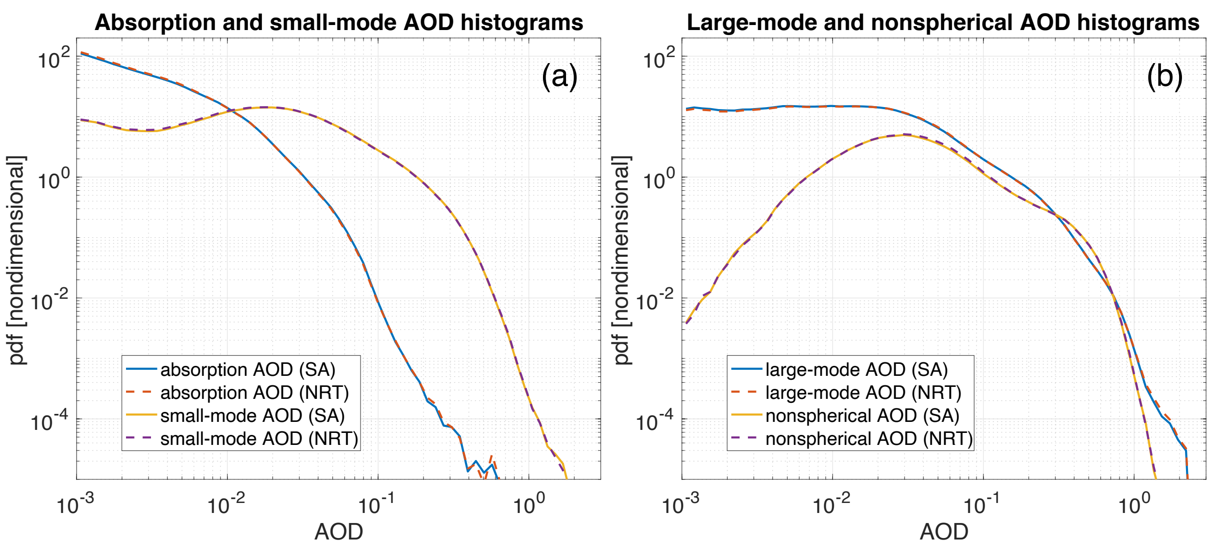

Figure 9 Normalized probability density functions for select MISR particle property retrievals in March, April, and May 2020. Solid lines represent SA retrievals and dashed represent NRT retrievals. (a) absorption AOD and small-mode AOD retrievals; (b) large-mode AOD and nonspherical AOD retrievals. The differences between the SA and NRT products are negligible.