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Interactive comment on "Characterizing the diurnal cycle of South Atlantic stratocumulus cloud properties from satellite retrievals" *by* Chellappan Seethala et al.

Anonymous Referee #2

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This paper presents an inter-comparison of cloud liquid water path retrievals using several different satellite retrievals toward the goals of evaluating the retrievals resulting from the SEVIRI geostationary observations relative to other satellite sensors, characterizing the specific biases resulting from light-absorbing aerosol above the cloud, and describing the diurnal cycle of stratocumulus clouds in the southeast Atlantic Ocean region. Given that the paper tackles all three of those goals, it is perhaps a bit ambitious. However, these issues are coupled together and the paper provides a reasonably comprehensive study of the relative biases in the retrievals and the diurnal cycle. I believe the paper may be published following some relatively minor revisions to some aspects of the paper discussed further below.

1) Figure 2 indicates that the SEVIRI retrieval is substantially more sensitive to the presence of smoke above the cloud. The difference in the response is robust and indicates something meaningful about the differences in how the retrievals are performed, but is only addressed very briefly on line 375 as "partially explained by the spectral difference that for SEVIRI retrievals the 0.6um channel is used as a non-absorbing channel in contrast to the 0.8um channel for MODIS." I feel that this needs some deeper discussion. In what way is the SEVIRI channel more sensitive? Perhaps there is a citation that documents that spectral absorption features that explain this. Could the MODIS bands be chosen for SEVIRI in light of this additional bias due to absorbing aerosol? If the is only partly explained by the differing spectral absorption of smoke between 0.6 um and 0.8 um, then what are the other contributing factors?

2) In line 319 it is noted that the SEVIRI retrieval exhibits a strong decrease in effective radius with increasing smoke above the cloud, but only a very weak decrease in cloud optical thickness. Is this consistent the cases presented in the Haywood et al. (2004) paper? Many of the cases in that paper exhibited a strong decrease in the optical thickness and only a weak decrease in the retrieved effective radius, although the details depend on the spectral bands chosen for the retrieval. Also, is this consistent with the explanation offered above for the stronger sensitivity of SEVIRI to smoke? I would expect that if the so-called "non-absorbing" band chosen is substantially more sensitive to smoke absorption, that this would cause a more substantial impact on the retrieved optical thickness than the effective radius. This needs to be clarified.

3) In the paragraph beginning line 435 comparing SEVIRI and MODIS is broken cloud scenes, it is noted that SEVIRI is biased high relative to MODIS primarily because of a high bias in the effective radius retrieved. The authors argue that this could be caused by the SEVIRI algorithm's artificial use of a climatological effective radius for optically thin clouds. However, I wonder if it might also be contributed by the differences in resolution between SEVIRI and MODIS. Could it be that SEVIRI with a larger footprint than MODIS is simply more likely in broken cloud scenes to report a valid retrieval in a

pixel that in reality is contaminated by some inhomogeneity or clear-sky regions? That would presumably lead to a high bias in effective radius that is more substantial for SEVIRI than MODIS.

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