Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2017-365-RC2, 2017

Atmospheric Chemistry and Physics Discussions

Interactive comment on "A Study of the Longer Term Variation of Aerosol Optical Thickness and Direct Shortwave Aerosol Radiative Effect Trends Using MODIS and CERES" *by* Ricardo Alfaro-Contreras et al.

Anonymous Referee #2

Received and published: 14 June 2017

This study computes AOT and SWARE trends from multiple satellite instruments. Although no particular issues are present in the methodologies used in the study, the manuscript would benefit from a more focused presentation. The motivations for this work isn't clearly stated and it is also not clear how this work is distinct from the authors' previous papers.

Relative to the authors' previous work, this study uses additional datasets, a longer time period and updates to C6 of the MODIS data products. Given this is study is essentially a repeat of previous work, I would encourage to authors to spend less time comparing

every detail between this and their previous work and instead concisely present to the reader what new knowledge this study gives compared to the group's previous work. While bits and pieces of this are found throughout the paper, they are difficult to pick out in the long-winded presentation. Additionally, there many other studies of AOT trends outside the authors' previous work that are not cited in the manuscript which require recognition.

The addition of the SWARE analysis is diminished somewhat since, in the context of the radiation budget, trends in instantaneous fluxes isn't particularly useful. Additional, although the authors appear to be surprised by this, the SWARE is largely controlled by AOT, so it is expected that trends will be highly correlated. This make the SWARE analysis somewhat redundant.

Concerning the overall motivation for this study: given the large uncertainties, how do these trends help our understanding of aerosols and their role in the climate system? In the conclusion the authors state that "This study suggests that comprehensive observational systems can and should be used in future studies to gain a better understanding of any changes in atmospheric aerosol states." But what specific understanding have we gained with this study beyond a set of descriptive statistics? Given the large uncertainties, these trends are far from being climate monitoring quality, how does that limit the impact of work like this? Do we observations with lower uncertainties or is getting a few robust regional trends good enough? Given the large calibration drifts, should the goal be to develop of more advanced drift removal method than using the Remote Ocean region? More discussion on these sort of question and the broader implications of this work is needed in the introduction/conclusion.

MINOR COMMENTS

What is the point of keeping the seasonal cycle in some of the plots, but not others? Unless there is some particular reason for this, I would find it more instructive if all

comparisons where deseasonalized.

The color bars on Figs. 1 and 12 make it difficult to infer any quantitative information. I suggest that the max/min range and the near-zero white portion be narrowed.

Why is Eq (1) is opposite the usual sign convention?

Lines 54-55: what is meant by "detecting aerosol plumes". MODIS doesn't have an aerosol mask.

Lines 60-62: Remove this sentence. The Terra/Aqua time series is not long enough to directly observe climate forcing. Additionally, the authors don't examine the SW direct forcing (i.e. radiative effect of only anthropogenic aerosols)

What version of the CERES data products are being used?

lines 147-148: not sure what is meant by this line. What else could aerosol be classified as

line 175: change "Overland" to "Over land"

line 186: remove "even"

lines 194-197: why is the C3M data mentioned if its never going to be used?

lines 197-199: remove this sentence

Line 215: remove "trend paper"

Line 240/251: remove "For illustrative purposes".

Lines 273-274: remove "A quick comparison"

Line 293: remove interestingly

line 492: remove "Surprisingly"

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2017-365,

2017.