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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Contrail life cycle and properties from one year of MSG/SEVIRI rapid-scan images" *by* M. Vázquez-Navarro et al.

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This paper presents a quantitative method of tracking contrails originally detected using high spatial resolution MODIS data, using geostationary imagery. A year's worth of contrails were considered, and thus a statistically significant sample size was collected. This paper presents information about the time evolution of contrail properties, which is new and important for the overall understanding of the impact of contrails on the Earth's radiation budget.

This work is valuable, generally well presented, and provides insight into an area that is still poorly understood. Most of the current satellite-based research of contrail properties has focused on linear contrails, even though non-linear contrail cirrus may have

a more significant radiative effect. This study provides a nice look into the morphology and overall impact of contrails as they age.

Based on the above comments, I suggest this paper for publication with minor revisions.

Specific comments:

Page 3, lines 166-170. Some discussion is necessary of the kinds of biases that may be introduced by performing the study using only contrails that passed very strict detection criteria. It is noted that the strict criteria lead to a lower detection efficiency. But does this, for instance, increase the optical depth of the contrails detected? Decrease the overall estimated contrail radiative forcing? Prevent the identification and/or tracking of smaller contrail outbreaks or contrails over non-uniform surface types?

Page 3, lines 183-184. It is stated that an altitude of 10 km is assumed for all contrails. However, aircraft cruise altitudes vary, and may be higher or lower depending on aircraft type, duration of flight, latitude, etc. Realistically, contrail altitude may be anywhere between around 8 km to 12 km. Please provide justification for choosing this particular altitude and comment on biases in contrail location and tracking data that may be introduced by assuming a fixed value.

Page 3, lines 200-207. How does the tracking algorithm handle images in which there may be many contrails in a partially merged together state initially? These contrail "outbreaks" will, arguably, have the greatest effect on radiative forcing, especially on a regional basis.

Page 5, lines 370-374. While I agree that the limited temporal sampling of MODIS is certainly a contributing factor in determining the contrail distribution, I believe it is insufficient to fully explain why the contrail distribution here differs so much from established patterns of air traffic. Other studies (such as Duda et al. 2013) have shown contrail distribution maps generated using a single MODIS instrument that are similar to air traffic patterns. Contrail detections over central Europe seem particularly under-

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represented. An expanded discussion of the biases that will lead to under-detection of contrails, especially over land, is necessary.

Page 7, lines 455-457. It would be useful, for comparison with other studies, to include the mean retrieved optical depth values and number of observations for each time window. This is especially since the overall mean value concluded from this study is higher than the other studies cited.

Technical concerns:

Page 2, line 133. “measures” should be replaced with “retrieves”

Page 5, figure 4. The color scale in this image makes it difficult to really identify regions of highest contrail volume. A different color scale that shows a greater color contrast would be helpful. Possibly larger pixel size and/or different map projection would also make this image more useful. As it is, I’m not sure that in print, it will be effective in its intended purpose.

Page 8, figure 8. Since the values of optical depth are so small, it is unnecessary to extend the x-axis all the way to 2.0. Stopping at 1.2 or so may allow finer subtleties in the distributions to be more readily observable. Same for optical depth x width plot, could probably be stopped at about 10.

Page 7+, Summary and Conclusions section. This section seems lengthy for a “summary”. Additionally, there seem to be new ideas/explanations presented here, some of which address some of the concerns noted above. The summary/conclusions section is not the place to present new ideas. I suggest a reorganization and shortening of this section to include only key take-away points from this paper. Lengthy discussions/explanations should be moved up into section 2 or 3.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 7019, 2015.