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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Large contribution of meteorological factors to inter-decadal changes in regional aerosol optical depth" *by* Huizheng Che et al.

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This study makes an extensive study of the global trends of aerosol optical depth during more then 30 years, with an emphasis on the quantitative estimation

of the different weights of emission and meteorological factors in the inter-decadal changes. Different aerosol optical deth sources have been employed, such

as satellite derived (MODIS and MISR), ground based (AERONET and CARSNET) and reanalysis (MERRA-2). 12 Regions of Interest were defined, using more than 400

ground stations. The method employed for the derivation of the different weights is based on a stepwise multiple linear regression model, further completed

with the Lindeman, Merenda and Gold method to quantitatively evaluate the contribution of each driving factor.

The objective of the paper is challenging, implying the use of good quality and large databases. The mthods used are complex and recognised by the

international community. The validation made in the first part of the study important, given that MERRA-2 performance on a global scope was not assessed

before. The results reached are of upmost importance, with adequate references to individual regional results that are complementary and support the

conclusions. The paper is well written, with very few and minor mistakes; no flaws detected on the English grammar or style.

On a first read I would like to make a few comments:

- Abstract, line 32: I would change the "in-situ" measurements with "ground-based measurements", even if it is not incorrect. - Line 129: Earth system? - Lines 180 - 183: The uncertainty estimation is based on Level 2 data, but this analysis uses Level 3 data. PLease consider using Level 3 uncertainty

estimations such as Ruiz-Arias et al. (2013): J. A. Ruiz-Arias, J. Dudhia, C. A. Gueymard, and D. Pozo-Vazquez. Assessment of the Level-3 MODIS daily aerosol

optical depth in the context of surface solar radiation and numerical weather modeling. Atmos. Chem. Phys., 13, 675–692, 2013. doi:10.5194/acp-13-675-2013 - Line 185: earth? - Line 201: I think it should be written "AERONET and CARSNET" - Line 235-236: other independent meteorological fields instead of MERRA-2? - Line 237: etc - Line 343: AERONET - Line 347-348: I don't understand this, based in figure b4. Should be "lower" instead of "greater" than 0.1 and 0.05, respectively? - Line 356: there clear? - Lines 488-490: any reason to explain the change? - Lines 824: the term "wind speed" was used in the previous paragraph, but here WS is used instead. Perhaps using wind speed would be fine, given that the

text includes many acronyms.

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