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Testing two recent methods for retrieving aerosol optical depth from sunshine duration measurements over Europe

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A better knowledge of the present–day aerosol forcing needs an accurate estimation of the past aerosol optical depth (AOD). Sunshine duration (SD) measurements are used as a proxy to infer AOD because of their remarkable long time–series and noticeable spatial coverage over the world. The European Climate Assessment & Dataset (ECA&D) project provides such long time–series over Europe. About 100 stations have collected SD measurements together with cloud cover data and other meteorological parameters such as air temperature and relative humidity. Few of them are collocated with AErosol RObotic NETwork (AERONET) stations providing AOD.

Two published methods for retrieving AOD from SD measurements are selected from the literature: Sanchez–Romero et al. (2016) and Li et al. (2016). In this study, we evaluated the performance of both methods by comparing the estimated AOD from SD measurements against measured AOD at collocated AERONET and ECA&D stations. The results are summarized by the means of statistical indicators for assessing the level of accuracy. Moreover, the historical evolution of the estimated AOD is presented to assess the capability of each method to distinguish dimming and brightening phenomena. This work is part of a project whose overarching goal is to provide an accurate reconstruction of past atmospheric aerosol load useful for the scientific community.

References:

Li, J., Liu, R., Liu, S. C., Shiu, C. J., Wang, J. and Zhang, Y.: Trends in aerosol optical depth in northern China retrieved from sunshine duration data, Geophysical Research Letters, 43(1), 431–439, 2016.

Sanchez-Romero, A., Sanchez-Lorenzo, A., González, J. A. and Calbó, J.: Reconstruction of long-term aerosol optical depth series with sunshine duration records, Geophysical Research Letters, 43(3), 1296–1305, 2016.