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Aerosol-induced signal in sunshine duration records: A review of evidences

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Aerosols play a complex and crucial role in the Earth′s radiation budget, by enhancing the absorption and scattering of incoming solar radiation. Consequently, knowledge of the interannual and decadal changes of the atmospheric turbidity induced by aerosols is fundamental for a better understanding of the climate variability and change since pre-industrial times.

However, there is a little knowledge regarding changes in aerosol concentrations in the atmosphere on decadal time scales, especially before 1980s, when both ground-based platforms (spectrophotometers) and satellite-borne measurements were available. Nevertheless, sunshine duration observations may be affected by changes in atmospheric aerosol loading, therefore they may provide an adequate proxy measurement for turbidity from the late 19th century up to present.

This work reviews publications reporting the suitability of the sunshine duration records measured by Campbell-Stokes instruments to detect changes in atmospheric turbidity, with special emphasis on decadal time scales. In addition, some possible directions for future research are also suggested, particularly pointing out that analyses based on sunshine duration measurements could be extended worldwide since the 1950s due to the availability of records; for some regions, these data are available since as far as the late 19th century.