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## A global analysis of climate-relevant aerosol properties retrieved from the network of GAW near-surface observatories

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Aerosol particles are essential constituents of the Earth's atmosphere, impacting the earth radiation balance directly by scattering and absorbing solar radiation, and indirectly by acting as cloud condensation nuclei. In contrast to most greenhouse gases, aerosol particles have short atmospheric residence time resulting in a highly heterogeneous distribution in space and time. There is a clear need to document this variability at regional scale through observations involving, in particular, the in-situ near-surface segment of the atmospheric observations system. This paper will provide the widest effort so far to document variability of climate-relevant in-situ aerosol properties (namely wavelength dependent particle light scattering and absorption coefficients, particle number concentration and particle number size distribution) from all sites connected to the Global Atmosphere Watch network. High quality data from more than 90 stations worldwide have been collected and controlled for quality and are reported for a reference year in 2017, providing a very extended and robust view of the variability of these variables worldwide. The

range of variability observed worldwide for light scattering and absorption coefficients, single scattering albedo and particle number concentration are presented together with preliminary information on their long-term trends and comparison with model simulation for the different stations. The scope of the present paper is also to provide the necessary suite of information including data provision procedures, quality control and analysis, data policy and usage of the ground-based aerosol measurements network. It delivers to users of the World Data Centre on Aerosol, the required confidence in data products in the form of a fully-characterized value chain, including uncertainty estimation and requirements for contributing to the global climate monitoring system.

**SARGAN team:** All station PIs contributing to data provision