

## Aerosol typing – key information from aerosol studies

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Aerosol typing is a key source of aerosol information from ground-based and satellite-borne instruments. Depending on the specific measurement technique, aerosol typing can be used as input for retrievals or represents an output for other applications.

Typically aerosol retrievals require some a priori or external aerosol type information. The accuracy of the derived aerosol products strongly depends on the reliability of these assumptions. Different sensors can make use of different aerosol type inputs. A critical review and harmonization of these procedures could significantly reduce related uncertainties.

On the other hand, satellite measurements in recent years are providing valuable information about the global distribution of aerosol types, showing for example the main source regions and typical transport paths. Climatological studies of aerosol load at global and regional scales often rely on inferred aerosol type. There is still a high degree of inhomogeneity among satellite aerosol typing schemes, which makes the use of different sensor datasets in a consistent way difficult. Knowledge of the 4d aerosol type distribution at these scales is essential for understanding the impact of different aerosol sources on climate, precipitation and air quality. All this information is needed for planning upcoming aerosol emissions policies. The exchange of expertise and the communication among satellite and ground-based measurement communities is fundamental for improving long-term dataset consistency, and for reducing aerosol type distribution uncertainties.

Aerosol typing has been recognized as one of its high-priority activities of the AEROSAT (International Satellite Aerosol Science Network, <http://aero-sat.org/>) initiative. In the AEROSAT framework, a first critical review of aerosol typing procedures has been carried out. The review underlines the high heterogeneity in many aspects: approach, nomenclature, assumed number of components and parameters used for the classification. The harmonization of the aerosol typing procedures is a fundamental need in aerosol studies for long-term perspectives, satellite validation, and accuracy. However, the possibilities and limits in defining a common set of aerosol types for satellite missions and ground-based measurements depends on different information content among measurement techniques and for different retrieval conditions (e.g. for low aerosol content there is smaller satellite aerosol type retrieval sensitivity), as well as different historical choices. The concept of a reference database for aerosol typing (REDAT) is developed with the specific purpose of providing a dataset suitable for the comparison of typing procedures (from ground-based, and satellite measurements) and to be used as reference dataset for the modelling community. It will also allow the definition of translating rules between the different aerosol typing nomenclature, information strongly needed for the more and more increased audience of scientific data with no scientific background, as well as policy and decision makers.

Acknowledgments: The research leading to these results is partially funded by ACTRIS2 Research Infrastructure Project by the European Union's Horizon 2020 research and innovation programme under the grant agreement n. 654169.