A European aerosol phenomenology-6: Scattering characteristics of atmospheric aerosols at 28 ACTRIS sites

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1. INTRODUCTION

Atmospheric aerosols are recognized as an important atmospheric constituent with demonstrated effects on climate and health. The radiative forcing of aerosols, estimated as \(-0.9 \text{ to } -0.1\) W/m² (IPCC, 2014), has two competing components: a cooling effect from most aerosols and a partially offsetting warming contribution from black carbon (BC) absorption of solar radiation. The aerosol cooling is the dominant effect; thus, aerosols are counteracting a substantial portion of warming effect from well-mixed greenhouse gases (GHGs) by increasing the planetary albedo. Reducing the uncertainties on the radiative effects of atmospheric aerosols is mandatory in view of the global warming experienced over the past 50 years.

2. Objectives

The main objective of this work is to summarize the aerosol scattering measurements performed at the European ground-based in-situ ACTRIS stations. A total of 28 stations (25 EU) are included in order to document the variability in surface aerosol scattering properties.

3. MEASUREMENT SITES (location)

Figure 1 shows the location of the measuring stations which were grouped based on their geographical location. Main characteristics of the measuring station involved in this work are summarized in Tables 1 and 2.

- Nordic and Baltic stations were represented by Biokovo (HR, regional), Hefaldt (HR, rural), Fallets (HR, continental), Vavilov (HR, continental), and the Polish (PL, coastal). Western EU sites were Pay De Dome (F, mountain), Moncenisio (F, mountain), Rossa (F, mountain), and the Finnish (FI, mountain) stations. Eastern EU stations were Parnitha (GR, mountain), Zepherinópolis (GR, mountain), and the Moldovan (MD, coastal). Central EU stations were Hornspitze (AT, mountain), Taurus (TR, mountain), and the Swedish (SE, coastal) stations. Lastly, the sites in the Nordic region were Troll (NO, mountain) and the Finnish (FI, mountain) stations.

4. Frequency distributions

Aerosol total scattering (\(\text{scattering} \, \text{Angström exponent} \, \text{Asymmetry Parameter}\))

5. Annual cycles

6. MEASUREMENT SITES (characteristics)

7. Conclusions

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