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Aerosol chemical composition of the middle Atlas region of North Africa

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Mountain and high-altitude sites provide representative data for the lower free troposphere and various pathways for aerosol interactions, changing boundary layer heights useful in understanding atmospheric composition. However, few studies exist in African regions despite its diversity in both natural and anthropogenic emissions. For this reason, the ATLAS Mohamed V (AM5) observatory in the Middle Atlas region was established to provide the necessary infrastructure for detailed atmospheric studies in the North African high-altitude region. Here, results of a field study conducted to determine the aerosol chemical composition in this region, understand its variations, and importance in assessing global and regional changes in the atmospheric composition is reported. Particulate matter (PM_{10}) filter samples (200) were collected using a high-volume (500l/min) collector in a 12h sampling interval from August to December 2017. The chemical composition of the samples was analyzed for trace metals, ions, elemental carbon, organic carbon, aliphatic hydrocarbons, and polycyclic aromatic hydrocarbon (PAHs) content. The results show that the high-altitude aerosol composition is influenced by regional and transregional transport of different pollutants. Local sources play an important role during periods when the wind speed is low, especially during autumn. Despite the proximity of the site to the Saharan Desert, its influence on the atmospheric composition was mainly seasonal and accounted for only 14% of the sampling duration. The chemical composition was dominated by inorganic elements, mainly suspended dust (47%) and ionic species (16%), and followed by organic matter (15%), water content (12%), and indeterminate mass (9%). Biogenic organics contributed up to 7% of the organic matter with high contributions from compounds such as Nonacosane, Heptacosane, and 2-Pentadecanone. Four main air masses characterized the inflow to the site, which often leads to different aerosol chemical compositions. Mineral dust influenced was seasonal and ranged between 20 and 70% of the PM mass with peaks observed during the summer and was accompanied by high concentrations of SO_4^{2-} of up to 1.3 µg/m³. PM_{10} concentrations during winter were low (< 30 µg/m³), with a dominance of marine air masses (53%) carrying aerosols rich in sea salt and polluted anthropogenic aerosols from the coastal regions (Rabat and Casablanca). During the day-time, mineral dust contribution to PM increased by about 42% due to road dust resuspension. In contrast, during night-time, an increase in the concentrations of PAHs, ketones, and anthropogenic metals such as Pb, Ni, and Cu was found due

to variations in the boundary layer height. The results provide first insights into typical North African high-altitude background aerosol chemical composition useful for long-term assessment of climate and regional influence of air pollution in North Africa.