Abstract

The sand winds are rich in mineral dust, which when transported, are part of the important fraction of PM10. Exposure to PM10 above the guideline thresholds recommended by WHO is associated with health and environmental risks, which may be irreversible. The objective of this work is to quantify the contribution of mineral dust to PM10. First, the results of a PM10 measurement campaign in an urban site, in Zouaghi, from January 2015 to February 2016 were used. After acid digestion, 48 elements were chemically analyzed by ICP-AES for the major elements and by ICP-MS for the trace elements. The identification of the days of Saharan dust intrusion was done using numerical tools such as HYSPLIT, BSC-DREAMS8b and NAAPS models and satellite maps via MODIS. The number of days of intrusion was 27 days. The concentration of mineral dust was calculated by chemical speciation with a concentration of 11.89 $\mu g/m^3$. The mean concentration of PM10 was 56 $\mu g/m^3$ and thus exceeded 2.7 times the WHO recommended guideline value (20 $\mu g/m^3$). The contribution of mineral dust to PM10 was about 21.3 % with significant seasonal contributions during the months of spring, summer, winter and autumn in descending order. The calculation of the enrichment factor and the monitoring of the temporal evolution of the constituent elements of mineral dust made it possible to confirm the Saharan origin of this dust. The influence of mineral dust intrusions on the composition of PM10 has been significant and has been explained. The meteorological parameters impacting the increase in the concentrations of PM10 and mineral dust have been identified. Secondly, the PM10 samples were collected in a suburban site in Chaab Ersas from June 2017 to June 2018 using a low-volume- sampler (TAS). The number of intrusion days was 58 days. The concentration of mineral dust of 25.6 $\mu g/m^3$ was calculated by the statistical method. The mean concentration of PM10 was 57.12 $\mu g/m^3$. The contribution of mineral dust to PM10 was significant with about 45%. 48 samples taken between 25/11/2017 and 01/06/2018 underwent mineralization and then an analysis by ICP-MS and ICP-AES of the elements constituting the mineral dust was carrid out. The concentration of PM10 and mineral dust was 71.3 $\mu g/m^3$ and 15.84 $\mu g/m^3$ respectively. The contribution of mineral dust to PM10 was 22%.

Keywords: PM10, mineral dust, Saharan dust, days of dust intrusion, metallic elements, back trajectories