

SHORT TERM SCIENTIFIC MISSION (STSM) SCIENTIFIC REPORT

This report is submitted for approval by the STSM applicant to the STSM coordinator

Action number: CA 16202

STSM title: International Network to Encourage the Use of Monitoring and Forecasting Dust Products

STSM start and end date: 16/3/2019 to 1/4/2019

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PURPOSE OF THE STSM:

The main objective of this STSM was:

- [1] Transporting the PM_{2.5} and PM₁₀ aerosols filter samples from Amman/Jordan (University of Jordan) to Barcelona/Spain (Consejo Superior de Investigaciones Científicas)
- [2] Conducting the gravimetric analysis for the aerosol filter samples

The particular matter (PM) sampling is a continuing project for the urban atmosphere in Amman (Jordan). The main objective of this project is to make chemical-physical characterization of urban background aerosols for two particle size fractions: PM_{2.5} and PM₁₀. The chemical characterization will include EC, OC, ions (such as sulfate and nitrate), elemental analysis and heavy metals. A source apportionment analysis will be made by using positive matrix factorization (PMF).

DESCRIPTION OF WORK CARRIED OUT DURING THE STSMs

Gravimetric Analysis:

The measurement takes place in the University of Jordan at the roof top of the Department of Chemistry, where one PM_{2.5} and one PM₁₀ sampler were set up ready. Each filter collected the air sample for 24 hours, while the total air volume change, temperature and humidity values were recorded.

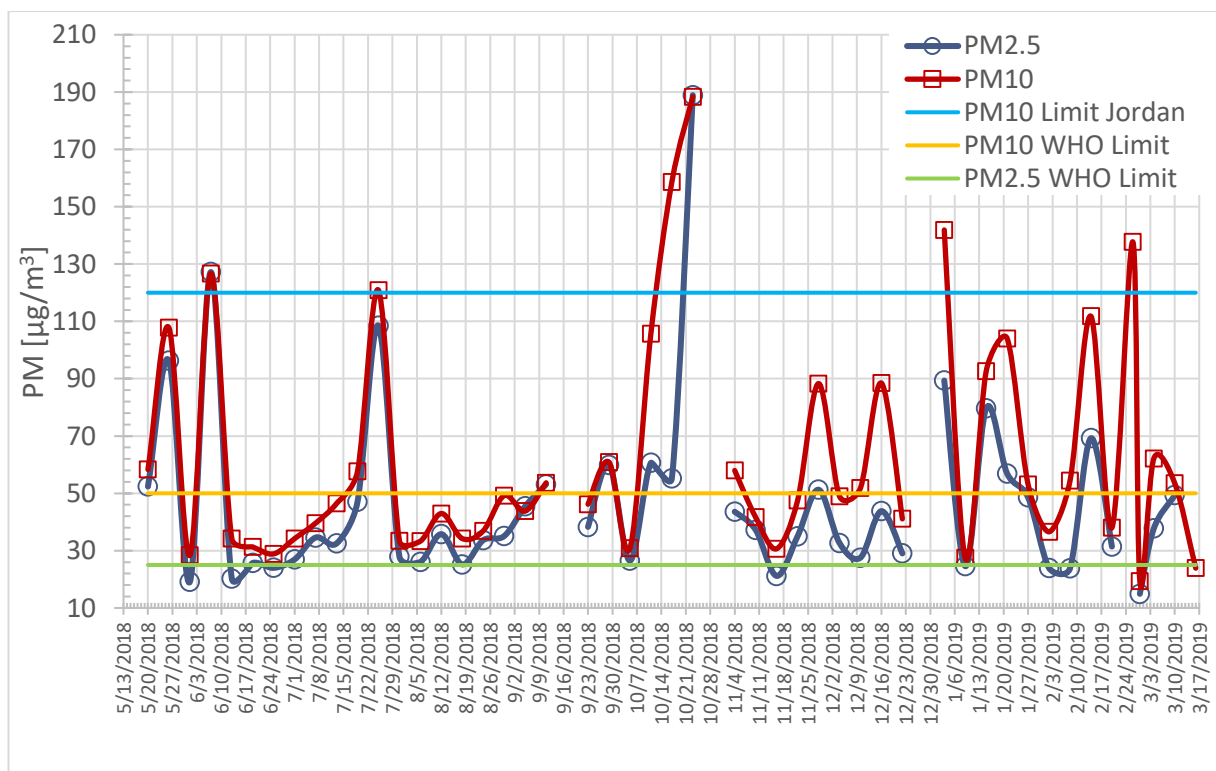
The air filters were transported from Amman to Barcelona during the 16th to the 26th of March for gravimetric analysis. In this article, the transported air filters include the measurements starting from May 2018 to March 2019. After transporting the air sample filters to CSIC (Consejo Superior de Investigaciones Científicas) in the University of Barcelona, all air filters were firstly saved in the balance room of the CSIC laboratory to keep the temperature and humidity stable for 24 hours, then the filters were weighed twice in the balance room before the gravimetric analysis. The weighing was completed using a laboratory analytical balance. The first weighing started after the temperature and humidity were balanced in 24 hours, while the second weighing started after 24 hours from the first weighing. Both weighing results were recorded and saved for the calculation of mass concentrations.

Chemical analysis (future work):

The analysis of EC and OC would be analyzed in the CSIC laboratory, and the analysis of ions (such as sulfate and nitrate), elemental analysis and heavy metals would take place in the Department of Chemistry of University of Jordan. Therefore, the air filters should be cut into half in order to do both experimental analyses separately. The cutting took place in the CSIC laboratory, and the action was guided under experienced lab workers. In the later laboratory work, the filter leaching and instrumental analysis will be done by the CSIC staffs, and the results will be shared for emission distribution and sources analysis.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

The mass concentrations for the air filters were calculated. The figure below shows the PM values in $\mu\text{g}/\text{m}^3$ with the indication of WHO PM2.5 and PM10 24 hours standard value comparisons. The PM10 and PM2.5 followed a similar trend except around the 21st October 2018 and the 27th January 2019, the PM2.5 values decreased while PM10 values increased. High PM values appeared in May, June, July, October, January and February. Comparing to the WHO 24-hour limit standard PM values, the measurements of PM2.5 for most of the days exceeded the limit; The PM10 results showed 51% of the measurements exceeded the WHO limit. The PM10 limit in Jordan is $120 \mu\text{g}/\text{m}^3$, and it gave 88% of the measurements were within the local PM10 limit.



FUTURE COLLABORATIONS (if applicable)

- [1] Master's thesis for the student enrolled at the University of Helsinki
- [2] Chemical analysis at IDAEA-CSIC (Institute of Environmental Assessment and Water Research)
- [3] Chemical and Physical analysis at the University of Jordan

The main outcomes have achieved and will achieve several objectives within the InDust scope: This work was done with the support and connection among multidisciplinary group of international experts (IDAEA-CSIC Spain, Department of Physics Jordan, INAR Finland) that provide measurement and

analysis of the urban dust in Amman; The dust physical, chemical characterization and sources analysis would be valuable for the study of the local/regional effects and transportation trajectories of the dust in Amman, hence to visualize the activities of the dust aerosols; The collected data from the Amman dust analysis would be used for dust aerosol observation and transportation prediction for more potential dust aerosol analysis in future collaborations; This STSM was done also to enhance the cooperation between institutions from Middle East to Europe for the further research in the European-driven climate change science and mitigation/adaptation strategies.