ATMO ACCESS
Access to Atmospheric Research Facilities

# Activity report of the TNA to ATMO-ACCESS research infrastructures

**Name and First Name:** Assoc. Prof. Burçak Kaynak Tezel

**TNA title and acronym:** **Im**pacts of **Po**llution Transport from **W**ildfires and **S**hip Emissions in the Eastern Mediterranean **- ImPoWS**

**Facility/ies accessed:** Finokalia Observational Facility (FNK), Environmental Chemical Process Laboratory (ECPL), Department of Chemistry, University of Crete
Institute of Environmental Research and Sustainability (IERS), National Observatory of Athens (NOA)

This work has received funding from the European Union's Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

## Instructions

*Please limit the report to max 3-5 pages, including tables and figures.*
*The report should be sent as pdf document and include the subheadings listed below. Please make sure to address any comments made by the reviewers (if applicable).*

Is the information provided in the report confidential and should not be made available on the ACTRIS website?

☒ No, the information can be made public.

☐ Yes, the information should not be made public and access should be restricted to the TNA Team, the ATMO-ACCESS access providers, the reviewers concerned and the ATMO-ACCESS Strategic TNA Board.

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## 1. Short executive summary (can be made available to reviewers and EU experts)

University of Crete Environmental Chemical Process Laboratory (ECPL) within the Department of Chemistry has been operating the Finokalia Observatory Station (FNK) since 1993 (https://finokalia.chemistry.uoc.gr/). By this TNA visit, users visited Finokalia as well as another traffic station located in Heraklion city center, and University of Crete to get information about the innovative field experiments and available infrastructure at these stations. In addition, users also visited NOA.

## 2. User group

| *Information on the User group members* | |
|---|---|
| ***Member # 1*** | |
| **First and last name** | Burçak Kaynak Tezel |
| **Gender** | ☒ Female ☐ Male ☐ Prefer not to say |
| **Nationality** | Turkish |
| **Profile** | ☐ Undergraduate<br>☐ Postgraduate<br>☒ Expert scientist<br>☐ Engineer, Technician<br>☐ Other |
| **Field of activity** | ☒ ENV-ATMO - Earth and environmental sciences/Atmospheric domain<br>☐ ENV-HYDRO - Earth and environmental sciences/Hydrosphere domain<br>☐ ENV-LITHO - Earth and environmental sciences/Lithosphere<br>☐ ENV-ECOBIO - Earth and environmental sciences/Eco-biosphere<br>☐ PHY - Physics astronomy, astrophysics and mathematics<br>☐ CHEM - Chemistry and material sciences<br>☐ BIO-MED - Biological, medical sciences and biotechnology<br>☐ ENG-TECH - Engineering and technology<br>☐ EGY - Energy<br>☐ ART - Humanities and arts<br>☐ ISC - Information science and communication<br>☐ SOC - Social sciences |
| **Are you a new user?** | ☒ Yes |
| | ☐ No |
| **Institution name (employer)** | ISTANBUL TECHNICAL UNIVERSITY (ITU) |

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| | | | |
|---|---|---|---|
| **Institution legal status (employer)** | ☐ Public research (including international research organizations and private research organization controlled by a public authority)<br>☒ University and higher education<br>☐ Public authority<br>☐ Small Medium Enterprise (SME)<br>☐ Other industrial and/or profit private organization<br>☐ Other | | |
| **Address (employer)** | ISTANBUL TECHNICAL UNIVERSITY (ITU), Ayazağa Campus, 34469, İstanbul/TÜRKİYE | **Country** | TÜRKİYE |
| **Email address** | kaynakbu@itu.edu.tr / burcakaynak@gmail.com | | |
| **Access start date** | 03/07/2023 | **Access end date** | 17/07/2023 |

| *Information on the User group members* | |
|---|---|
| ***Member # 2*** | |
| **First and last name** | Seda Tokgöz |
| **Gender** | ☒ Female ☐ Male ☐ Prefer not to say |
| **Nationality** | Turkish |
| **Profile** | ☐ Undergraduate<br>☒ Postgraduate<br>☐ Expert scientist<br>☐ Engineer, Technician<br>☐ Other |
| **Field of activity** | ☒ ENV-ATMO - Earth and environmental sciences/Atmospheric domain<br>☐ ENV-HYDRO - Earth and environmental sciences/Hydrosphere domain<br>☐ ENV-LITHO - Earth and environmental sciences/Lithosphere<br>☐ ENV-ECOBIO - Earth and environmental sciences/Eco-biosphere<br>☐ PHY - Physics astronomy, astrophysics and mathematics<br>☐ CHEM - Chemistry and material sciences<br>☐ BIO-MED - Biological, medical sciences and biotechnology<br>☐ ENG-TECH - Engineering and technology<br>☐ EGY - Energy<br>☐ ART - Humanities and arts<br>☐ ISC - Information science and communication |

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| | | | |
|---|---|---|---|
| | ☐ SOC - Social sciences | | |
| **Are you a new user?** | ☒ Yes | | |
| | ☐ No | | |
| **Institution name (employer)** | ISTANBUL TECHNICAL UNIVERSITY (ITU) | | |
| **Institution legal status (employer)** | ☐ Public research (including international research organizations and private research organization controlled by a public authority)<br>☒ University and higher education<br>☐ Public authority<br>☐ Small Medium Enterprise (SME)<br>☐ Other industrial and/or profit private organization<br>☐ Other | | |
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| **Access start date** | 03/07/2023 | **Access end date** | 17/07/2023 |

## 3. Scientific objectives

The scientific objectives of this TNA can be summarized below:

(i) to visit the Finokalia (FKL) observatory station, and other urban air quality monitoring station in Crete in order to get information about online and offline particulate matter, air pollutant and greenhouse gas measurement techniques and available infrastructure;

(ii) to discuss with the researchers at the University of Crete about combining measurements of Finokalia station (FKL) with ROPOMI satellite retrievals to investigate unsystematic air pollution events such as wildfires, agricultural fires or remote sources such as ships;

(iii) to combine measurements performed in Finokalia station (FKL) along with satellite retrievals to understand and assess the impacts of 2021 wildfires in the area; and

(iv) to investigate the possibility of using FKL measurements with satellite retrievals of $NO_2$ and $SO_2$ to understand the impact of shipping emissions in the Mediterranean.

## 4. Reasons for choosing the Facility/ies

The Finokalia (FKL) station is one of the earliest observatory stations located in the Eastern Mediterranean, and is a remote background station far away from main anthropogenic sources. FKL has installed high technology instruments and has been conducting very innovative field campaigns in the fields of air quality and climate change. With the experience gained during this TNA visit, users will be able to transfer know-how to operate an air quality monitoring stations in their home institution and country.

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## 5. Activities during the TNA (research, training, events, .)

During this TNA visit, the leading user and a PhD student first visited the ECPL, where they have multiple meetings with the researchers. The impact of summer 2021 fires over Finokalia station was investigated, and findings were compared. Investigating the agricultural fires and their impacts were also discussed for future studies. In addition, the instruments for the analysis of collected samples are introduced, the users were informed about the pre-treatment and analysis of the collected samples in the available laboratories. The users visited the urban sampling site at the city and Finokalia (FKL) observatory station and learned about the available instruments, measurement techniques during this TNA. The online and offline measurement instruments were introduced to the users. The QA/QC procedures including the calibration and maintenance of the instruments were explained by the researchers at the host institution.

## 6. Method and set-up of research

The detailed information on the 2021 wildfires can be found elsewhere (***Eke et al., 2022***).

## 7. Preliminary project results and conclusions

The users experienced best available practices in terms of air quality monitoring and analysis of collected samples at the monitoring sites. The analysis of 2021 summer fires and their impact are still ongoing. Further online meetings will be held by the users and the researchers at the host institution.

## 8. Outcomes and future studies

The previous findings of the users visiting about the 2021 summer wildfires were presented to the researchers at the host institution. Common research areas and days impacted by the fires were investigated. Even though the fires in Turkey were not found to the transported to Finokalia station, several other fires at the Greece around the same time were found to be impacting the station. Also, significant formaldehyde signals were observed.

Satellite retrievals are advantageous for spatial coverage; however, they lack detailed temporal resolution on diurnal basis and have higher uncertainties in measuring some species. Long-term detailed measurements at FKL will give valuable insight on the sources with speciation and multiple observations simultaneously. Combining these two measurements for validation of satellite retrievals and explaining the temporal changes at FKL will help us understand the drivers of changes in atmospheric composition of the Eastern Mediterranean. This region is known to be impacted from wildfires in Turkey and Greece, and significant number of shipping routes are within close proximity. The methodology developed here can be used in the future when more wildfires are expected due to climate change. This investigation can also be important in understanding the secondary aerosol formation from wildfires.

## 9. Plans for publications

*(in peer-reviewed journals, conference proceedings, etc. acknowledging the support by ATMO-ACCESS). Details, including the DOI, need to be provided as soon as available.*

The investigation of 2021 wildfires resulted in an observed HCHO signal which was not observed previously. A paper with these findings will be prepared and submitted to one of the highly cited peer-reviewed journals.

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## 10. References

The Finokalia (FKL) Atmospheric Observatory Station, https://finokalia.chemistry.uoc.gr/, last access date: 21/07/2023.

Eke M., Cingiroglu F., Kaynak B. (2022) Impacts of summer 2021 wildfire events in Southwestern Turkey on air quality with multi-pollutant satellite retrievals, EGU General Assembly Conference Abstracts, EGU22-12134, https://doi.org/10.5194/egusphere-egu22-12134.

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