Press Release

Optimized sensors measure firefighters' real-time exposure to toxic aerosols during wildfires

- **A study by IDAEA-CSIC shows that the similarity in the concentration of pollutant particulates in wildfires and prescribed burns allows the latter to be used for designing prevention strategies**

- **The measurements were carried out using portable sensors integrated into firefighters' gear**

Firefighter from the *Generalitat de Catalunya* during a controlled burn in Salàs de Pallars | Aina Maín (IDAEA-CSIC)

Barcelona, March 4, 2025. Anticipating future scenarios, better understanding firefighters' exposure risks, and developing mitigation strategies were the main objectives of a study conducted by researchers at the **Institute of Environmental Assessment and Water Research (IDAEA-CSIC)**, in collaboration with **the Fire Department of the *Generalitat de Catalunya***. The study, developed within the framework of the **European project FIRE-RES**, coordinated by the *Centre de Ciència I Tecnologia Forestal de Catalunya* (CTFC), enabled real-time measurement of atmospheric pollutant concentrations during

wildfires and controlled burns thanks to the implementation of lightweight, non-invasive portable monitoring systems integrated into firefighters' protective clothing.

This work aims to establish measures to better combat extreme wildfires, which are becoming a serious environmental, economic, and social threat worldwide, with increasingly longer seasons and more severe consequences. Climate change and land-use changes exacerbate these events, which in turn pose significant health risks to those near the fire. Wildfire emissions contain pollutants strongly linked to respiratory and cardiovascular diseases, as well as various types of cancer.

Real-time measurement systems

The optimized sensors provide **immediate data on exposure to fine particulate matter smaller than 2.5 micrometers (PM2.5) and black carbon**, two harmful pollutants present in wildfire smoke.

"Access difficulties in fire-affected areas limited real-time data collection. To address this issue, we adapted urban air quality measurement instruments to extreme conditions, enabling precise and safe data collection and monitoring of exposure and air quality in fire environments," explains **Mar Viana**, researcher of the study.

The study revealed that the concentrations of these compounds are comparable in wildfires and prescribed burns, making the latter a useful scenario for assessing firefighters' exposure under more controlled and less complex conditions than real wildfires. The data showed that fine particulate peaks are higher during controlled burns, but total exposure is greater in wildfires since they generally last longer.

"One of the most surprising findings is that post-combustion activities, such as mop-up and final extinguishing tasks, have a higher exposure to contaminants than previously thought. This underscores the importance of maintaining protective measures—often used only during active burning—even during these activities that do not involve direct contact with flames," says **Barend van Drooge**, a researcher in the study.

The study's results open new possibilities for improving safety in wildfire response and protecting emergency teams from pollutant exposure. Additionally, the diversity of geographic, ecological, and burning conditions analyzed ensures that the findings are representative not only of Catalonia but also of broader Mediterranean biomes, reinforcing the study's relevance for regions beyond the Mediterranean basin.

Gili, J., Maín, A., Van Drooge, B. L., & Viana, M. (2025). Source-resolved black carbon and PM2.5 exposures during wildfires and prescribed burns. *Environmental Pollution*. https://doi.org/10.1016/j.envpol.2025.125660

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