



Wildfire impact assessment through air quality monitoring in natural conservation areas and WRF-HYSPLIT coupled modelling

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In the Mediterranean region, climate change-induced effects (i.e., increasing drought and heatwaves) are intensifying wildfire occurrences and severity. During 2017 the administrative region of Calabria (southern Italy) was affected by an exceptional wildfire season. This study evaluates the wildfire impact on some air quality parameters in two National Parks, located in the north and south of the region, respectively. Two sampling stations were considered for the impact assessment, namely the Monte Curcio Global Atmosphere Watch (GAW) regional station, located in the Sila National Park, and the Mammola rural-regional background station of the Regional Environmental Protection Agency of Calabria (ARPACal), in the Aspromonte National Park. To evaluate wildfire impact, a method based on the integration of ground-based observations (i.e., PM_{2.5}, PM₁₀, EBC, CO, and fire location) and WRF-HYSPLIT back-trajectories was applied. The WRF-HYSPLIT coupling allowed to reproduce high-resolution back-trajectories, improving the model accuracy in a complex orographic region such as the study area. Furthermore, wildfire impact on human health was qualitatively evaluated in terms of passively smoked cigarettes (PSC), related to the measured PM_{2.5} concentrations. During the examined period (summer 2017), the exposure to wildfire emissions resulted equivalent to approximately 6 PSC per day, for both stations. These outcomes, obtained at the regional scale in southern Italy, highlight that wildfire emissions, whose associated risks are still underestimated, are of concern for human health even in protected areas. Future studies, based on a more thorough chemical characterization and source apportionment methods, should be oriented towards assessing the wildfire contribution to air quality deterioration.