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The role of fire radiative power to estimate fire-related smoke pollution.

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The intensity of a wildfire can be assessed based on its released energy, obtained through remote measurements of the fire's radiative power. Since the Fire Radiative Power (FRP) is proportional to the amount of burned biomass and therefore to smoke production. Higher FRP values are associated with more severe fires, suggesting higher levels of smoke production and, consequently, higher emissions of particulate matter and other pollutants. The specific composition of smoke emissions can vary depending on factors such as the type of vegetation burned, the temperature of the fire, and the combustion conditions. In general, fire smoke is composed of a variety of air pollutants, including gases (NOx, CO, VOCs, O_3, PAHs, etc) and particulate matter (PM). The objective of this work is to evaluate the ability of FRP, to be used as an indicator of fire smoke pollution. Particulate matter (PMx) and carbon monoxide (CO) concentrations emitted during recent wildfires in Portugal are analyzed to assess the link between pollution concentration levels and fire intensity over the affected areas, taking into account the spatial and temporal characteristics of each event. For this purpose, two particularly severe fires with significant impacts on air quality in central and southern Portugal were analyzed namely the ones taking place in October 2017 and August 2018. Concentrations of PMx and CO were evaluated through CAMS data, and the radiative power through the FRP product of the SEVIRI/MSG disseminated by LSA-SAFThe results show that the emitted pollutant concentrations significantly exceeded the established daily target limit values (air quality and public health guidelines). The fire intensity, based on the emitted Radiative Energy (FRE) derived from FRP, aligns with the known severity of these events, consistent with the observed concentrations of air pollutants, being demonstrated that the FRP can be associated with smoke production, especially PMx emissions during a fire. Thus, the proposed methodology using FRP can be a valuable tool for assessing the impact of wildfires on air quality and understanding the potential for smoke dispersion over fire-affected regions. The role of FRP as an indicator of air pollution highlights the potential use of FRP in assisting in management activities, operational planning, and emergency intervention during ongoing fires.

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