environmental sciences proceedings

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Abstract

Estimating the Impact on Air Quality of the Portuguese 2017 Forest Fires with the New APIFLAME Model †

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† Presented at the Third International Conference on Fire Behavior and Risk, Sardinia, Italy, 3–6 May 2022.

Keywords: forest fire emissions; air quality; forecast; modelling

The extreme wildfires events recently registered in different parts of the world highlighted again the importance of wildfire smoke's impact on the society and the economy. In Portugal, during the 2017 October wildland fires, several air quality monitoring stations from the Portuguese networks registered dangerous levels of atmospheric pollution due to smoke.

In the scope of a national project called SmokeStorm, we aim to develop near-real-time smoke dispersion forecasts to be used by Portuguese stakeholders, with sufficient detail in time and space. Therefore, the recent module developed within the CHIMERE air quality model—the APIFLAME—was tested to calculate the daily fire emissions and their impact on air quality. In addition to the current APIFLAME approach for emissions estimation, which is based on satellite data and global model fuel load, a bottom-up approach was used. This relies on local data about fuel characteristics, including fuel load, and burned area, as well as emission factors particularly selected for the specific burnt vegetation. The possibility to apply CHIMERE-APIFLAME considering these two approaches improves its applicability to high spatial resolutions and the flexibility to different input data, together with the chance of merging burned area and fire radiative power satellite observations.

In this paper, the characteristics and impact of the plumes from the major fire events that occurred in October 2017 in Portugal are studied using CHIMERE-APIFLAME. Emissions were calculated with both approaches and the smoke plume dispersion and chemistry was simulated, allowing us to estimate the impact on the local, regional and national air quality. The obtained results were compared with monitored air quality data with a bias less than 30%. The performance of the modelling system, as well as the high air pollution estimated levels, support the SmokeStorm proposal for the development of a near-real-time smoke dispersion forecasting system.

Author Contributions: Conceptualization, A.M., C.G. and A.I.M.; methodology, A.M., C.G., A.P.F. and A.I.M.; software, C.G. and T.O.; validation, C.G. and T.O.; formal analysis, A.M., C.G., T.O., A.P.F. and A.I.M.; investigation, A.M., C.G., T.O., A.P.F. and A.I.M.; resources, A.I.M.; data curation, A.M., C.G., T.O., A.P.F. and A.I.M.; writing—original draft preparation, A.M. and C.G.; writing—review and editing, A.I.M.; visualization, C.G. and T.O.; supervision, A.M., C.G. and A.I.M.; project administration, A.I.M.; funding acquisition, A.I.M. All authors have read and agreed to the published version of the manuscript.

Citation: Monteiro, A.; Gama, C.; Osswald, T.; Fernandes, A.P.; Miranda, A.I. Estimating the Impact on Air Quality of the Portuguese 2017 Forest Fires with the New APIFLAME Model. *Environ. Sci. Proc.* **2022**, *17*, 29. https://doi.org/10.3390/environsciproc2022017029

Academic Editors: Pierpaolo Duce, Donatella Spano, Michele Salis, Bachisio Arca, Valentina Bacciu, Grazia Pellizzaro and Costantino Sirca

Published: 9 August 2022

Funding: The authors are grateful for the financial support of the Fundação para a Ciência e a Tecnologia (Science and Technology Portuguese Foundation), I.P., through national funds (PIDDAC), under the SmokeStorm project (PCIF/MPG/0147/2019). The authors also acknowledge the financial support of the European Union's Horizon 2020 research and innovation action for the FirEUrisk project under grant agreement ID: 101003890. Thanks are due for the financial support to CESAM (UIDB/50017/2020 + UIDP/50017/2020), to FCT/MCTES through national funds, and the co-funding by the FEDER, within the PT2020 Partnership Agreement and Compete 2020.

Conflicts of Interest: The authors declare no conflict of interest.