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IX International Conference on Forest Fire Research and 17th International Wildland Fire Safety Summit: introduction to special issue (Part 3)

Luís Mário Ribeiro[A,*], Domingos Xavier Viegas[A] and Miguel Almeida[A]

For full list of author affiliations and declarations see end of paper

*Correspondence to:
Luís Mário Ribeiro
Department of Mechanical Engineering, ADAI, University of Coimbra, Rua Luís Reis Santos, Pólo II, 3030-788 Coimbra, Portugal
Email: luis.mario@adai.pt

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ABSTRACT

The ninth International Conference on Forest Fire Research, organised by the Forest Fire Research Center of the Association for Developmental of Industrial Aerodynamics every 4 years since 1990, was held in November 2022 in Coimbra, Portugal. The conference was held in conjunction with the 17th International Wildland Fire Safety Summit, sponsored by the International Association of Wildland Fire. The number and quality of the submissions for this joint event was very high, and the authors were encouraged to submit a full paper to a special issue of the *International Journal of Wildland Fire* (IJWF). Given the large number of submissions, the Journal decided to publish the special issue in several parts. Part 1 was published in January 2023, with eight papers, and Part 2 in March 2023, with 10 papers. This third part presents 15 original papers in five topical areas: decision support systems and tools (3), risk reduction (2), risk assessment (3), wildland urban interface (3) and wildfire management and safety (4). All the papers in this special issue are published Open Access.

Introduction

The ninth International Conference on Forest Fire Research (ICFFR) held in Coimbra, Portugal, from 11 to 18 November 2022, brought together scientists and fire managers from around the world to advance and update knowledge in the area of fire management. For the second time in its history, the conference was held jointly with the International Association of Wildland Fire's 17th International Wildland Fire Safety Summit (IWFSS).

The combined ninth ICFFR and 17th IWFFS was attended by 364 delegates from 30 countries, and their geographical distribution can be seen in Fig. 1.

The 318 abstracts submitted for presentation were evaluated by an International Scientific Committee composed of 58 internationally recognised scientists and coordinated by Dr Michael Flannigan from Canada. From these submissions, 241 abstracts were accepted for oral presentation and 51 were accepted for presentation as posters.

These submissions were distributed across six topics within the scope of wildland fire research and management: (1) decision support systems and tools, (2) fire at the wildland urban interface, (3) risk assessment, (4) risk reduction, (5) risk adaptation, and (6) wildfire management and safety.

In January 2023, the first set of papers, published as Part 1 of the special issue in Volume 32, Issue 1 of IJWF (Viegas and Ribeiro 2023), covered topics including seasonal fire activity and spatio-temporal fire-weather patterns under climate change, the role of atmospheric conditions on fire and flaming zone behaviour, analytical techniques for measuring oxidative pyrolysis gases, particulate morphology of fires in the wildland urban interface, deep peat fire smouldering and the impact of post-fire treatments on soil.

In March 2023, the second set of papers, published as Part 2 of the special issue in Volume 32, Issue 3 of IJWF (Almeida *et al.* 2023), covered topics related to modelling of ignition probability, fire behaviour modelling, wildfire hazard mapping, fire management policies, imagery and mapping, and wildland urban interface.

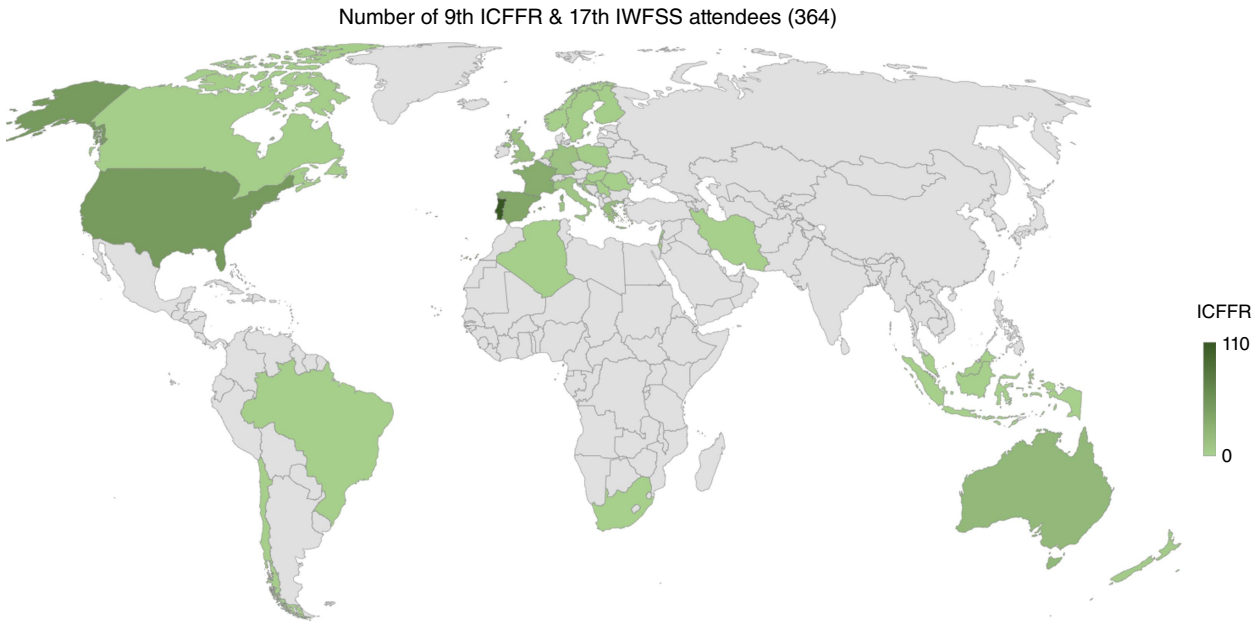

Fig. 1. Geographical distribution of the conference attendees.

This third issue includes 15 papers that address multiple subjects, including simulation of peatland wildfires, heat transfer in porous fuels, Canadian Forest Fire Danger Rating System and related subjects, burnover events, nature-based solutions, post fire erosion, fire behaviour, fuel properties and combustion dynamics, decision support systems and wildland urban interface. The contents of these papers are summarised below, organised according to the original Conference Topics in which they were included.

Contents (Part 3)

Decision support systems and tools

Purnomo *et al.* (2023) presented a cellular automata model to simulate flaming and smouldering wildfires in peatlands over long duration, which, for the first time, considers daily variations in peat moisture. The model reveals that smouldering burned area varies widely depending on the daily variations in moisture.

Hanes *et al.* (2023) started from the premise that drought in fire danger rating is often estimated using weather-based models. They explored the potential to supplement those estimates with soil moisture content measurements from electronic soil moisture probes, and estimates from land surface models that include remotely sensed soil moisture within the boreal forests of Canada.

Moreno-Ruiz *et al.* (2023) described the development and validation of a burned area product at a spatial resolution of 0.05° (~5 km) for the boreal region between 60°N and 72.5°N from 1982 to 2020. This satellite-based dataset provides unique long-term burned area information of interest for fire and carbon dynamics studies.

Risk assessment

Brody-Heine *et al.* (2023) explored vector wind change with station and gridded data over New Zealand and compared it with the Fire Weather Index. They used vector wind change to create a modified Fire Weather Index that incorporates sudden wind changes into fire danger prediction.

Parente *et al.* (2023) tested three different erosion prediction tools to identify areas with erosion rates above the 95th percentile in the first year after a fire, and address model recalibration based on fire characteristics.

Lopes *et al.* (2023) investigated the modelling of sorption processes of 10-h *Pinus pinaster* branches, based on both laboratory and field data. They state that forest fuel moisture content is an important parameter that determines fire risk; therefore, its accurate prediction has great importance. The resulting model showed an ability to predict moisture content.

Risk reduction

Campbell-Lochrie *et al.* (2023) investigated how the effects of fuel structure on physical phenomena controlling flame spread are complicated by the porous nature of wildland fuels. They measured heat transfer in pine needle fuel beds (across a range of fuel structural conditions) to characterise these effects and the resulting variations in fire behaviour.

Valencia *et al.* (2023) carried out controlled gorse burning experiments using specialised drone-mounted instrumentation to measure fire movement and duration. They then

compared the results with detailed maps of vegetation height measured before the experiment. Their results provide new insight on the role of the arrangement of vegetation in the development of wildfires.

Wildfire management and safety

Regos *et al.* (2023) described how the FirESmart project sheds light on the renewed EU agroforestry policies and on how these policies could benefit open habitat dwelling species while providing further fire suppression opportunities. They concluded that the use of fire can enhance 'climate-smart' strategies such as 'rewilding' or 'tree-planting' in mountain areas across Southern Europe.

Viegas *et al.* (2023) studied two fires that started near Pedrógão Grande, Portugal in June 2017. Due to a thunderstorm in the region these fires spread out of control and merged, producing a very fast spreading fire. A laboratory scale simulation showed good qualitative and quantitative agreement with the full-scale observations.

Jamaladdeen *et al.* (2023) acknowledged that while wildfires are a growing threat, especially in Mediterranean climate areas during periods of drought, knowledge about the effect of wildfire stresses on plants remains lacking. They studied the effect of combined hydric and thermal stresses on *Rosmarinus officinalis* and *Cistus albidus*, which are widely consumed in Mediterranean wildfires.

Sahila *et al.* (2023) studied the combustion characteristics of dead Mediterranean vegetation in the absence of wind. They observed anomalous relaxation of the fuel's mass accompanied by anomalous diffusion of gas particles during flaming combustion. They analysed and compared combustion characteristics (burning rate, flame height and temperature, gas velocity) and relaxation properties of these fuels.

Wildland urban interface (WUI)

Link and Maranghides (2023) conducted a post-fire case study of the 2018 Camp Fire and identified 23 entrapment and burnover events that threatened the life safety of evacuating civilians and responding emergency personnel. The high number of events within one fire incident suggests this may be a more frequent issue in the future, specifically in the context of WUI fires.

Singh *et al.* (2023) investigated fundamental fire behaviour during flame spread across a pine needle bed, focusing on the dynamic nature of fire and how this impacts fire spread using cameras, temperature, and velocity. Intermittent flame spread was observed in the form of leaps caused by point ignitions due to flame contact.

Àgueda *et al.* (2023) presented a tool for the quantitative assessment of vulnerability of dwellings to wildfire at the wildland–urban interface. Structural vulnerabilities and fire spread through these fuels were tackled through a fuzzy logic approach informed by expert opinion. The tool was tested against real-world data taken from two case studies of WUI fires in Spain.

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Conflicts of interest. DXV was the Chairman, LMR was the Co-Chairman and MA was on the Conference Scientific Committee of the IX ICFFR and 17th IWFSS. The authors declare they have no further conflicts of interest.

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Author affiliation
[A]Department of Mechanical Engineering, ADAI, University of Coimbra, Rua Luís Reis Santos, Pólo II, 3030-788 Coimbra, Portugal.