

Bushfire and Natural Hazards Newsletter May 2022

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Initial projects to extend Black Summer insights

The first round of research projects from Natural Hazards Research Australia (the Centre) gives a fresh boost of funding to research that will strengthen natural hazard resilience and disaster risk reduction across Australia, New Zealand and globally.

While the Centre has been busy finalising its research priorities that will guide future rounds of research, a first round of nine new projects has commenced to meet the Australian Government's requirements for funding the Centre. The funding of these new projects ensures that natural hazards research activities can continue while the broader research priorities and program are developed.

The projects in this initial round both extend research and support the utilisation of findings from the Bushfire and Natural Hazards CRC's [Black Summer research program](#), funded through the Australian Government in 2020. For the projects that are not extensions, these address more urgent research needs and issues raised by recommendations from the [2020 Royal Commission into National Natural Disaster Arrangements](#), the [2020 NSW Independent Bushfire Inquiry](#) and by stakeholders during the Centre's research priority scoping workshops in August 2021.

The projects are:

- [*Translation of observed and modelled extreme bushfire behaviours to improve fire prediction and fireground safety*](#)
- [*Predictions in public: understanding the design, communication and dissemination of predictive maps to the public*](#)
- [*Connecting Indigenous people and the emergency management sector – effective partnerships*](#)
- [*Cultural land management research and governance in south east Australia*](#)
- [*Community-led recovery: evidence, dimensions and supports for Community Recovery Committees*](#)
- [*Identifying water sources for aerial firefighting*](#)
- [*Bushfire information database – scoping study*](#)
- [*Understanding the resilience of lifelines for regional and remote communities*](#)
- [*Research data management*](#)



Blaxland Ridge Rural Fire Brigade

Science to guide our relationship with nature

Author: Dr Richard Thornton, CEO Natural Hazards Research Australia

The full force of nature has again been felt on the Australian east coast, leaving a trail of death and destruction. The devastating floods in Queensland and New South Wales over the last month have left many Australians with a mix of frustration, grief and anger. Tragically, people lost their lives. Homes, businesses, infrastructure, natural environments and agricultural land have all been impacted. The recovery process will be long and difficult and communities will need tailored support.

The time has come to cease using the word ‘unprecedented’. It is unhelpful. These floods have precedents and it is inevitable they will occur again, along with devastating bushfires and cyclones. Just like the 2019–20 bushfires, these floods should force us – again – to rethink our relationship with nature.

Living in some parts of Australia has always been fraught with danger. Calls to permanently move people out of harm’s way sound logical, but it is just not practical to move every home or community that could be threatened. Buybacks of at-risk areas have been tried in the past at a small scale, with mixed success. We all love where we live.

The manifestation of our risk today has been created by decisions made in the past. Our decisions today are creating the risks of the future – we must make wise ones. We need to understand the possibilities as well as the limits to what we can do to reduce risk in different places.

Climate change creates conditions that cause severe weather systems to occur more regularly and intensely, across a wider area. We can’t keep repeating response, clean up and recovery, in an attempt to get things back to how they were. Business-as-usual is not an option.

Firstly, we must build on what we know.

Our collective knowledge on fire, flood and storm is large, and we have hundreds of recommendations from inquiries and scientific expertise in weather, engineering and community behaviour that must guide us. The [Inquiries and Reviews Database](#), created through Bushfire and Natural Hazards CRC research, is a fantastic starting point. This database will be updated by Natural Hazards Research Australia as a new inquiries report. Learn how the Inquiries and Reviews database gives emergency services the upper hand in learning from the past to create a better future in [this short video](#).

Mitigation is the key to doing things better today. If I were to tell you that your house will be inundated with water tomorrow, you would immediately think of things to do with a very reactionary approach. What if I were to tell you that the same house would flood a year from today? Would you act?

Our use of land is critical to reducing future risk. Hard questions need to be answered about where and how to rebuild, that may take longer to get right. This should take place before, not during the disaster or in the immediate aftermath. Research into the long-term sustainability of our communities can ensure we are not repeating mistakes but building on what works.

Secondly, we must focus on what we don't know.

Either our knowledge is falling short or we are unable to act on what we have learnt. We must do better. We need to better understand where most of the impacts were felt. Past research, [including CRC research from Prof Mehmet Ulubasoglu](#), has shown that disasters disproportionately affect the most marginalised and vulnerable groups and can increase the gaps between the haves and have nots.

We need to be better at predicting and tracking severe events, managing landscapes for fire and flood safety, building smarter houses and other infrastructure, and preparing our workforces, both volunteer and paid, for a future with natural hazards on increasingly larger scales.

We need to continually improve how we warn communities, so they can take action. A warning may be urgent in the next five minutes. It may be the weekly weather forecast. It may be in the historical records that show an area floods often and with force. Awareness of risk is built up over the long-term.

We must base our emergency management policies and planning on research and evidence that better includes a multi-agency and multi-government response across large areas. We must look to Indigenous knowledge and historical analysis for new insights.

At the community level, we need to find affordable and sustainable ways of funding our mitigation, response and recovery. Insurance must be accessible and affordable, as part of risk management. If the risk is so high that properties are uninsurable, that is of no benefit to the homeowner or the insurance industry and risks a market failure.

These areas are part of the focus of Natural Hazards Research Australia. We have been asking the question – what knowledge is needed to get Australia ready for the next big disaster, and the next? This is the research the country needs to focus on now, to make us safer and to reduce the economic, social and environmental impacts of natural hazards.



Queensland Fire and Emergency Services

Bushfire insights uncovered with new fire-atmosphere modelling

Cutting edge research led by Dr Mika Peace from the Bureau of Meteorology and the Bushfire and Natural Hazards CRC is offering insights into complex interactions between the fire and atmosphere that produced extreme local fire behaviour. Advanced super-computer simulations combining bushfire behaviour and meteorology has investigated why the Badja Forest (New South Wales), Green Valley Talmalmo/Corryong (NSW/Victoria), Kangaroo Island (South Australia), Stanthorpe (Queensland) and Yanchep (Western Australia) bushfires were so extraordinary and challenging to firefighters.

By combining fire and weather simulations, we can see how both change in response to each other. Fire behaviour, such as extreme, local winds and rotating fire plumes can only be studied through work like this. As we learn and share these findings, we are able to apply our knowledge to future bushfires. Right now, we can use the findings to help fire behaviour analysts and fire meteorologists recognise the conditions that lead to extremely dangerous localised bushfire behaviour.

Research shows that the drought and heatwave conditions experienced in the lead up to and during all five fires were a key factor in priming the landscape for extreme fire behaviour, but local weather conditions were also important when combined with the very dry vegetation.

Unusual fire activity occurred in the overnight period, when fire intensity and rate of spread is typically expected to decrease. Interactions between strong winds above the ground, topography and the fire plume circulation were key drivers accelerating surface fire spread at night.

"The conventional understanding of bushfire behaviour will tell you that fire activity will decrease overnight as the temperature drops, humidity rises and winds become lighter," Dr Peace explained. "The modelling shows that very strong low-level winds descending to the ground behind the fire plume were a critical reason why the Badja Forest and Corryong bushfires burnt so fast overnight."

Pyrocumulonimbus (pyroCb) clouds or fire generated thunderstorms were a feature of the 2019-20 fire season and the number of pyroCb clouds recorded was an Australian record for one season. However, the five fires examined were not all associated with pyroCb's, highlighting that it is not the sole weather phenomenon associated with extreme fire behaviour.

The simulations show that the fire-affected wind near a fire plume can be much stronger than the background winds and that destructive winds can occur, including extreme fire-front winds and fire generated vortices.

“For the bushfires that occurred close to the coast – Yanchep in Western Australia and on Kangaroo Island – the combination of heatwave conditions, the temperature difference between the hot land and the cooler water and local topography led to complex winds that changed the bushfire behaviour,” Dr Peace explained.

Sea breezes, the local environment, and the fire caused erratic, variable winds along active fire lines which at times stretched for several kilometres.

The bushfire simulations undertaken through this research use the Australian Community Climate and Earth System Simulator Fire (ACCESS-Fire) model and are run on the National Computing Infrastructure supercomputer in Canberra. The results show the benefits of enhanced simulation capability and supercomputer power. Due to the level of detail, data and computer power required it is currently not possible to model bushfire behaviour like this when bushfires are burning.

This research was a partnership between the Bushfire and Natural Hazards CRC and the Bureau of Meteorology and was conducted in close collaboration with fire and land management agencies in each state.

The project highlights the complexity of the fire environment and fire management and shows how a coordinated multidisciplinary approach can make effective fire behaviour predictions.

This research was part of the Bushfire and Natural Hazards CRC’s Black Summer research program, funded by the Australian Government and the CRC to investigate key issues from the 2019-20 bushfire season. The research team consisted of Dr Mika Peace, Barry Hanstrum, Dr Jesse Greenslade, Dr Dragana Zovko-Rajak, Dr Abhik Santra, Dr Jeffrey Kepert, Dr Paul Fox-Hughes, Dr Harvey Ye, Tasfia Shermin and Jeffrey Jones from the Bureau of Meteorology.

The research report, *Coupled fire-atmosphere simulations of five Black Summer fires using the ACCESS-Fire model*, can be accessed [here](#).



Ms Janice Newnham

Accessible support for young volunteer mental health

A new interactive mental health module is making it easier for young volunteers and emergency agencies to learn, practice and promote positive mental health and wellbeing.

The Interactive Care4Guide is the latest resource from the Bushfire and Natural Hazards CRC's [Positive mental health in young adult emergency services personnel](#) project. This research is led by Dr Amanda Taylor at the University of Adelaide, in partnership with AFAC, Flinders University, the University of Western Australia, the University of British Columbia in Canada, the Hospital Research Foundation, Military and Emergency Services Health Australia, several key emergency service agencies and the young adult members of the project's Young Volunteer Advisory Committee.

The Interactive Care4Guide – [available here](#) – increases the accessibility of the recently launched *Care4Guide* booklet by presenting the content as an interactive and engaging online module. This new format includes helpful animations, exercises and a quiz that volunteers can work through privately and at their own pace, to make it as easy as possible to develop and maintain the mental health support skills they need while volunteering.

It joins a suite of recently launched resources from this project, including the original *Care4Guide* booklet, posters, social media assets and fact sheets, which all work together to support the integration of positive mental health activities into the day-to-day practices of emergency services.

This research was the first in Australia to focus specifically on mental health of young emergency service volunteers. Researchers worked with young volunteers to understand the potentially traumatic impacts that volunteering has on them and what support currently exists within agencies. From the findings, researchers developed evidence-based resources that volunteers and their agencies can use to support and promote positive wellbeing.

The Interactive Care4Guide is now also available to download and embed within agency websites or intranets, giving emergency services a practical tool to use when managing and supporting volunteers. You can access all of these resources, including the new Interactive Care4Guide and instructions for how to embed it, [here](#).



Research prepares organisations for climate-challenged futures

Will your organisation be ready for the impacts of natural hazards and climate change as they become more significant in the near future? What can you do today to be ready to face a tomorrow that is fundamentally changed by natural hazards and climate?

New [Transformative Scenarios in a Climate-challenged World](#) resources provide a set of plausible futures to help leaders in the emergency management sector across Australia and New Zealand understand what 2035 could look like under the compounding pressures of natural hazards and climate change, so they can stress-test their current services and decide how best to adapt.

The duration, scale and intensity of the 2019-20 bushfires and the subsequent disruptions of COVID-19 remind us that the management of natural hazards does not always go as expected, and that we cannot rely on the past as a good indicator of the future. The importance of using plausible futures to adapt and mitigate against likely climatic shifts over the next decade was emphasised by the recent Intergovernmental Panel on Climate Change's Sixth Assessment Report on the current knowledge of the physical science of climate change. Importantly, the climate is not the only thing that is changing – where and how we live will change, the political environment will be different, and the social and economic drivers of society will have changed.

The use of transformative scenarios – sometimes called plausible or alternative futures – is a way for organisations to strategise and adapt now, to prepare for a future where we will see different social and political drivers, and where climate change will result in more frequent, severe and compounding natural hazards.

The [Transformative Scenarios in a Climate-challenged World](#) resources are based on recent research lead by Reos Partners in collaboration with RMIT University, through the Bushfire and Natural Hazards CRC's [Preparing emergency services for operations in a climate-challenged world](#) Tactical Research Fund project. The project was supported by the AFAC Climate Change group.

The research team worked with leaders in emergency management to develop four distinct and plausible scenarios likely to unfold between now and 2035 in Australia and New Zealand, based on current climate trends. The four scenarios are presented as four different variations on social cohesion (low or high) and governance (reactionary or strategic; long-term or short-term).

Using these scenarios, organisations can consider the impacts of natural hazards and climate change and assess whether current organisational practices and plans will be sufficient in the context of each plausible future. Using a 'board game' analogy, organisations can use the pieces (resources) to explore how well their current and forward-looking organisational planning will prepare them for a climate change-affected future.

This gives organisational leaders an opportunity to make informed decisions about how to adapt their services and mitigate against the likely impacts of climate change to come.

Research Strategy Director at Natural Hazards Research Australia, Dr John Bates, explains that these resources include the flexibility to visualise different possible severities and impacts of natural hazards so that organisations can develop informed planning solutions.

“One of the challenges in planning for climate change has been understanding how the continental-scale climate predictions will play out at a local level – and combining that with the social, political, economic and environmental changes that will develop alongside, or because of, the changes in the climate,” Dr Bates said.

“The plausible futures we have developed combine all those elements to help you visualise what our future world might look like. You can use them to see how well current approaches to disaster risk reduction, disaster resilience, emergency response and disaster recovery will work in these futures – and explore how actions you can take now could help us all be better prepared for 2035.”

The resources are all available [here](#), including guidance on how to use them. Lead researchers of this project were Geoff Brown and Stephen Atkinson from Reos Partners, and Prof Lauren Rickards and Dr Adriana Keating from RMIT University.

Transformative scenarios in a climate-challenged world

Use the new evidence-based workbook to explore plausible climate futures (2021–2035)

2025

2030

2035

bnhcrc.com.au/climatescenarios



bushfire & natural
HAZARDS CRC



ReosPartners



The National Bushfire Behaviour Research Laboratory at CSIRO Black Mountain, Canberra

CSIRO's laboratory is dedicated to the study and testing of fundamental bushfire dynamics. The objective is to derive accurate results that support the management of bushfires. This laboratory houses the CSIRO Bushfire Behaviour and Risks research team and is home to the CSIRO Pyrotron and the CSIRO Vertical Wind Tunnel (VWT).

The Pyrotron is a 29-metre tunnel of glass and steel loaded with sensors and a wind turbine at the back of the tunnel. Wind speed, fuel load, moisture content and fuel type can be tightly controlled and varied, to study the fire behaviour.

The burning embers, driven by high winds, can spark up ahead of the fire front, and drive the fire spread. The Vertical Wind Tunnel is designed to study the combustion and aerodynamic characteristics of burning bark and other firebrands lofted in the fire's plume and carried ahead by the wind.

Both instruments will help to understand the physical processes involved in the behaviour and spread of bushfires under a range of conditions. Specific characteristics of the behaviour and spread of fires and firebrands, such as IR thermography, turbulence, and thermal characteristics will be quantified. This will feed models and simulations, as well as design for large-scale field instrumentation that can then be used to forecast bushfire behaviour and help decision-making.

[Link](#)



Nuclear physicists develop ultra-light fireproof material for firefighting in Australia

This material could revolutionise firefighters' equipment and uniforms, and protect household items with a simple coating. This material is made by bombarding a mixture of aluminium, titanium and carbon with neutrons, and once the aluminium is removed, the titanium carbide obtained is coated with layers of flame retardants extracted from natural materials such as shrimp or oyster shells. It can then be applied to furniture, or fabrics. Tests on polyurethane foam have shown that this material not only reduces the flames, but also the toxic fumes released from the foam.

[Link](#)

Aerial Firefighting and Search & Rescue Europe

18-20 May 2022

This conference and exhibition has featured the largest exhibition to date, demonstrations and a focused two-day conference program including a dedicated session on the research and innovation dimension, making this an essential event to attend for science, new technologies and methods, and industrial opportunities for future air fleets.

As global warming accelerates and the consequences worsen, this event gathered government officials, commercial entities, scientists, engineers, and business leaders to ensure a safer environment for the generations to come. With the modernisation of European air fleets, coupled with the challenges of low-carbon aviation, this event supports European innovation and the international aviation industry to make sure these challenges are met.

Key elements of this ground breaking event include focusing strongly on [Science and Innovation](#) across aerial technologies and practices enhancing the efficiency and safety of air and air-land mission leading to better civil protection for all. With the participation of key French and European decision-makers, procurement representatives and VIPs, this event has provided a platform for many meaningful partnerships and long-lasting synergies.



Opportunities for collaboration on hydrogen technology safety training

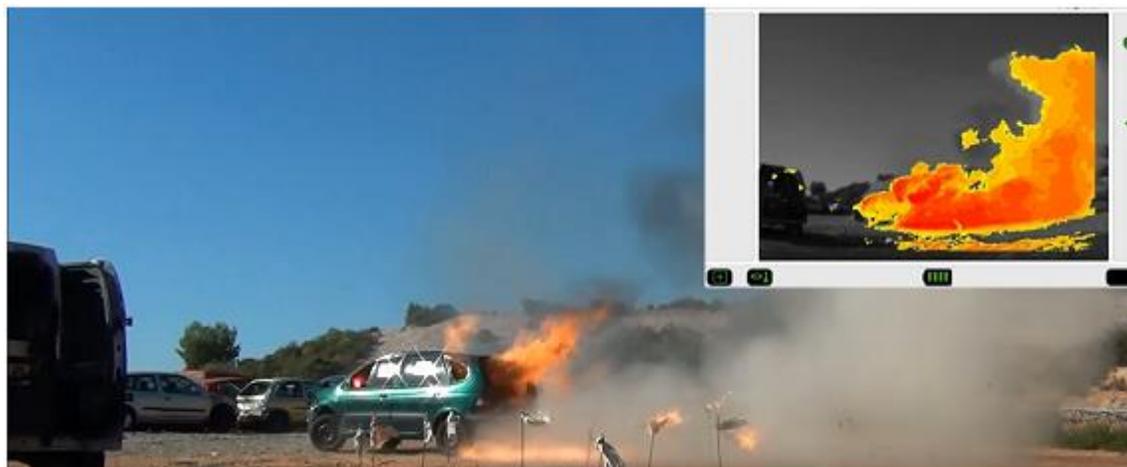
At the end of March 2022, the Australasian Fire and Emergency Service Authorities Council ([AFAC](#)) published the [results of its study](#) on the training needs of emergency services personnel in relation to the national hydrogen strategy. Risks related to the development and use of hydrogen technologies need to be considered in the training of emergency response personnel. This report recommends:

- The establishment of a collaborative group, including emergency services, industry and academia, to develop training on hydrogen-related risks,
- The development of a sustainable model to fund this training, taking into account the evolution and maturation of the technologies concerned,
- The establishment of a training framework and open data portal to provide a platform for consistent resources at the national level.

Europe has developed a comprehensive range of training on the prevention and management of operations involving hydrogen technologies. This was done in two European projects, [HyResponder](#) and [HyResponse](#), and the standards developed are now recognised at EU level.

In France, for example, the [National School of Fire Brigade Officers](#) has state-of-the-art training tools, including a technical platform (with physical equipment implementing hydrogen technologies) and a virtual reality simulation system. This system makes it possible to conduct online training, according to different scenarios.

Cooperation could therefore be envisaged between France and Australia, to adapt these resources to the Australian context, set up distance training courses, or also to train the various countries of South East Asia to these hydrogen risks in joint action with regional countries.



Australian-French Bushfire cross-sectoral exchange of knowledge webinar - 1 June 2022

With the multiplication of crises related to climate and environmental changes, international collaborations in the field of bushfire and natural hazard management are more and more pertinent. Stronger links are being built between Australia and France among research teams (INRAE, CSIRO, UNSW, University of Corse...), industries (ATRISC, SMEs) and fire and rescue services (NSW Rural Fire Service, VIC Country Fire Authority, Fire and Rescue Service of French Department13, Fire and Rescue Service of South Corsica...).

In this context, SAFE cluster, within the [AFRAN initiatives](#) framework, is organising the visit in Australia of a French delegation gathering researchers, end-users and companies, to foster collaborations and partnerships. Prior to this visit, a webinar is being setup to present the Australian landscape to French stakeholders, before the visit of the delegation scheduled in 2023.

This Australian-French Bushfire cross-sectoral webinar should provide French and Australian researchers and industries a forum to share, discuss and appreciate current and future developments and activities pertinent to bushfire and other natural hazard emergencies across our two nations with final users and practitioners including governmental and emergency services agencies.

[SAFE Cluster](#) is the French competitiveness cluster positioned in the Aeronautics & Space, Security & Safety, Defence and Environment sectors. It manages a network of more than 450 players (SMEs, large companies, research and training centres, end-users), 60% of whom are companies. SAFE Cluster is a member of the European Security Poles network and contributes to the European Commission's research and development programmes.

Register on this link: <https://lnkd.in/eEkfSvfr>



The graphic is a promotional poster for a webinar. It features a background image of a bushfire with a green overlay on the left side containing the text 'Register!'. On the right side, there is a green vertical bar with white text. At the bottom, there are logos for SAFE, AFRAN, BUSINESSFRANCE, and REGION SUD AUVERGNE RHONE ALPES.

Register!

AUSTRALIAN-FRENCH BUSHFIRE CROSS-SECTORAL EXCHANGE OF KNOWLEDGE WEBINAR

June, 1st, 2022

8h30 - 10h (CEST)
16h30 - 18h (AEST)

SAFE AFRAN BUSINESSFRANCE REGION SUD AUVERGNE RHONE ALPES

Call for PhD - Multiscale experimentation and simulation of wildfire SPOTting

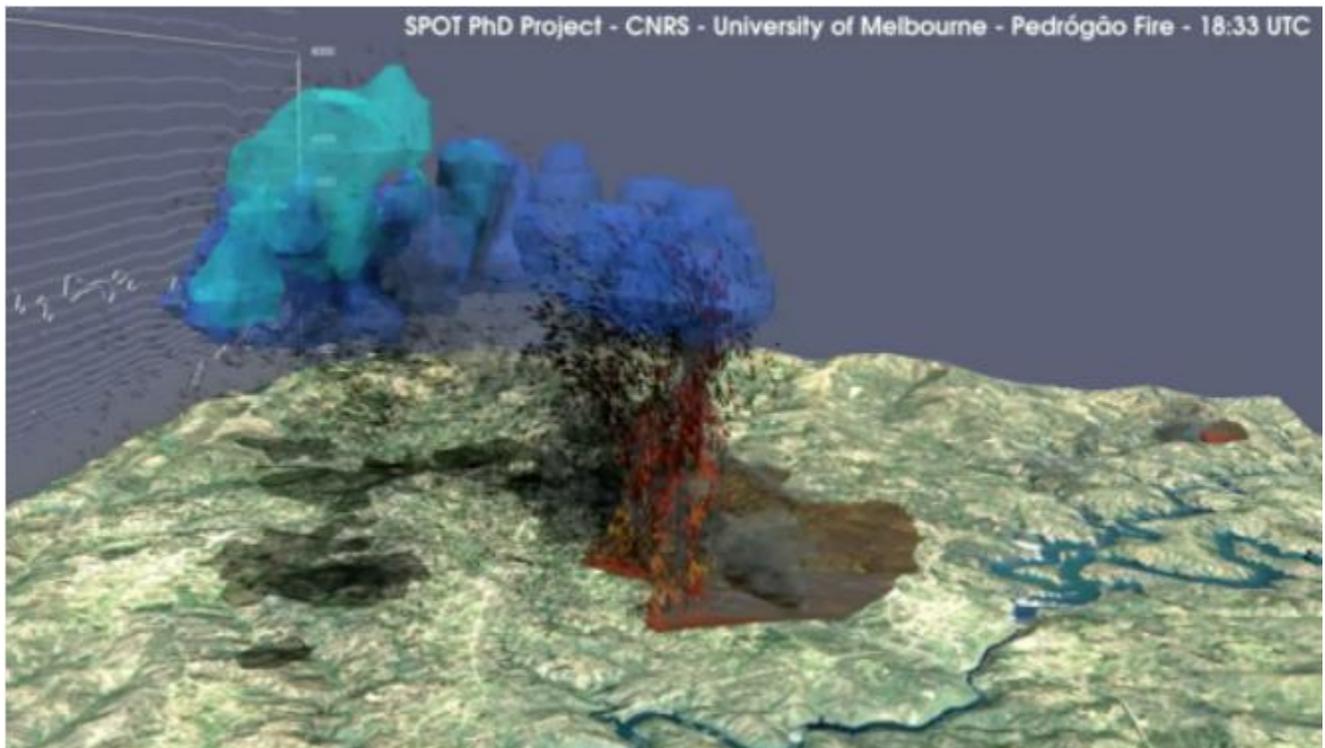
Wildfires pose a significant risk to human and environmental assets around the world, especially in the Mediterranean region and Australia. Firebrands generated in wildfires are one of the most dangerous exposure mechanisms and the main cause of the house and life loss. They can be lifted by fire plume and transported far ahead of the fire front by wind (short-range) or convective column (medium- and long-range), initiate new fires and ignite structures. This process calls spotting and consists of generation, transport and fuel ignition mechanisms.

Although short-, medium- and long-range spotting are parts of the same process, they are still studied separately, and there are no multiscale models that include all mechanisms. The key idea of this project is that spotting must be considered simultaneously at all scales in order to understand the generation (combustion) and transport (atmospheric convection) of firebrands, as well as the ignition mechanism of fuel beds and structures (fire dynamics).

This holistic approach is needed to develop a new generation of coupled fire-atmosphere numerical models that will improve the prediction and prevention of wildfires and their impact on communities.

The project will be led by Dr Filippi (CNRS, France) and Dr Filkov (University of Melbourne, Australia)

[More information](#)



Australian-French Bushfire Cross-sectoral exchange of knowledge webinar



1er Juin 2022, online

A webinar to introduce the Australian landscape of fire management and natural hazards for researchers and industry.

[More information](#)

Social Responsibility of Algorithms 2022 (SRA22)

13-17 June 2022 online

The first of three Algorithmic Futures Policy Lab events will focus on algorithmic fairness, explicability / interpretability, trust, privacy, and decision autonomy, with the aim of identifying mutually influential challenges and opportunities for technology and policy-development in EU and Australia. A study case will explore bushfire management in France and in Australia.

[More information](#)

AFAC Conference: Connecting communities. Creating resilience.

23-26 August 2022 Adelaide Convention Centre, Australia

Australasia's largest and most comprehensive emergency management conference and exhibition will offer access to over 100 conference presenters from international and local thought leaders, featuring the Institution of Fire Engineers (Australia) National Conference and the Australian Disaster Resilience Conference. Its exhibition will be a showcase of the latest and best equipment, technology and service providers.

[More information](#)

International Conference on Forest Fire Research & International Wildland Fire Safety Summit

11-18 November 2022 in Coimbra, Portugal

the scope of this Conference will cover the main topics related to fire management in a research perspective. There will be six major themes: Fire at the Wildland Urban Interface, Fire Risk Management, Decision Support Systems and Tools, Fire Management, Fuel Management and Socio Economic Issues.

[More information](#)

Interested in joining the community?



You are welcome to register with [AFRAN](#), or to [contact us](#)