

## Bureau of Meteorology Annual R&D Workshop 2019

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The Bureau of Meteorology's 31st Annual Research and Development workshop was held in Melbourne, in November 2019 and had the theme 'Forecasting for the Future: New science for improved weather, water, ocean and climate services'.

Environmental forecast services range from routine daily weather forecasts for the public, to seasonal outlooks and climate projections aimed at informing decisions by agriculture and water managers. Emergency managers rely on highly customised services during times of extreme weather such as fires, floods, heatwaves and tropical cyclones. Industry specific advice on the influences of climate variability and change enables society to deal with the challenges posed by our unique climate, both today and in the future.

In order to meet the increasing demands of customers and deliver greater impact and value, service providers are transforming the way in which they work. This transformation process requires significantly enhanced capability in science and technology. Key advances that enhance our abilities to forecast from hourly to decadal scales include:

- developments in Earth system modelling and high performance computing,
- improving our ability to use an increasing diversity and number of observations,
- extended forecast automation at all time scales,
- the application of machine learning,
- the development of impact-based forecasting,
- improvements in the communication and use of uncertainty information, and
- closer engagement with social and economic sciences.

The 2019 workshop brought together experts from across these fields to discuss ways they could work together to provide the Australian and international community with improved services and improved decision-making abilities, resulting in greater impact and value. A series of more focused workshops was held after the main workshop to convey recent research findings in greater detail and to co-design future services to meet customer needs.

This Research Front includes a number of papers drawn from the presentations relating to the workshop themes. Starting with short-range forecasting, Just and Foley (2020) present a history of the development of the graphical forecast process in the USA and Australia – drawing parallels between the two and also highlighting points of difference. One of their key points is that

by streamlining and automating the forecast process, forecaster time can be made available for other value-adding activities. This point is further developed in Sturrock and Griffiths (2020) who describe in more detail how the role of the forecaster is changing and present a case study in which the forecasts were mainly automated, but the forecaster made key interventions in order to add value to the forecast.

Moving on to longer range forecasts, Dowdy (2020) describes the development of a technique to produce seamless predictions of fire weather, from multi-week forecasts, through to seasonal and longer time scales. These seamless products can enhance long-range planning capabilities and climate adaptation efforts, leading to enhanced resilience and disaster risk reduction. For example, at the multi-week scale, projections of the widely used McArthur Forest Fire Danger Index will improve the ability of emergency service managers to strategically deploy their resources.

In relation to the provision of climate services, Hewitt (2020) describes some of the challenges facing the UK Met Office. These challenges include gaps between the requirements of users and the capabilities offered by the science, shortcomings in capacity (for both providers and users) and communication issues. Some approaches that have helped overcome these challenges are presented.

Finally, looking to the future, Freeman (2020) presents some examples of how forecasts could be enhanced to allow people to immerse themselves in augmented reality environments as a way of experiencing the forecast. The provision of location-aware weather information and warnings in the user's desired language could improve decision-making abilities in the presence of severe weather.

Further information on the workshop and abstracts for all presentations can be found in Greenslade *et al.* (2019).

### References

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