

# ECMWF Feature article

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## VIEWPOINT

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Using ECMWF's Forecasts:  
a forum to discuss the use  
of ECMWF data and products  
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## Using ECMWF's Forecasts: a forum to discuss the use of ECMWF data and products

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'Using ECMWF's Forecasts' is a forum for exchanging ideas and experiences on the use of ECMWF data and products. It is an opportunity for participants to provide feedback to ECMWF on forecast performance and the range of products, and for ECMWF to update them on recent developments of the forecasting system. The theme of this year's meeting, which focused on applications and impact of weather information, was '*Integrated use of ECMWF forecast products in decision making and risk management*' with three thematic areas:

- Weather and financial/energy applications.
- Weather forecasting.
- Weather and societal impact.

In June 2013 an international audience of 90 people gathered at ECMWF for the annual workshop when ECMWF meets users of its numerical weather predictions, who over the years have increased in number and now encompass National Meteorological Services, commercial businesses, universities, international organisations and international projects. This year's meeting had a strong focus on the impact of weather information in decision-making and applications.

Invited speakers introduced and set the scene for each thematic area. Networking and exchange of ideas among participants and with ECMWF staff were encouraged during a very popular poster session which accounted for 22 posters on a variety of ECMWF data and product applications, and in the group activities. The presentations and posters are available at: [http://www.ecmwf.int/newsevents/meetings/forecast\\_products\\_user/](http://www.ecmwf.int/newsevents/meetings/forecast_products_user/)

In the following a summary of the key points highlighted by the invited speakers is given for each thematic area.



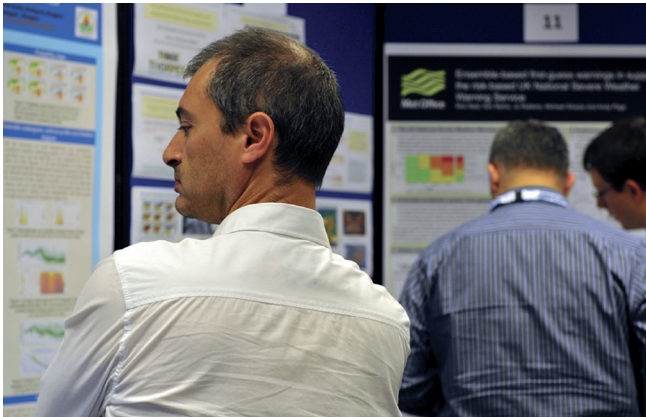
**Participants arriving at the meeting registration desk.** 90 people from Europe and the USA attended the meeting. They had a wide range of interests including commercial applications, weather and forecasting, and humanitarian operations.

### Weather and financial/energy applications

The theme dedicated to '*Weather and financial/energy applications*' explored the use of ECMWF weather information and uncertainty estimates in managing risk and pricing in sectors such as insurance, agriculture, energy and commodity trading. Contributions on weather impact on energy production, consumption and management of related risks were presented.

Judith A. Curry (Climate Forecast Application Network and Georgia Institute of Technology) informed the audience about the operational forecasting system for the energy sector that had been developed based on ECMWF's analysis and forecasting system. She stressed the influences of weather information on energy demand and supply, and on the resilience of the energy sector. In this context, she highlighted that ECMWF weather forecasting system is particularly appreciated as it allows for an internally-consistent post-processing across time scales as well as an assessment of forecast confidence by making use of ensemble predictions.

Curry illustrated the benefits of extended-range forecasts in the energy sector to stabilize energy costs and supplies. She described how trading prices of gas futures can be affected by reduced gas production due to, for example, offshore platforms being evacuated in expectation of a severe weather event. But the needs of the energy sector do not stop at extended-range forecasts. Curry said that there is also interest in early warnings up to seven days in advance to be able to mitigate risk – for instance by implementing a pre-hazard strategic stockpiling whereby in the event of severe weather generators are disconnected from the grid but continue to deliver power to a local circuit. Moreover, operators are able to mobilize emergency crews to deal with the aftermath of an extreme event.



**The poster session.** The 22 posters on display offered the participants an opportunity to explore a variety of applications of ECMWF data and products. They also encouraged participants to network and exchange ideas.

### Weather forecasting

The '*Weather forecasting*' theme focused on weather and marine forecasting practices in the operational environment with emphasis on the use of ECMWF's data and products to shape decisions and assess risks of high impact weather events. Some of the presentations in this session described novel ways of communicating weather information to decision makers, including use of new technologies to extend the reach of warnings. Also the importance of post-processing as a way to add value to NWP output data was highlighted.

William B. Gail (Global Weather Corporation) described the post-processing technology (DICast – Dynamic Integrated foreCast) developed at the National Center for Atmospheric Research (NCAR); this is used to compute forecasts at specific locations. The technique employs a three-step process using a number of NWP models and observations as input. He reported that recent inclusion of ECMWF's high-resolution and ensemble forecasts (HRES and ENS) in the DICast system had improved significantly the skill of their post-processed forecasts.

Gail emphasized that the market for weather apps is rapidly evolving in step with technology; customers demand high-quality weather information delivered for their location which can be displayed on mobile devices. He showed an example of these applications developed for a group of end-users which encompassed a pin drop facility, whereby a location can be easily selected with a dynamic overlay (i.e. to be able to visualize more variables for hourly to daily summaries) and weather alerts.

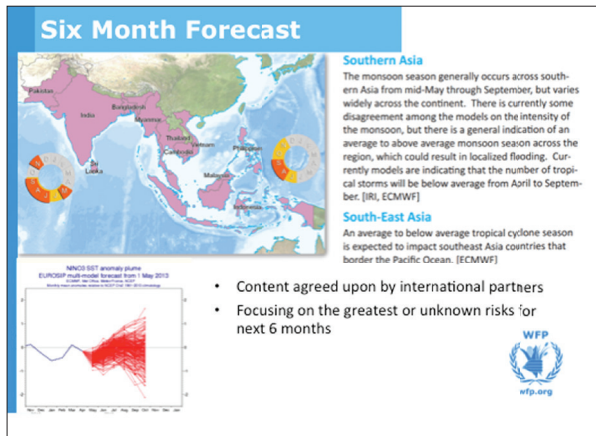


### Weather forecasting and technology.

Commercial enterprises mentioned that the market for weather apps is rapidly evolving in synchronism with technology and customers demand high-quality weather information delivered for their location and displayed on mobile devices (Courtesy of William B. Gail).

Nicole Girardot (Météo-France) told the audience that Météo-France uses ECMWF forecasts in operations for a wide range of activities and forecast ranges. Moreover she stressed that weather warnings provided by a National Meteorological Service (NMS) very much rely on the NWP data, post-processing and human expertise. She reminded the participants that at present forecasters are still facing difficulties linked to the vast amount of information that has to be assimilated in a short time, the availability of heterogeneous tools as opposed to a single solution, and the lack of precise methods to communicate uncertainty. The latter is a long journey started many years ago and its progress relies on the ability of NMSs and other meteorological organisations to provide adequate training for their users about uncertainty and probability forecasts.

It was interesting to see in a number of oral presentations and posters that severe events, which had always been defined as absolute thresholds for specific meteorological variables, are now increasingly referred to as thresholds for the parameter distributions.



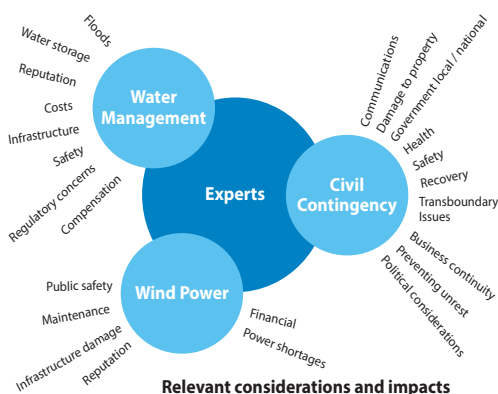
**Weather and societal impacts.** Humanitarian operations work on the assumption that saving time usually leads to saving lives, therefore timely intervention and prevention of high-impact events is a crucial element (Courtesy of Emily Niebuhr and WFP GIS team).

**Weather and societal impacts**

In the session on ‘Weather and societal impacts’ the contributions described applications that helped mitigate or reduce risks associated with high-impact weather events. Emily Niebuhr (World Food Programme) presented the use of ECMWF’s meteorological data for humanitarian relief operations. These work on the assumption that saving time usually leads to saving lives; therefore timely intervention and prevention of high impact events is a crucial element. The large amount of weather information needs to be summarized and integrated in complex systems that take into account human activities, health, conflicts and infrastructure.

Niebuhr suggested, supported by other speakers during the meeting, that a framework would be needed to digest the vast quantity of weather information available to support humanitarian relief, as most humanitarian organisations do not have the resources and ability to do it. There was no conclusion on what this framework should look like, but it was clear that more training is essential to ensure that the information provided can be understood and used in an appropriate manner.

Niebuhr highlighted that, even though local NMSs in the intervention areas are the first contact for humanitarian organisations, it is not always possible to obtain the necessary local weather information to build a complete picture. Therefore, to plan the logistics for the intervention, indices such as the Extreme Forecast Index, which describes the departure from the local climate, are very useful as they provide local knowledge.



**Discovering the needs of different users of weather data.**

The ‘Decision making in action’ group activity started with a role-playing game aimed at discovering the needs of different users of weather data. The forecasters (‘Expert’) interacted with diverse customers represented by the categories of water management, wind power and civil contingency. Risks and weather impact was specific to each type of customer (Courtesy of Liz Stephens and Steven Ramsdale).

## Exchanging ideas and experiences

Group activities provided an opportunity to exchange ideas and experiences about using ECMWF products and services. There were three group activities:

- *'Decision making in action'* focused on users needs in decision making processes.
- *'Product delivery'* discussed future developments in ECMWF products delivery and services.
- *'Calibration'* explored the concepts of data post-processing.

The *'Decision making in action'* group offered an opportunity for participants to explore how different users of NWP products expect to integrate weather information into their decision-making processes. The group analysed how the diverse needs could be addressed by providing bespoke products rather than 'selling' the one-fits-all approach. It was recognized that there is a huge appetite for information on extreme weather but communicating forecasts is not enough; the end-user is interested in clear and concise forecasts that include the impact of weather for their circumstances. Clearly customer consultations, training and support are key elements to bridge the gap between forecasters or meteorologists and weather data users. Terminology and jargon need to be understood by all parties to be able to obtain the largest benefits from weather forecasts. Moreover, sensitivities and vulnerabilities of the various users must be explicit to allow the development of new weather products.

Communication of uncertainty was touched upon at various stages of the group discussion, and it was clear that education and training for all the users of weather information are essential and more should be done in this direction. The participants expressed appreciation for the education and training provided by ECMWF on its NWP products and software.

Members of the *'Product delivery'* group commented on their experiences with ECMWF products and expressed their requirements for future development of ECMWF services. The graphical products available on the website and via the interactive web interface ecCharts are appreciated. The group expressed the need to increase the number of products available on ecCharts (e.g. soundings and cross sections) and make interactive features available for the plots on the web (e.g. zooming, panning, overlays and feature hovering). There was a definite interest in having maps delivery via Web Map services. Modalities of data delivery and cloud services to facilitate expensive data processing were discussed as well as data availability on the commercial catalogue. The group highlighted the need for earlier delivery of the 00 UTC run of the ensemble, which would encourage the use of ensemble forecasts in the daily routines at weather services. Options on how to achieve this are currently under investigation as part of a two-year project at ECMWF on product delivery.

Finally, during the *'Calibration'* working group, post-processing of raw model output was discussed. There is evidence that calibration improves forecast skill; it is therefore encouraged at least for those variables that are commonly used. While spatial calibration is less common, point calibration is more widely used and it relies on the availability of timeseries of hindcasts for specified locations. Therefore, easy access to timeseries of specific variables for a number of selected locations was desirable for future developments. The group highlighted the importance of calibration for extreme event forecasts with the caveat that care must be taken in selecting the appropriate method for post-processing.

## Feedback

The general feedback to the meeting was very positive. Participants appreciated having a theme to focus on and the opportunity of exchanging experiences with people with different business backgrounds. The poster session was very well received, even though it was suggested that in future meetings the time allocated to it could be longer. Having the opportunity to discuss issues with ECMWF staff as well as time to share experiences, whether in the group activities or in coffee breaks, was commended by many participants.

I would like to thank all the participants for making *'Using ECMWF's Forecasts'* an enjoyable and successful meeting. Also my thanks go to ECMWF staff who contributed to the success of the meeting, particularly Erik Andersson, Konrad Bogner, Karen Clarke, Alfred Hofstadler, Florian Pappenberger, David Richardson, Cihan Sahin, Stephan Siemens, Ivan Tsonevsky, Fabio Venuti, Fredrik Wetterhall and Ervin Zsoter.

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