

Automatization and innovation in the production of severe weather warnings – insights from MeteoSwiss

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Abstract:

Severe weather poses significant threats to society, necessitating the development of effective forecasting and warning systems to mitigate their impacts. In the framework of the renewal of the warning system at MeteoSwiss, we use the possibility to redesign the software as well as the scientific approach of generating warnings. The production chain is designed such that the data is guided and refined along the pathway. Here, we present the operational production process currently in development for the next generation warning system. The production chain can be divided into four steps. The first step is the combination of all available data into one data stream (seamless weather). The second step identifies extreme weather events in this data stream and prepares warning proposals for the forecasters. The third step consists of the forecasters evaluating the proposals, changing them if necessary, and issuing the official warnings. In this step, the only human interaction with the otherwise automatic warning system takes place. In the fourth step, the warning products are customized and distributed to our customers. In the fifth and last step the warnings are verified automatically to monitor the quality of the system.

MeteoSwiss furthermore aims to integrate impact-based forecasts into warnings and the warning chain introduced above. The premise of reducing people's harm by introducing possible impacts in extreme weather warnings is a paradigm change for many national weather services (Geiger et al. 2024). Being at the intersection of probabilistic forecasts, uncertainty analysis and state-of-the art risk modelling, this new paradigm also entails significant challenges. Through collaboration with stakeholders including first responders and local authorities, MeteoSwiss draws on pilot regions to find specific use cases from professionals impacted by severe weather to learn about the specific needs and enhancement potentials for early warning. Co-developing these use cases, conducting impact studies, and eventually providing stable products serves as a learning for further development and scaling up of impact-based warnings.

This requires an operational impact model for Switzerland, which flows back into the warning production chain, posing various scientific and technical challenges on the way; we will discuss a solution developed at MeteoSwiss, and highlight the need for seamless conceptual and technical integration within the current warning production processes, with the ultimate aim to better cater to the diverse needs of society in the face of severe weather events while maintaining a reliable warning chain.

References

Geiger, T. *et al.* (2024) How to provide actionable information on weather and climate impacts? – A summary of strategic, methodological, and technical perspectives, *Front. Clim.*, 6, <https://doi.org/10.3389/fclim.2024.1343993>