

**"The future role of the human forecaster  
-  
a change in the philosophy?"**

Zentralanstalt für Meteorologie und Geodynamik



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- In 2003, the Meteorological Service of Canada (MSC) began a significant restructuring of its forecasting operations in response to financial pressures.
- Senior management proposed that MSC could be more cost effective
  - \* continuing to provide quality services by pursuing a more centralized forecasting approach
  - \* and increasing the automation of forecasts via numerical weather prediction (NWP).





- **As a result regional public forecasting centres were reduced in number from 14 to 5 and renamed in Storm Prediction Centres (SPC).**
- **Aviation forecasts were centralized to two Canadian Aviation Centres in Edmonton and Montreal.**





**FIG. 1. Map of Canada showing MSC SPC areas of responsibility (thick lines) and office locations (circles). Canadian Meteorological Aviation Centres are colocated with the SPCs in Edmonton and Montréal. The national meteorological operations forecast office is also located in the Montréal area.**



- **A new methodology for operational forecasting was introduced:**
- **Specifically, automations of „routine weather“ forecasts would be increased to allow the forecaster to concentrate their efforts on „high-impact weather“ (HIW).**
- **There would also be greater emphasis on science in operations, including improved forecasters knowledge, tools incorporating the latest research.**
- **National laboratories were to be established at each Storm Prediction Centre (SPC), focusing the flow of knowledge and technology between operations and research, and developing new approaches to meteorological problems with national applications.**





- **The reduction in the number of weather offices meant that the area of responsibility for each new Storm Prediction Centre (SPC) would be more than 1,000,000 km<sup>2</sup>.**
- **By comparison, France is approximately 540,000 km<sup>2</sup> and is served by 7 regional forecast offices.**
- **The U.S. state of Texas covers approximately 690.000 km<sup>2</sup> and is served by 13 regional forecast offices.**



- **3 forecasters forums took place in 2003, 2004 and 2005 and were attended by more than 450 participants.**
  
- **Presentations included:**
  - **the new Meteorological Service of Canada (MSC) structure and forecasting methodology,**
  - **defining „high-impact weather“ (HIW),**
  - **the future role of the human forecaster at MSC,**
  - **forecast tools of the future,**
  - **forecaster training and development,**
  - **links between operational meteorology and research,**
  - **the future of NWP**
  - **and the communication of uncertainty via probabilistic approaches.**





- **The new MSC forecast methodology – that routine weather forecasts would be automated and forecasters would focus on „high-impact weather“ (HIW) – was well understood and for the most part of participants accepted.**
- **There was an agreement on „high-impact weather“ (HIW) to provide the basis for local and regional variations and imply differences between single and cumulative events and can result in significant impacts on safety, health, environment and economy.**





- Most participants thought that
- **the human forecaster should be the heart of weather prediction,**
- meaning the forecast process would be driven by the forecaster rather than than automated NWP systems.
  
- Furthermore it was expressed that to do an adequate job of predicting „high-impact weather“ (HIW) the forecaster must go through the analysis, diagnosis and prognosis process to have an opportunity to recognize potential „high-impact weather“ (HIW) events and maintain skills.
  
- NWP was considered to be a good tool offering important guidance as well as sophisticated methods of viewing NWP comparing it with observational data.





- **Ensemble forecast systems should be used by the forecaster to make deterministic products better.**
- **Additional forecaster training needs to reach a better level of comfort with ensemble concepts.**
- **More probability information should be included in public forecasts.**
- **Free-formed text was identified as the best way for forecasters to express uncertainty to the public.**





- **MSC has completed the implementation of its restructuring strategy and has worked towards addressing many of the Forecasters Forum recommendations.**
- The forecaster of the future would not be able to maintain the analysis, diagnosis and prognosis skills
- his only role is occasional intervention when automated forecast process go awry.
- It is recognized that there will be skill in knowing when to intervene.
- It is stated that it is becoming increasingly difficult for human forecasters to add value to NWP forecasts.





- However to add value to NWP is at those times when NWP does poorly and the weather is typically of critical importance to the public.
- Under these circumstances expert forecasters can increase forecast skill considerably. The human forecaster will have a crucial role in producing the best possible forecast for „high-impact weather“ (HIW).
- This role should be recognized and resources devoted to better facilitating it.





- Taking all the above into account, it is suggested that the primary role of the human forecaster should be **to develop and maintain a shared weather-object database that uses a sequence of composite depictions that evolve through time the current and future states of the atmosphere.**
- The emphasis would be on the sensible weather near the surface, since that region of the atmosphere has the greatest influence on the activities of the public.
- Basic activities are based in nowcasting and warnings for the public.



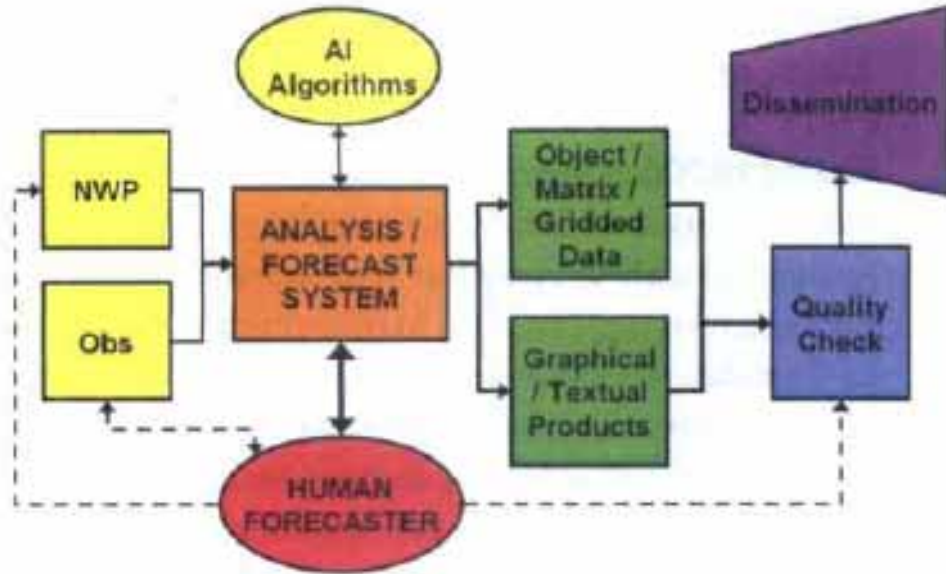


FIG. 2. (left to right) Flowchart showing the proposed role of the human forecaster in the forecast production process. Yellow boxes represent various inputs, while green boxes represent various outputs. Bold arrows indicate that the main interaction is between the human forecaster and the analysis/forecast system. The human forecaster may also influence NWP, observations, and quality checking (all shown as dashed arrows). Public reports of severe weather events are a special type of observation that could go directly to the human forecaster (dashed arrow).





- **The main idea is that the daily activity of the forecaster would be focused on meteorology, not on details in generating products.**
- **That means maintaining shared situational awareness at all times.**
- **This would likely require a forecaster with specific task of maintaining the „big picture“ of the atmosphere and coordinating the more detailed activities of the mesoscale weather activities.**





- **The question now is how the to optimize the human-machine mix.**





- **Summary:**
- **The human forecaster currently plays a vital role at MSC weather offices and could continue to contribute towards significant improvements in „high-impact weather“ (HIW) forecasting if supported by tools that achieve an optimal human-machine mix.**





## Summary:

- This would be accomplished using an area-based, object-oriented analysis / forecast system with a toolbox of NWP guidance.
- The forecaster's work would be focused on „high-impact weather“ (HIW) events, mainly in the short term but also in the longer term if necessary.
- Products would be automatically generated from the weather object database, allowing the forecaster to focus on „hands on“ analysis, diagnosis and prognosis and maintain shared situational awareness at all times.





- Reference:
- David M. L. SILLS:
- *„On the MSC forecasters forums and the future role of the human forecaster“*
- Bulletin of the American Meteorology Society (BAMS),
- Volume 90, Number 5, May 2009





- Thank you for your patience.

