Forecasting Challenges & Improvements for the Future
Forecast Accuracy to Innovation Relationships

Avg Avg 80s 90s

Avg Avg 80s
Satellites

From the 60’s through the mid 80’s satellite assisted the forecasting effort but were limited in printed quality and enhancement capabilities.

Resolution was limited and animation required transposing location of major features by hand due to skewing.
In 1987 the invention of the GODDESS by Sea Space, Inc. (version 1 TeraScan) allowed the polar orbiting images to be flattened, and overlaid for still animation.

In addition the recorded image could be enhanced readily on the monitor to pull out features without using valued printing paper process.

This produced a near instant increase in short term forecasting accuracy with this new timing and feature identification tool.

Short range forecast accuracy improved $\sim$5% (based on go-no go tracking).
Modeling

1991 to 1994 – After the end of the cold war and Russia economic collapse forced the closure of Molodezhnaya and Novolazarevskaya stations and applicable intercontinental air transport. The reduction of the Russian Antarctic Program eliminated many manned stations providing weather reporting. Forecast accuracy had a slight and slow decline. Manual analysis and projection had been replaced by modeling world-wide.

In 1990 University of Wisconsin promoted the use of internet connection via a 9.6 connection. This was jointly used by operations to extract FNMOC (then FNOC) NODDS fields. Over time the NOGAPS model was identified to have fair value at 500hPa and particularly above at 400hPa for steering flow and guidance on speed/development. Forecasting tools were established but lacked any significant impacts in low level and minor circulations and periods beyond 18 hours.

NOGAPS assumed a flat earth and did not offer much in terms of low level forecasting abilities.
Modeling

2000 to present – Many improvements have allowed a peak with another roughly 5% increase in short term forecasts from the peak in 1988 – 1991 and an unmeasured notice in the ability to have confidence in longer range projections (24 – 48 hours).

Improvements include:

- Cooperative with science / research NCAR, OSU, U/W
- Implementation of AMPS MM5/WRF
- AWS network to include unification through AMRC cooperative and LDM Software
- Increased number of orbital satellites decreasing the mid-day gap
- Joint science/operations awareness increases through relationships, meetings, and correspondence
- New concepts for tools and education
AWS Locations 2011-2012
(circle radii are approximately 10, 20, 30, and 40 statute miles)
Arrow indicates direction of webcam.
VIS indicates visibility sensor.
Star indicates landmass visible on webcam image.
Fan box indicates year-round site with different summer/winter-over configurations (preferred).

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CHALLENGES IN EVALUATION PERFORMANCE

It stands clear the “norm” is merely an average of extremes. Annual tracking shows each season has its own characteristics impacted by variations in the global and regional situations. From the early 2000’s with ice bergs changing the Marginal Ice Zone (MIZ) impacting the seasonal variability to the lack of sea ice during the 2010-2011 summer season where exaggerated meridional flow expressed a greater influx of horizontal heat exchange in the Ross Sea in the spring through early summer period.

Seasons range from extremely active high transport periods to lulls with limited hazardous weather conditions. It is noted that even seasons with high activity do not follow similar patterns from month to month. This vast difference adds to the difficulties to make seasonal pattern forecasts.
Individual system inconsistencies are mostly driven by extreme terrain issues coupled with small nuances within the system’s structure. Although AMPS provides a great detail of information a greater focus over the upcoming years to identify patterns in grouped observational devices in tandem with system pattern recognition. The outcome is expected to yield the highest level of forecast proficiency with the current guidance available.
Driving Factors
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This document is the final report on the Development of an Open Source Desktop Environment (DOS) by the National Center for Atmospheric Research (NCAR) that was submitted to the National Science Foundation (NSF). The report details the development of a new software system designed to improve the accuracy of weather predictions. The system is designed to integrate user feedback and incorporate advanced machine learning algorithms to enhance forecasting capabilities.

The report begins with an overview of the project's objectives and the challenges faced during development. It then describes the technical architecture of the DOS system and the various components that were developed, including the user interface, data processing modules, and machine learning algorithms. The report also includes a detailed analysis of the system's performance and its impact on weather prediction accuracy.

The conclusion of the report highlights the potential benefits of the DOS system and its potential applications in various fields, including meteorology, aviation, and climate research. The report concludes by emphasizing the importance of ongoing support and collaboration to ensure the long-term success of the project.

The author of the report expresses gratitude to all the contributors who worked on the project and encourages further research and development to optimize the system's performance and expand its capabilities.
What’s Next

1. Use what we have to its fullest ability. We still have a lot we can learn from what we have

2. Train, Train, and re-Train
   - Don’t repeat errors
   - Work at maintaining peak percentage even during poor weather seasons

3. Keep our ears to the ground for even the smallest advancements

4. Be patient and support science for new forecasting tools and processes