SPACE WEATHER CULTURE GAP (CSSP)

N. A. SCHWADRON, UNH

SISCOE'S IDENTIFICATION OF A CULTURE GAP

SPACE WEATHER The International Journal of Research and Applications AGU

A Culture of Improving Forecasts: Lessons From Meteorology

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25 January 2006

Space weather forecasting, like all forecasting, is challenging. Nevertheless, it has the advantage that as a young field it can look to the older field of terrestrial weather forecasting for guidance. Terrestrial weather forecasting enjoys enviable success from the perspective of space weather forecasters, who can learn from the experience of terrestrial weather forecasters as far as circumstances allow.

There is, however, a lesson from forecast meteorology that could have a bigger impact on space weather forecasting if learned not by practicing forecasters but by the general space weather research community: A significant benefit to both research and practice can result when the research community in general is familiar with the problems and the methods of the forecast community. This is a comment about the culture of the community in which space weather research and space weather operations are embedded.

TRACKING PROGRESS

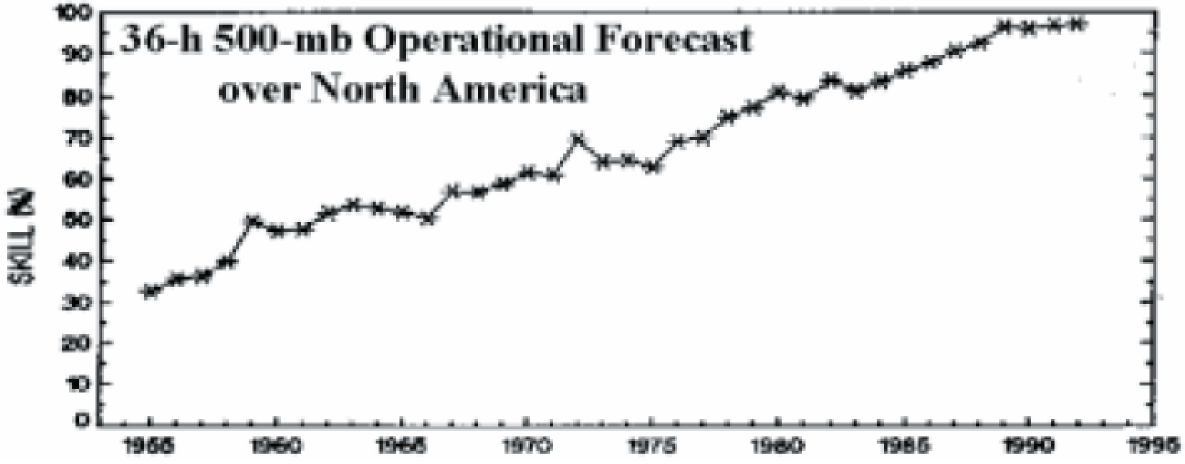

Figure 1. Forecast skill from 1955 to 1992 in the 36-hour predicted height of the 500-mbar surface over the United States, showing the escalator effect on skill that occurs once forecasting bases predictions on numerical integrations of the equations of motion (stage 9) [*McPherson*, 1994].

FORECASTING: HOW DO WE KNOW WHERE IMPROVEMENTS ARE NEEDED

With no benchmarks of skill scores communicated across the community, how can we make ANY quantitative assessment about where improvements are needed

ELSEVIER

Journal of Atmospheric and Solar-Terrestrial Physics 66 (2004) 1499–1507

Journal of ATMOSPHERIC AND SOLAR-TERRESTRIAL PHYSICS

www.elsevier.com/locate/jastp

Center for integrated space weather modeling metrics plan and initial model validation results

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Received 13 February 2004; received in revised form 25 March 2004; accepted 26 March 2004

		Baseline Models	Skill Score Data Sets	Physics Models
	Operational SW Community			
Operational Metrics	1 *Shocks and CMEs at L1*		ACE	MAS+ENLIL
	a Speed	Augmented Vrsnack-Gopalswamy[a]	"	
	b Arrival time	"	"	
	c Bz	"	"	
	d Duration	"	"	
	2 *SEP Properties*		GOES	UCB
	a Event/No Event	PROTONS[b]	"	
	b Rise Time	"	"	
	c Peak Flux	"	"	
	d Duration	"	"	
	e Cutoff	Shea-Smart[c]	POES	
	3 *Magnetic Indices*			
	a Dst	Temerin-Li[d]	NGDC	LFM+RCM
	b Ap/K	ARX-McPherron	"	
	4 *Regional Ground dB/dt*	Weigel-Baker[e]	IMAGE (mag)	LFM+TING
	5 *Radiation Belt EP fluxes*			
	a GEO	Li[f]	LANL	RBM
	b MEO and LEO	Vassiliadis[g]	SAMPEX	"
	6 *Ionosphere/Neutral Atmosphere*			
	a "State" of ionosphere	IRI[h]	Digisondes	TING
	Scientific SW Community			
Science Metrics	1 Solar/Coronal			
	a Coronal Hole Index	PFSS/Wang-Sheeley[i]	SOHO UV maps	MAS+ENLIL
	b White-light Streamer Belt Index	PFSS/Yi-Ming Wang[j]	SOHO LASCO	"
	2 *Solar Wind/IMF at L1*			
	a Density	WSA[k] + nv = constant	ACE	MAS+ENLIL
	b Velocity	WSA	"	"
	c IMF - vector	WSA + IBI	"	"
	3 *GEO/MEO Environment*			
	a Magnetic field	Tsyganenko[l]	GOES	LFM+RCM
	b Particle fluxes (ring current/rad belt)	MSM[m], CRRESELE[n]	GOES/LANL	LFM+RCM,RBM
	c M'pause crossing	Shue[o]	"	LFM+RCM
	4 *MI Coupling*			
	a Polar Cap Potential	Weimer[p]	DMSP	LFM+TING
	b Polar Cap Boundary	Weimer	"	"
	c Field Aligned Currents (2D)	Weimer	"	LFM+TING+MIC
	d Particle precipitation	AURORA[q]	"	MIC
	5 *Ionospheric Plasma*			
	a E-, F-region Heights	IRI	Digisondes +	TING
	b E-, F-region Peak Densities	"	ISRs	"

[a] Vrsnak and Gopalswamy (2002), Gopalswamy et al. (2001), Bothmer and Rust (1997), and Owen and Cargill (2002).
[b] Balch (1999).
[c] Shea and Smart (1990).
[d] Temerin and Li (2002).
[e] Weigel and Baker (2003).
[f] Li et al. (2003).
[g] Vassiliadis et al. (2004).
[h] Bilitza (2001, 2003).
[i] Wang and Sheeley (1992).
[j] Wang et al. (1997).
[k] Wang and Sheeley (1992); Arge and Pizzo (2000); Arge et al. (2004).
[l] Tsyganenko (1995, 2003).
[m] Magnetospheric Specication Model from AF-GEOSpace.
[n] CRRESradiation belt electron model from AF-GEOSpace.
[o] Shue et al. (1997,1998).
[p] Weimer (1996), Weimer (2001a, b).
[q] Air Force Statistical Auroral Models from AF-GEOSpace.

CULTURE ISSUES

- **Would forecasting capabilities improve if we moved toward open source models?**
  - Improves collaborative approach
- What are the metrics tracked by the community and who is responsible for tracking these metrics over the long term?
- What are the user-specified requirements for space weather forecasting?
- Can funding lines be created with the PRIMARY OBJECTIVE of improving forecasts?