AVN-Based Statistical Forecasts of Thunderstorms and Severe Thunderstorms

CAFTI Presentation
September 6, 2000

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Observations (Predictand Data)

- Cloud-to-ground lightning data from the NLDN were obtained from NASA (Oct. 1, 1994 - Mar. 31, 2000).
- One or more lightning strikes defined a thunderstorm.
- Storm Data reports were obtained from OM.
- A severe thunderstorm was conditional based on the occurrence of a thunderstorm. A tornado, wind gust or damage, or large hail defined a severe thunderstorm.
- Because the data were random in time and space, data were placed on a grid.
- Hourly reports were summed up over 6-, 12-, and 24-h periods for each grid point.

Seasonal Stratification

- Seasons were defined for both the thunderstorms and the severe thunderstorms as:
  - Spring: March 16 - June 30
  - Summer: July 1 - October 15
  - Cool: October 16 - March 15

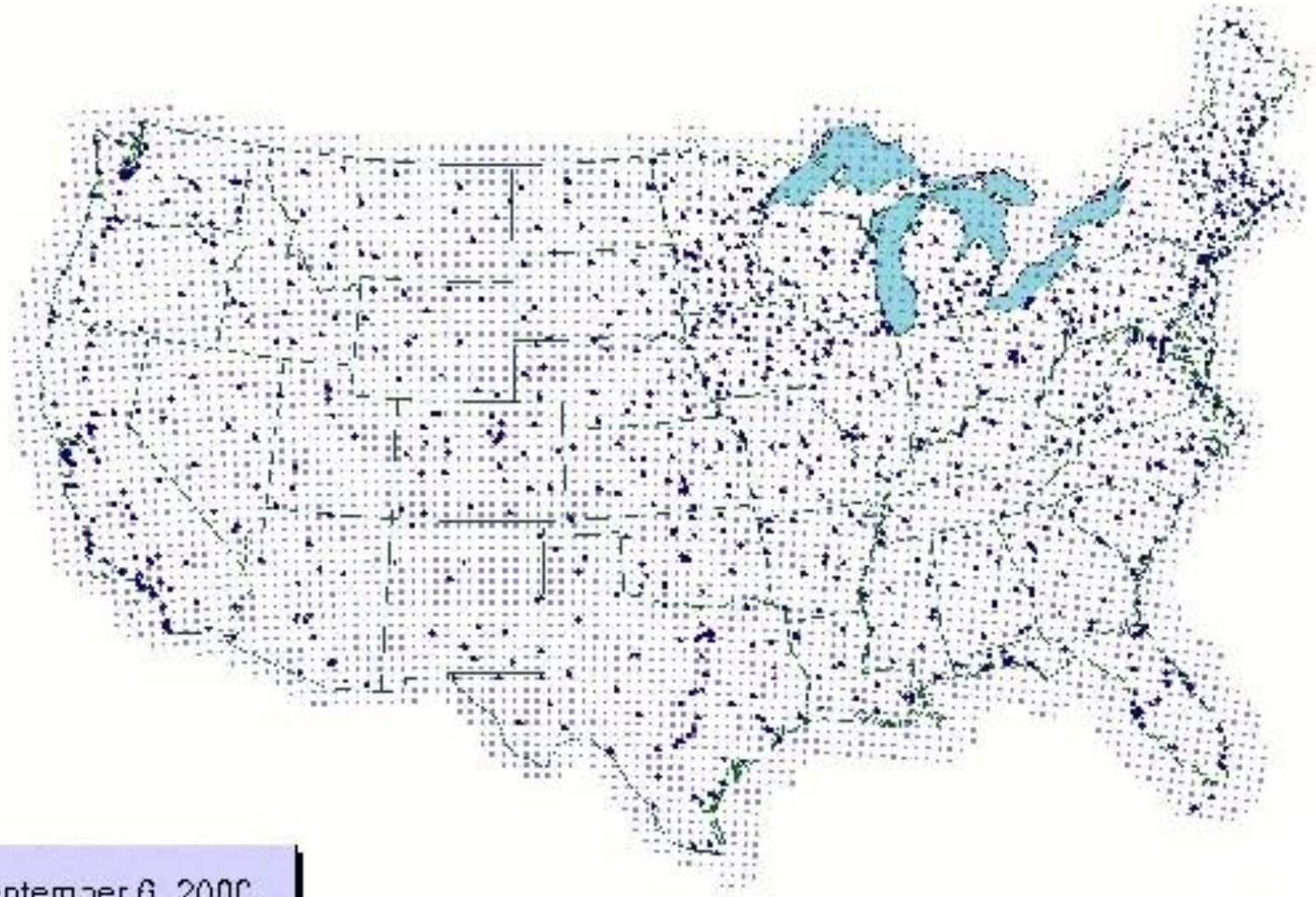
Model Data

- TDL's current AVN archive was established in April 1997.
- Predictors were available every 3 hours from 3 to 72 hours in advance from 0000 and 1200 UTC cycles.
- Two years of data were used for the summer test sample.
  - June 16, 1997 - October 15, 1998
- Three years of data were used in the development of the final summer equations
  - June 16, 1997 - September 30, 1999

Important AVN Predictors

- Lifted Index (calculated)
- Total Totals
- Thicknesses
- U & V Wind Components
- Thunderstorm Relative Frequency * K-Index
- Convective Precipitation Amount
- CAPE
- Vertical Velocity

Thunderstorm Grid with CONUS MOS stations



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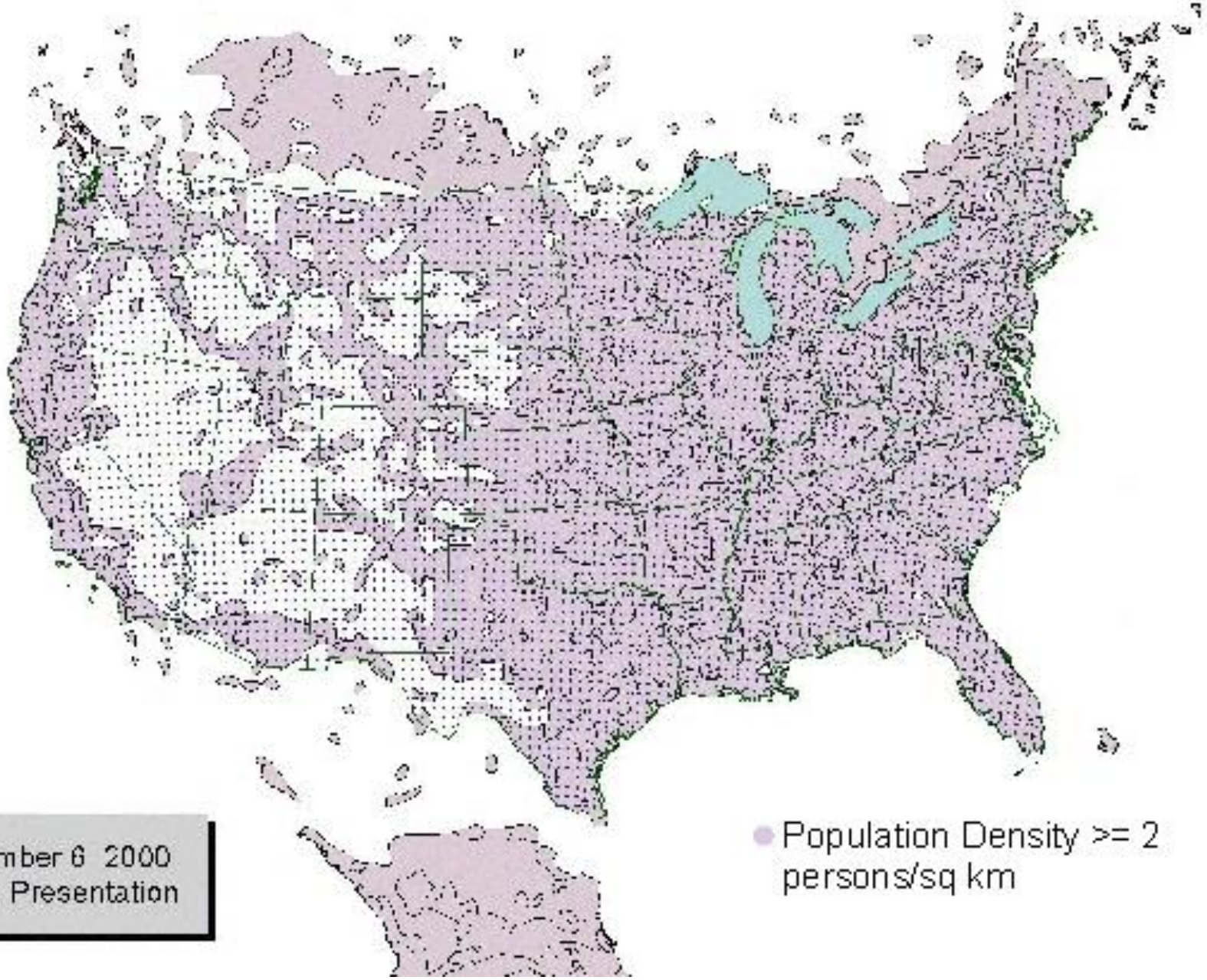
Severe Weather Grid



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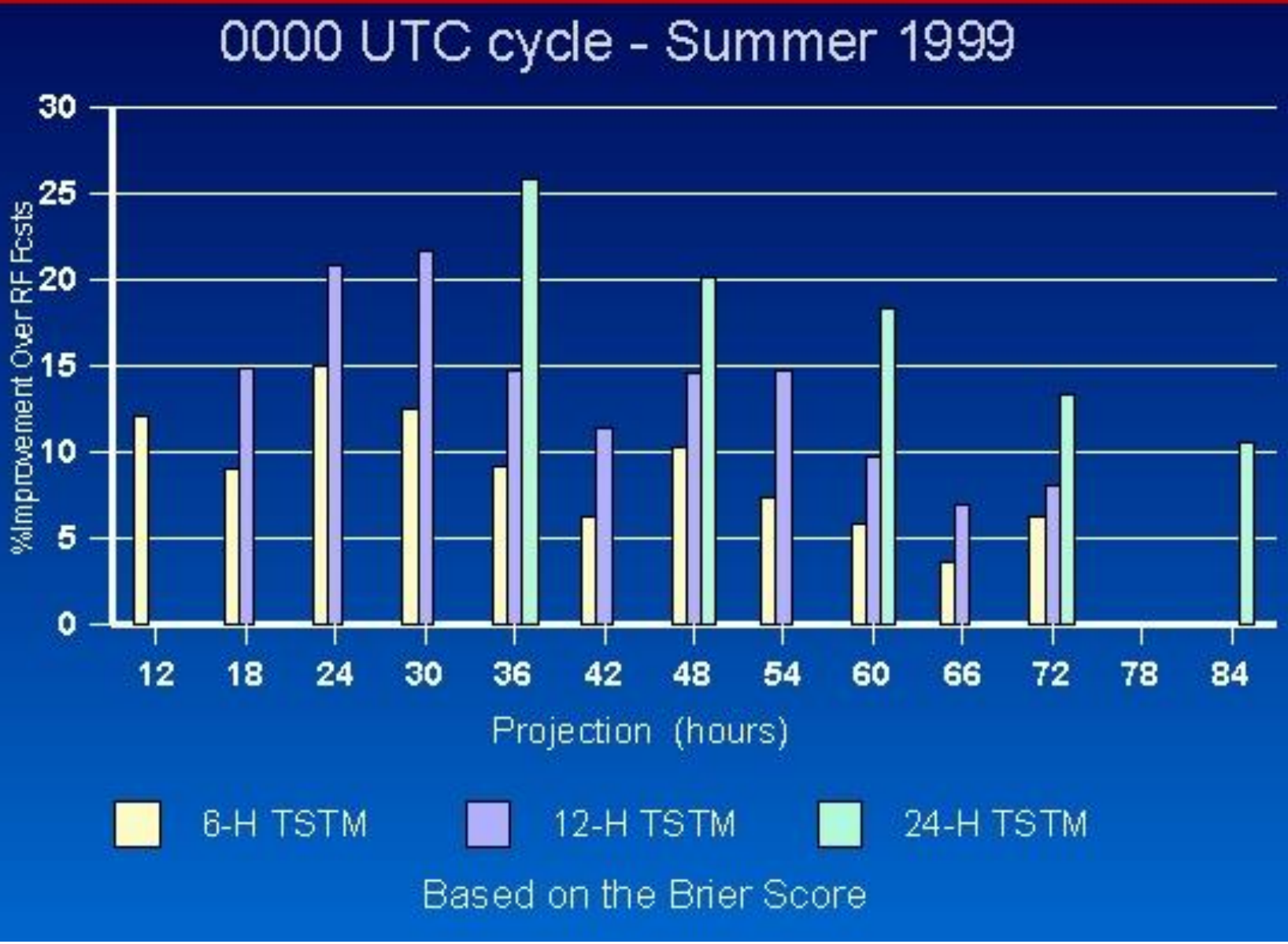
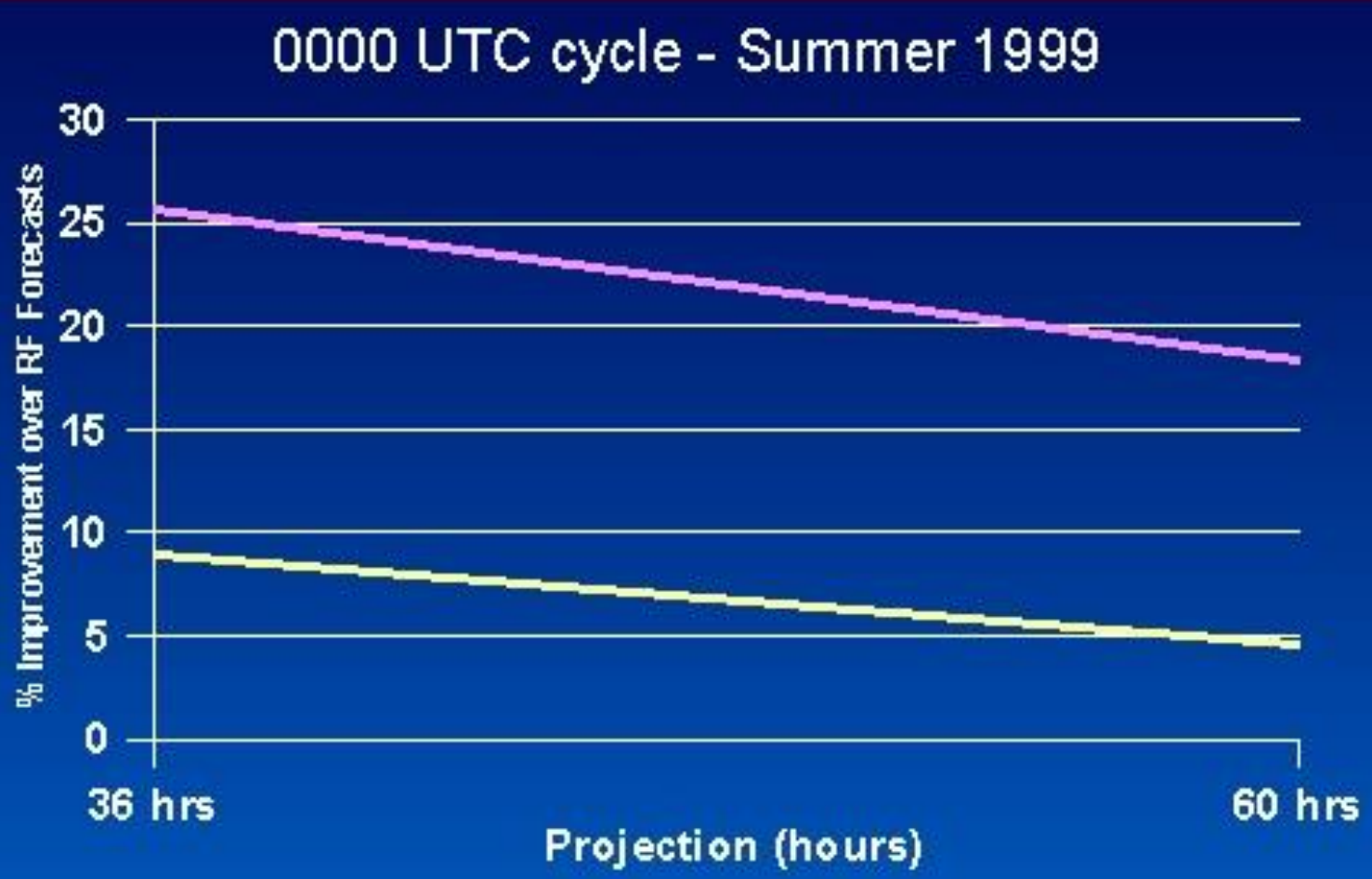
AVN MOS Thunderstorm/Severe Thunderstorm Forecast Projections

0000 UTC and 1200 UTC cycles

AVN MOS Thunderstorm Skill

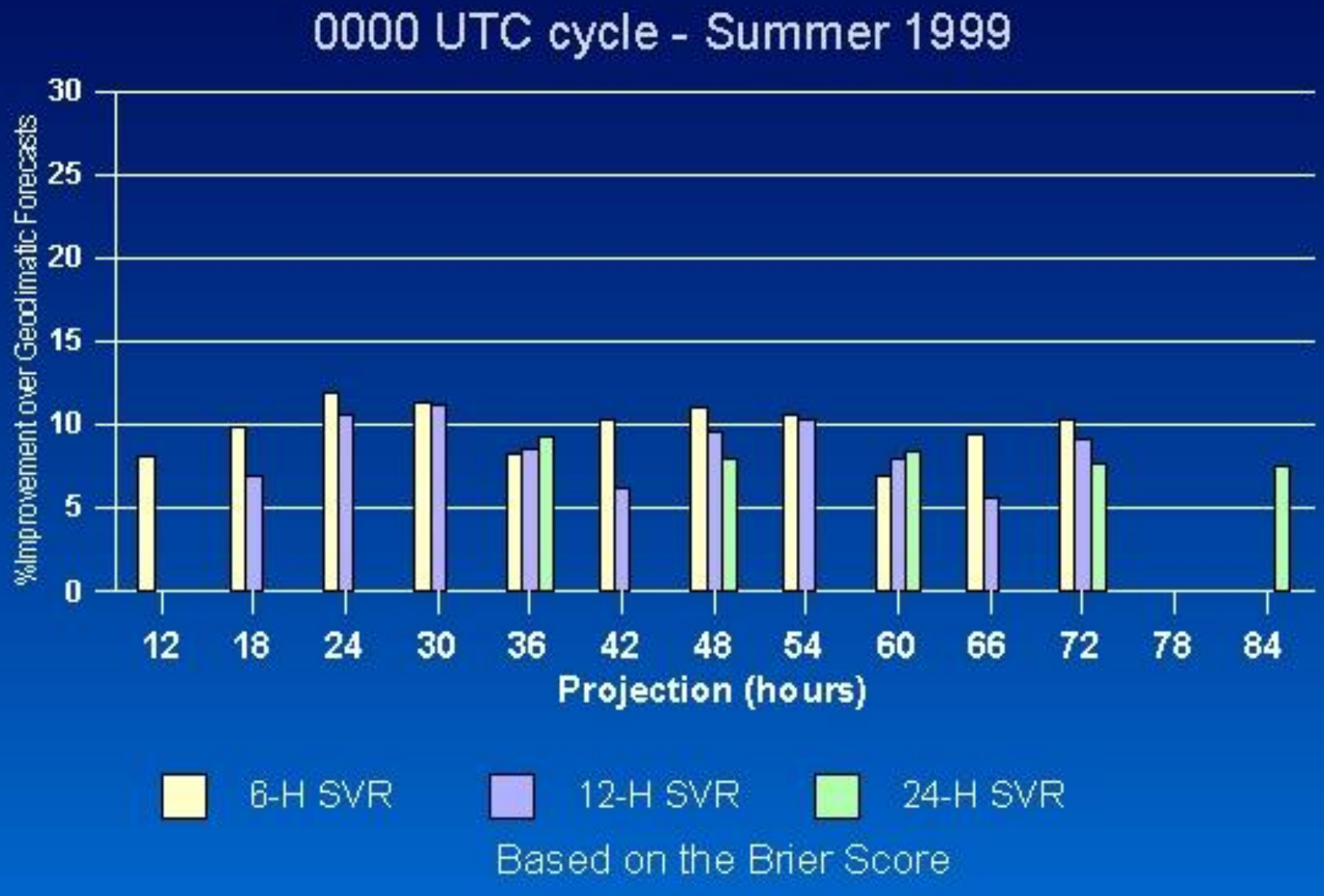


New AVN MOS 24-h forecasts vs NGM MOS 24-h thunderstorm forecasts



Based on the Brier Score

AVN MOS Severe Weather Skill



Products

- ***Alphanumerics*** - Thunderstorm and severe thunderstorm forecast probabilities will be available in the AVN text message for 6-h and 12-h periods.
- ***GRIB*** - files will be provided to NCEP and used to generate GEMPAK files for the National Centers.
- ***Red-Book Graphics*** - 24-h probabilities will be distributed to AWIPS and the NOAAPORT.
- ***BUFR*** - all of the station forecasts will be formatted in BUFR and provided to AWIPS.

NEW AVN MOS MESSAGE

```
KALB   AVN MOS GUIDANCE   10/24/1999  0000 UTC
DT /OCT 24                    /OCT 25                    /OCT 26                    /
HR   06 09 12 15 18 21 00 03 06 09 12 15 18 21 00 03 06 09 12 18 00
X/N                    49                 30                 51                 43    61
TMP  32 30 30 41 47 47 38 34 32 32 34 47 58 60 54 50 48 47 49 57 53
DPT  25 23 23 24 23 23 24 26 28 28 30 32 34 37 39 41 43 43 45 45 44
CLD  CL CL CL CL CL CL CL CL SC SC CL CL CL CL CL CL CL SC SC SC SC
WDR  32 32 32 31 31 32 32 00 00 00 36 15 16 15 16 16 16 16 18 18 19
WSP  08 08 08 11 12 09 02 00 00 00 01 04 10 08 04 06 08 06 11 12 08
P06        0     0     0     3     5     0     0     9    14 15 20
P12                    0                 6                 0    17    25
T06     0/ 7  0/ 1  0/ 2  0/ 4  2/ 1  1/ 1  2/ 1 18/ 3  4/ 2 22/ 3
T12           0/ 7        0/ 3        4/ 2       14/ 4    10/ 3
POZ  0  0  5  9 11  9 15 13  7 10  5  0  0  0  0  1  0  1  0  0  0
POS 84  0 95 90 75 47 35 16 20  5  6  0  0  0  0  1  1  1  0  0  0
TYP  S  S  S  S  S  S  S  R  R  R  R  R  R  R  R  R  R  R  R  R  R
Q06        0     0     0     0     0     0     0     0     0  0  0
Q12                    0                 0                 0     1
SNW                    0                 0                 0     0
CIG  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7
VIS  7  7  7  7  7  7  7  7  7  7  5  7  7  7  7  5  5  1  5  6  7
OBV  N  N  N  N  N  N  N  N  N  N HZ  N  N  N  N HZ HZ FG HZ HZ  N
```

Conclusions and Future Work

- AVN MOS probability forecasts for 24-h periods are more skillful than the NGM MOS forecasts.
- AVN MOS thunderstorm and severe thunderstorm forecasts have skill for all forecast periods at all projections.
- Eta MOS thunderstorm and severe thunderstorm probability forecasts will be available for the Spring of 2001.
- MRF MOS thunderstorm probability forecasts will be available for the Spring of 2001.

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