Gridded MOS – A Prototype System

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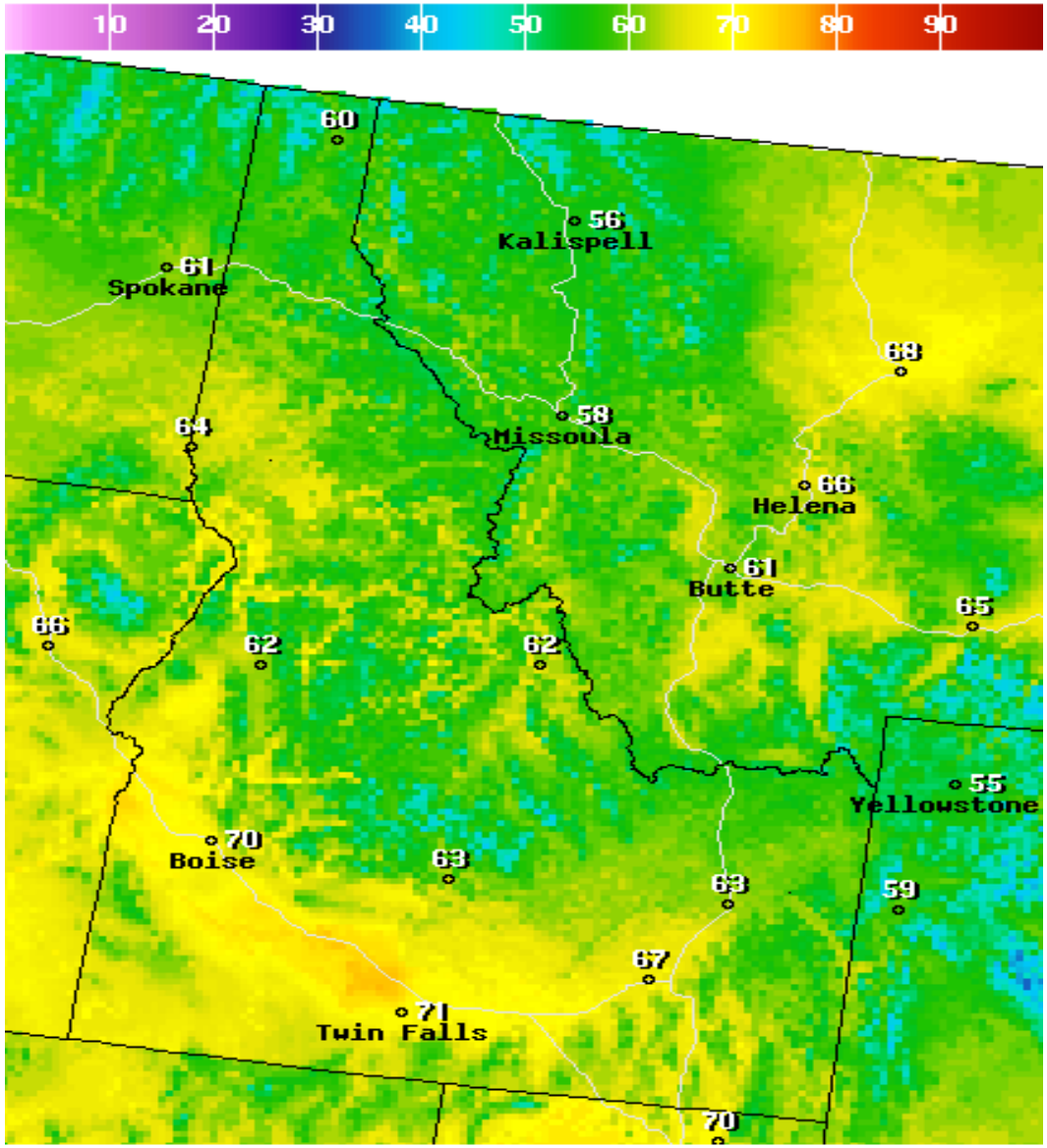
Revolution

DEFINITION:

A radical change of circumstances in a scientific, social, or industrial system

(Webster's Dictionary, 1974)

NWS Revolution



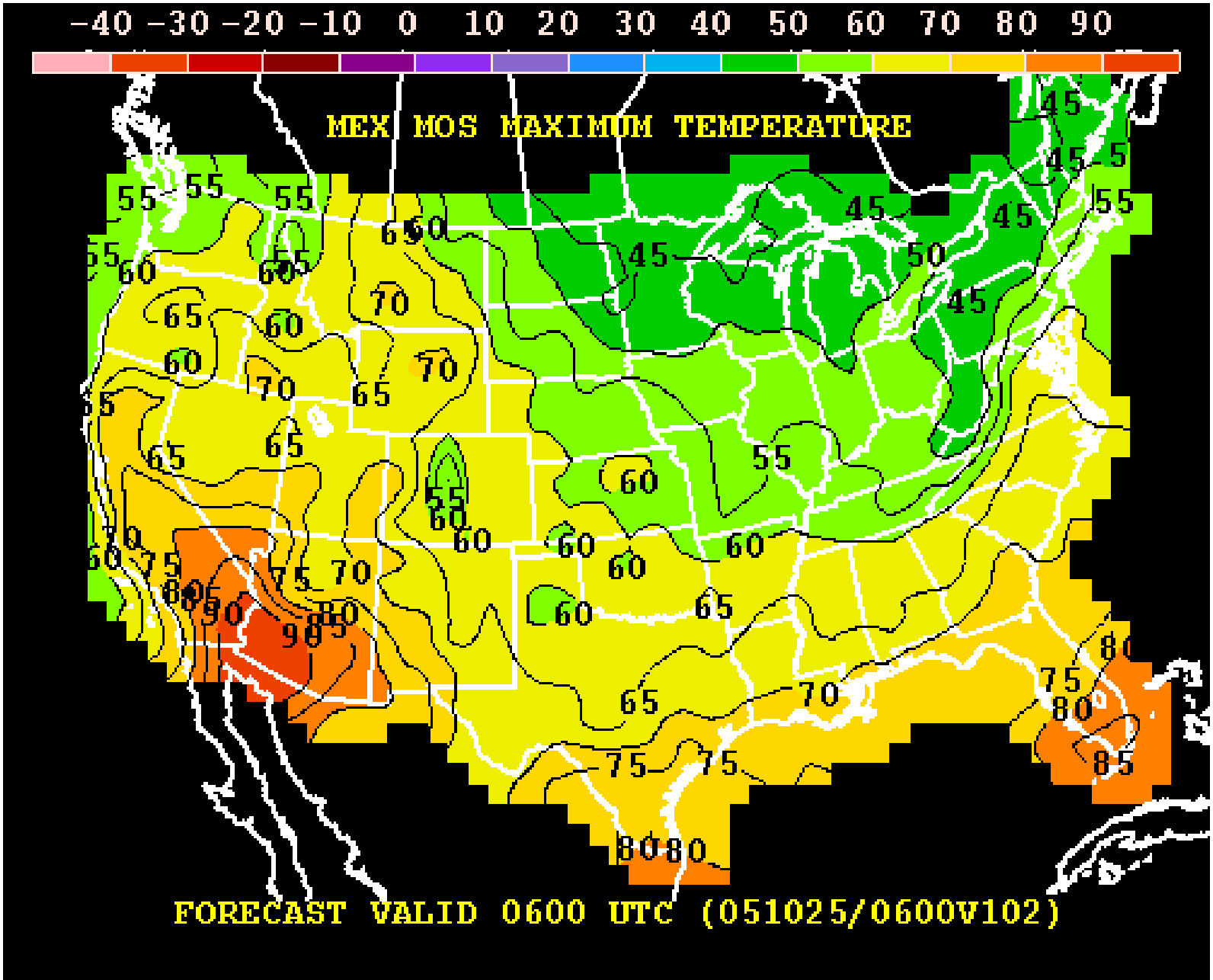
Traditional Short-Range MOS Guidance

```
KGTF   GFS MOS GUIDANCE   10/21/2005  0000 UTC
DT /OCT  21             /OCT  22             /OCT  23           /
HR   06 09 12 15 18 21 00 03 06 09 12 15 18 21 00 03 06 09 12 18 00
X/N                    56          32          61          35    68
TMP  39 36 34 38 48 53 51 43 40 37 36 42 53 58 55 46 42 40 39 61 62
DPT  38 36 34 35 35 33 33 32 30 29 28 31 31 29 29 30 29 28 28 31 30
CLD  OV OV OV SC CL CL SC SC SC SC SC CL SC SC SC CL CL CL CL CL CL
WDR  07 36 17 00 22 20 10 17 19 22 19 18 20 20 12 17 19 19 19 20 19
WSP  02 02 01 00 03 03 02 03 02 02 02 01 04 06 03 06 05 03 03 05 07
P06         2     0     0     0     1     1     1     1     1  1  1
P12                     4           1           1           1     1
Q06         0     0     0     0     0     0     0     0     0  0  0
Q12                     0           0           0           0     0
T06      0/ 1  0/ 0  0/ 2  0/ 0  0/ 0  0/ 0  0/ 0  0/ 0  0/ 0  1/ 0
T12            0/ 1        0/ 2        0/ 0        0/ 0     0/ 0
POZ   0  0  0  0  0  0  0  1  1  0  0  0  0  0  0  0  1  0  0  0  0
POS  26 29 33 38 48 37 40 40 44 43 45 17 33 29 28 30 38 38 25 29 27
TYP   R  R  R  R  R  R  R  R  R  R  R  R  R  R  R  R  R  R  R  R  R
SNW                           0                          0
CIG   7  7  7  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8
VIS   7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7
OBV   N  N  N  N  N  N  N  N  N  N  N  N  N  N  N  N  N  N  N  N  N
```

Traditional Extended-Range MOS Guidance

```
KGTF   GFSX MOS GUIDANCE  10/21/2005  0000 UTC
FHR  24| 36  48| 60  72| 84  96|108 120|132 144|156 168|180 192
FRI  21| SAT 22| SUN 23| MON 24| TUE 25| WED 26| THU 27| FRI 28 CLIMO
X/N  56| 32  61| 35  68| 37  68| 42  68| 42  64| 34  54| 32  52 33 54
TMP  51| 36  55| 39  62| 41  61| 45  61| 47  56| 39  48| 37  46
DPT  33| 28  29| 28  30| 26  32| 32  33| 31  29| 25  26| 25  27
CLD  PC| PC  PC| CL  CL| CL  CL| CL  CL| PC  OV| OV  OV| PC  OV
WND   7|  8  10|  9  13| 11  17| 13  17| 16  18| 15  17| 13  15
P12   4|  1   1|  1   1|  2   3|  4   3|  3   7| 19  16| 14  18 13 17
P24    |      1|      2|      4|      5|      7|     19|     25    22
Q12   0|  0   0|  0   0|  0   0|  0   0|  0   0|  0    |
Q24    |      0|      0|      0|      0|      0|       |
T12   0|  0   0|  0   1|  1   0|  0   0|  2   2|  2   0|  0   0
T24    |  0    |  1    |  1    |  0    |  2    |  2    |  2
PZP   1|  1   1|  8   4|  5   4|  2   2|  2   2|  2   3|  3   3
PSN  26| 24  27| 19  27| 17  18| 19  21| 24  33| 36  38| 40  51
PRS  16| 17  16| 11   8|  8   6|  4   7|  8  13| 17  17| 19  14
TYP   R|  R   R|  R   R|  R   R|  R   R|  R  RS| RS  RS| RS   S
SNW    |      0|      0|      0|      0|       |       |
```

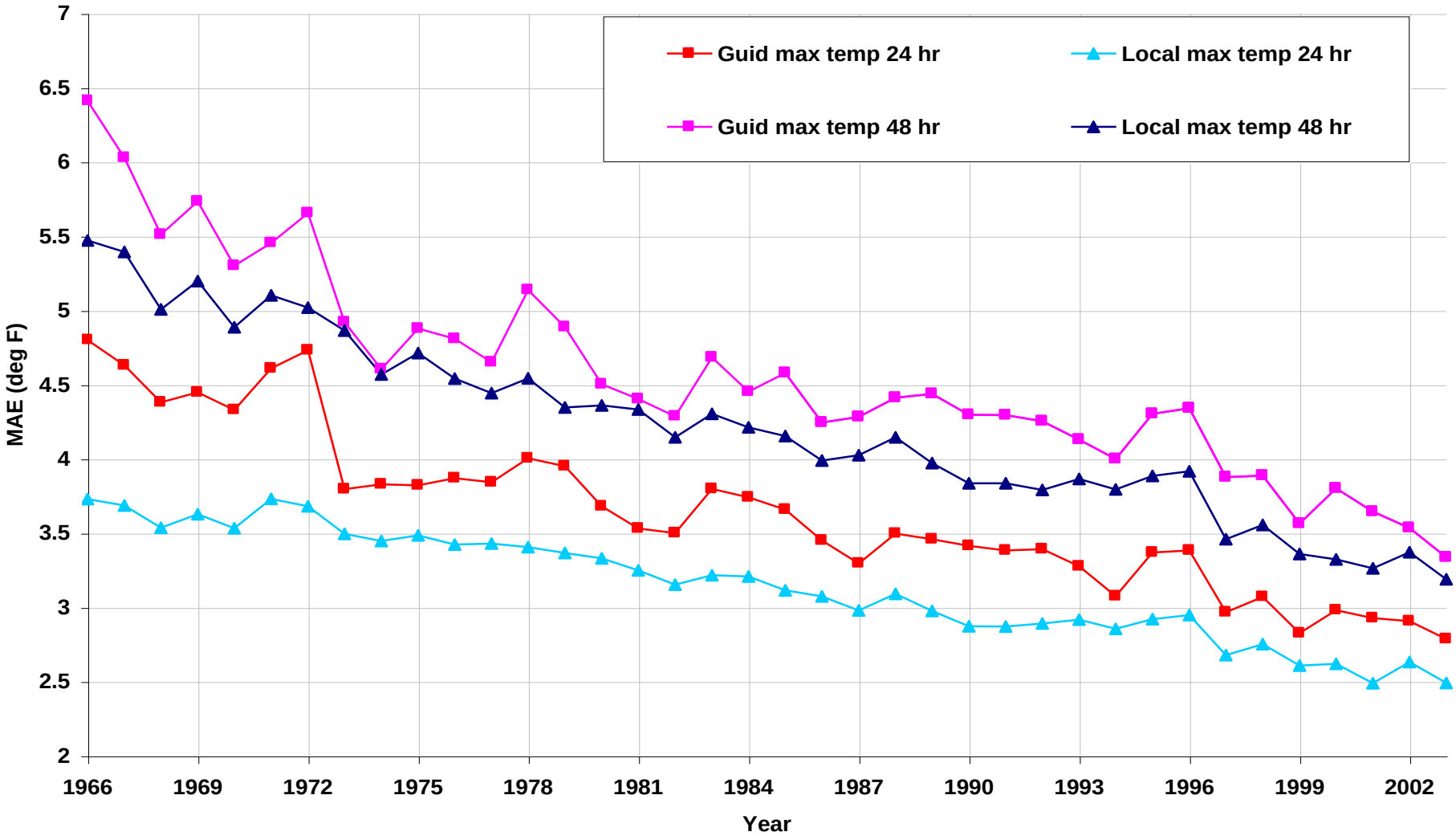
Traditional MOS Graphics



Objectives of Gridded MOS Project

- **Produce MOS guidance on high-resolution grid (2.5 to 5 km spacing)**
- **Generate guidance with sufficient detail for forecast initialization at WFOs**
- **Generate guidance with a level of accuracy comparable to that of the station-oriented guidance**

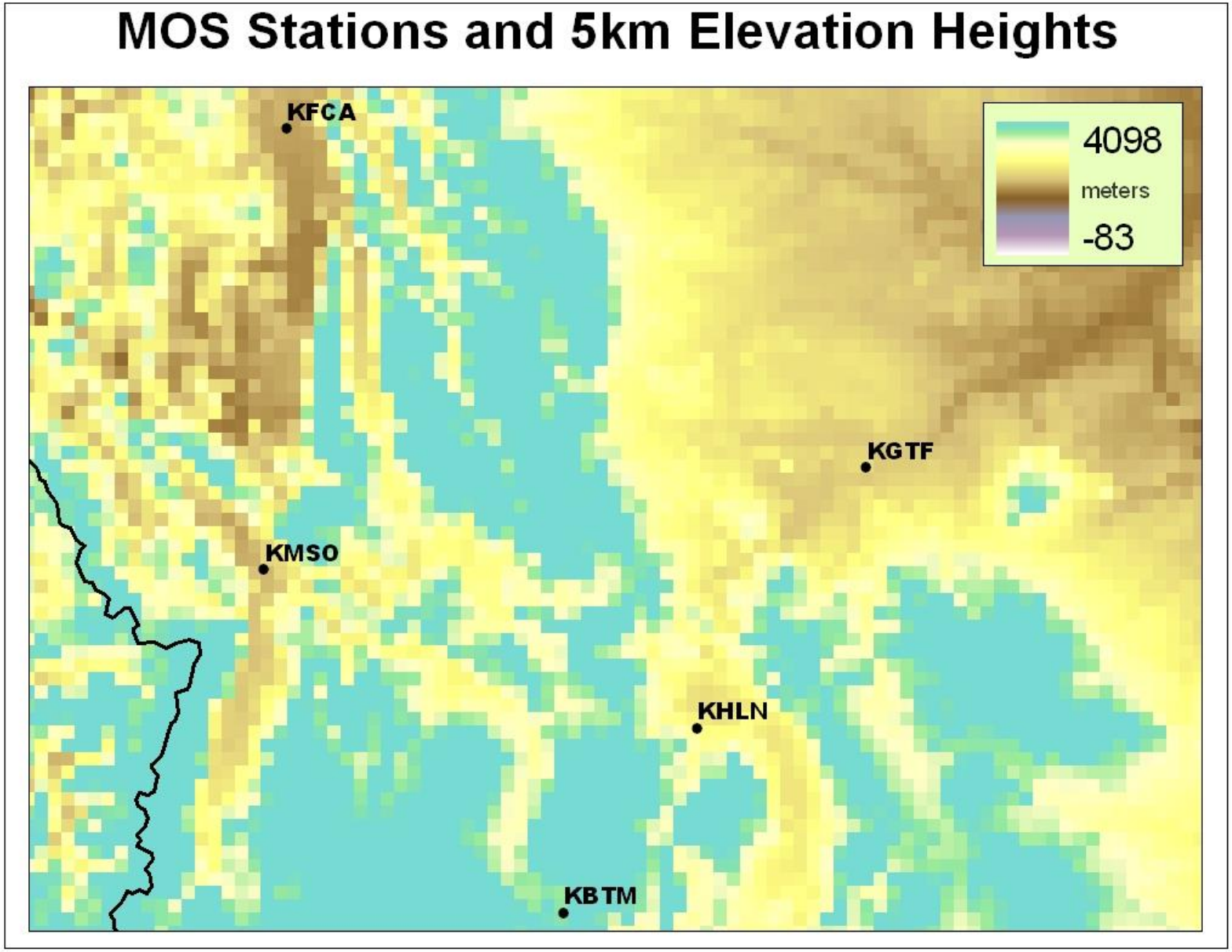
Max Temperature – Cool Season (0000 UTC Cycle)



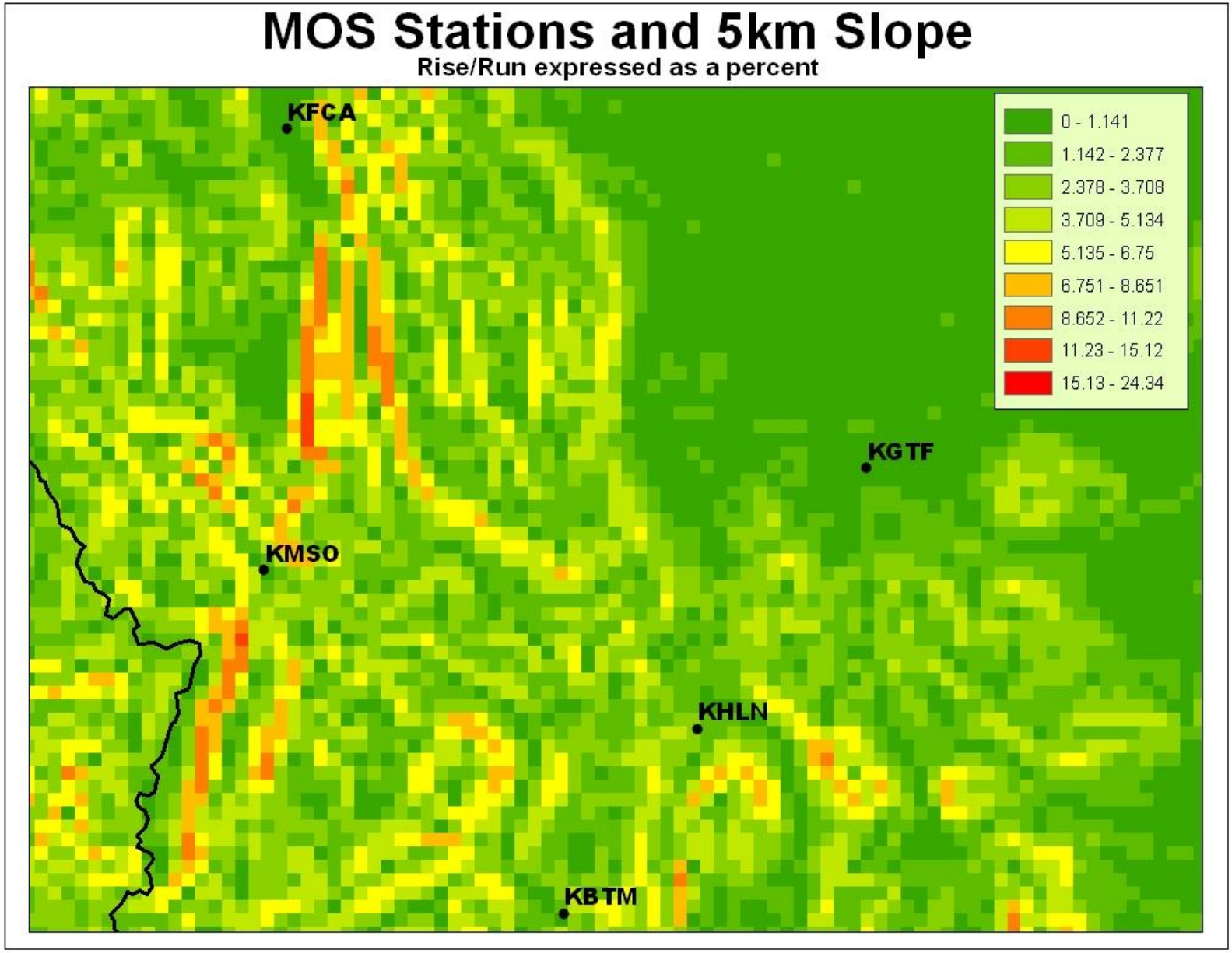
MDL Approach to Downscaling

- **High-resolution geoclimatic variables**
- **Diverse observational networks**
- **Appropriate MOS equation development (single station, regional, or generalized operator)**
- **Analysis on high-resolution grid**

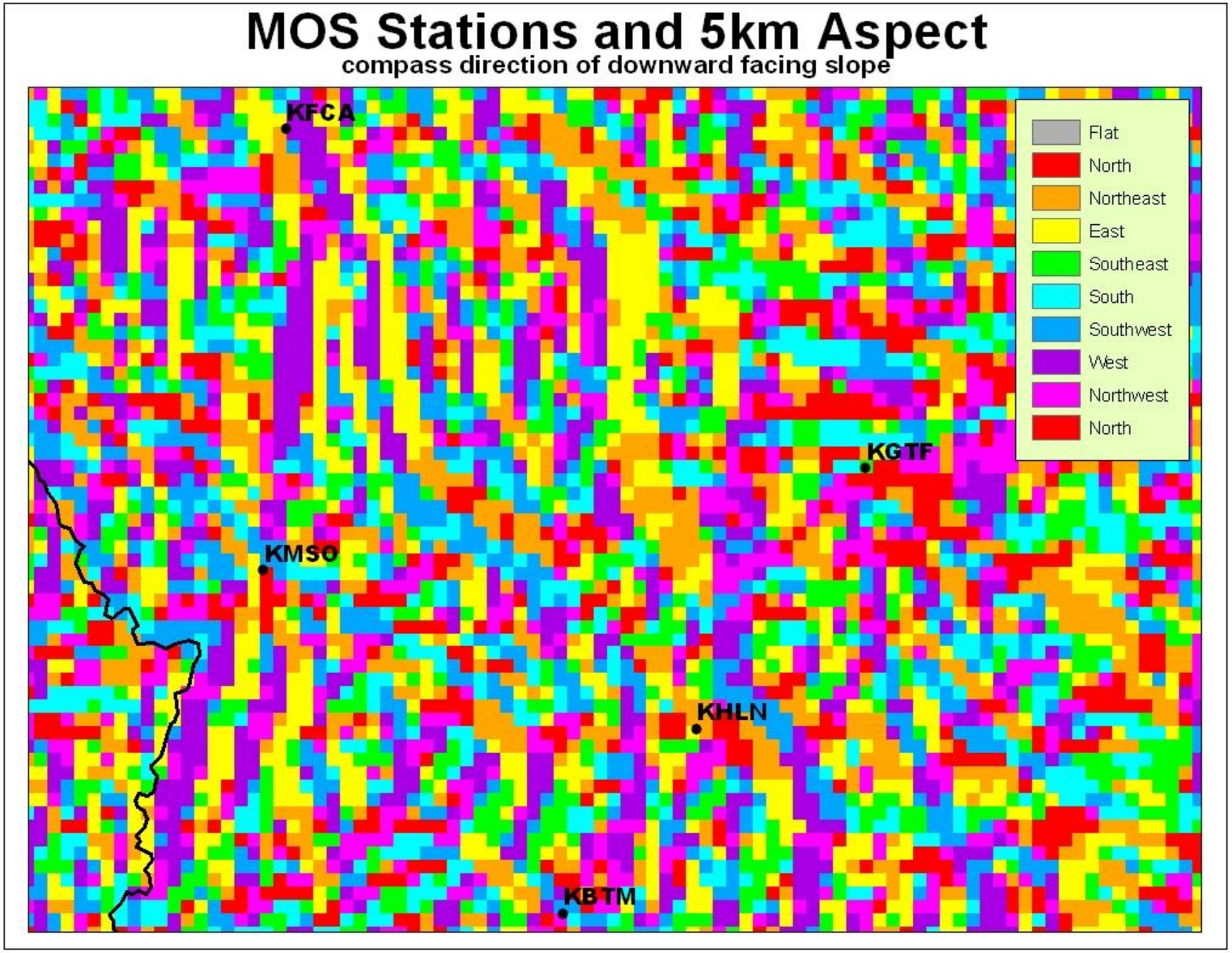
High-Resolution Terrain



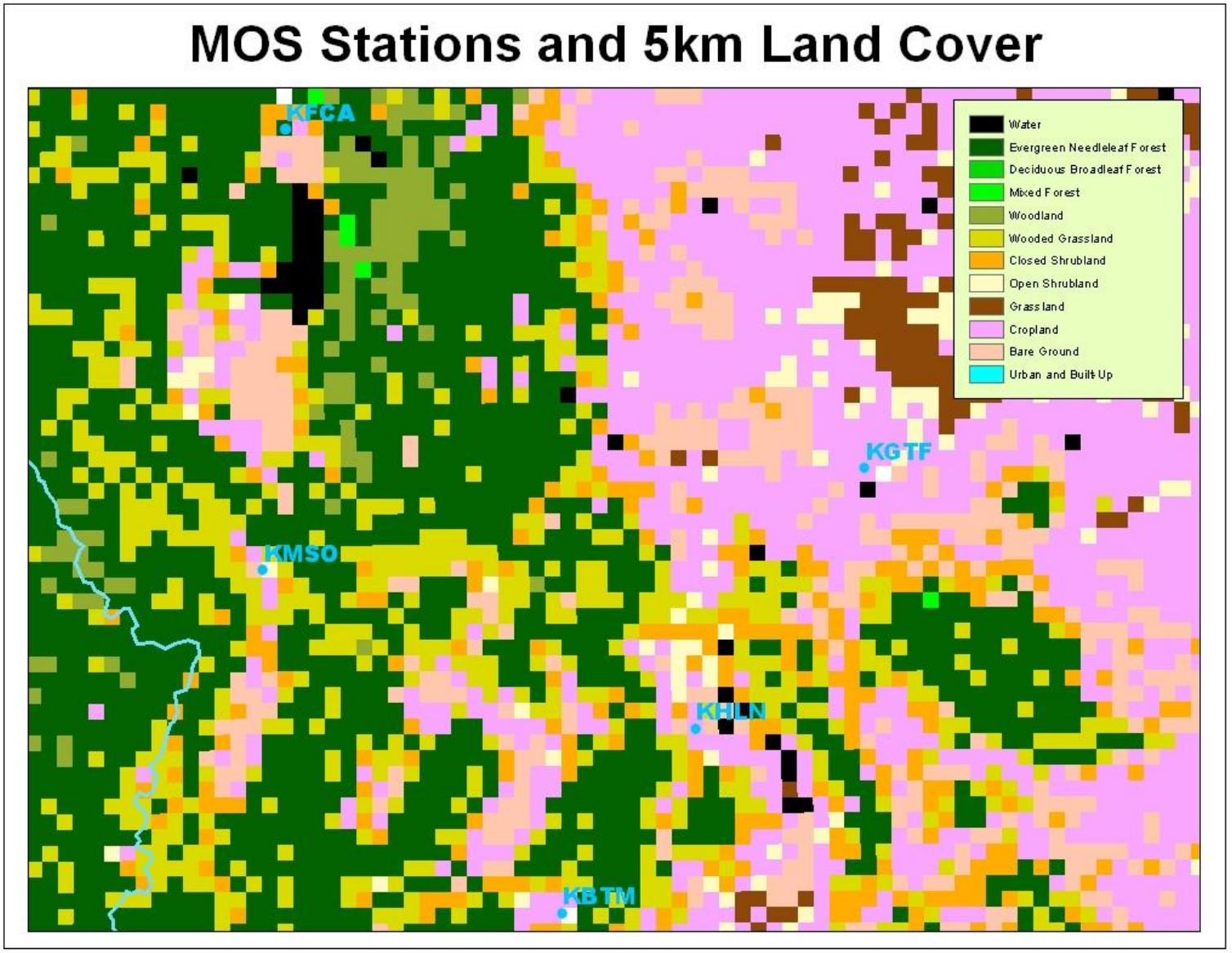
High-Resolution Geophysical Data



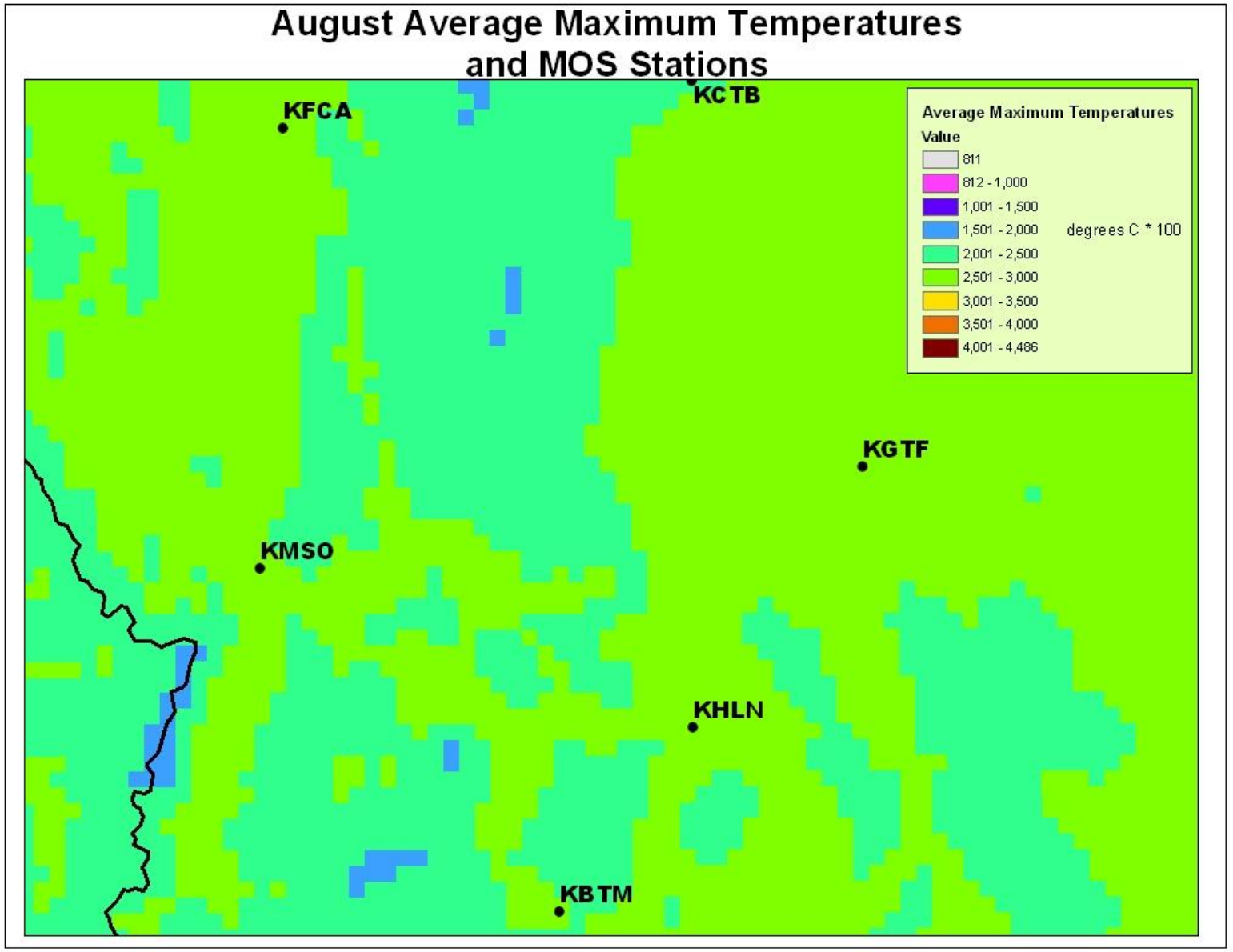
High-Resolution Geophysical Data



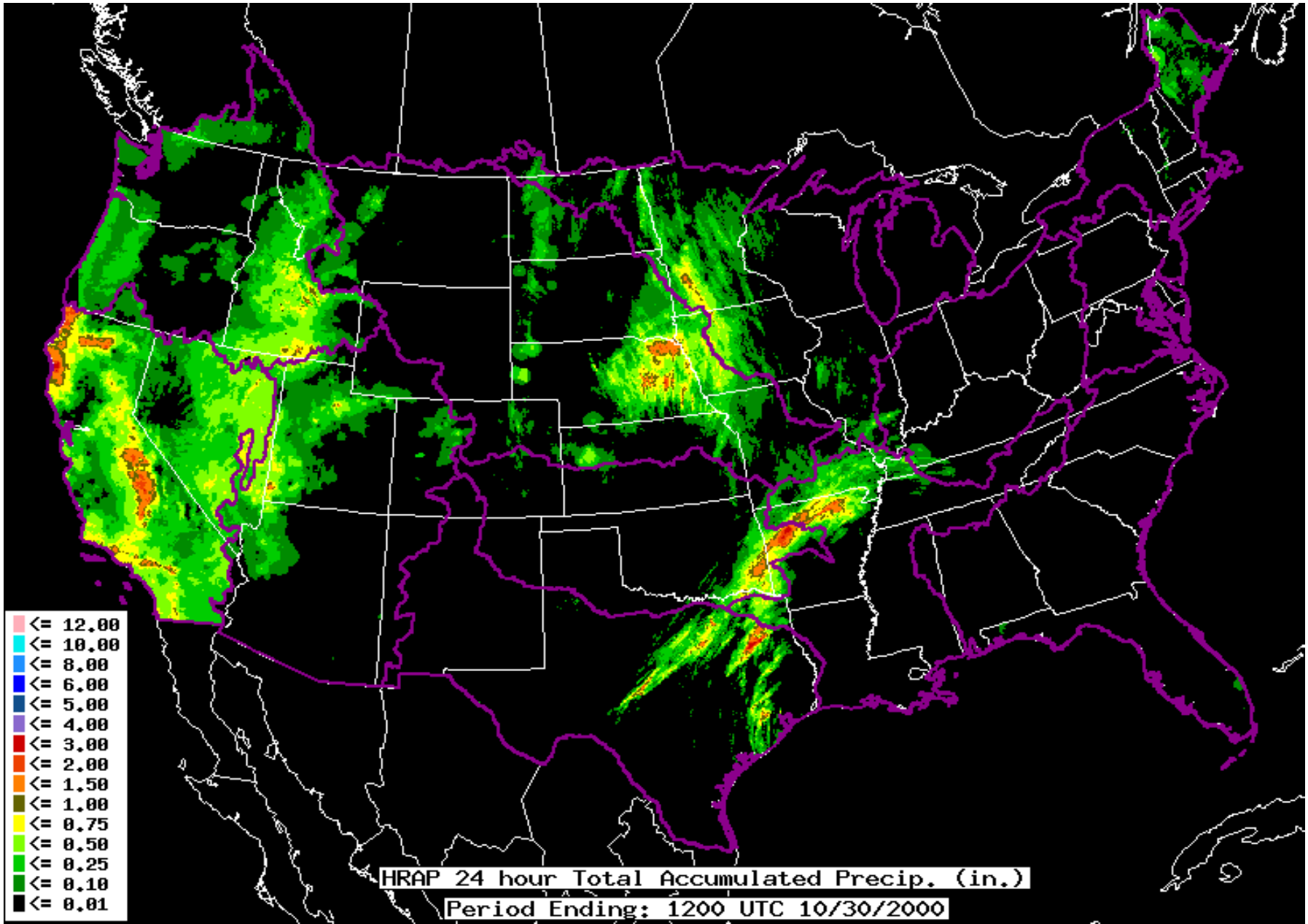
High-Resolution Geophysical Data



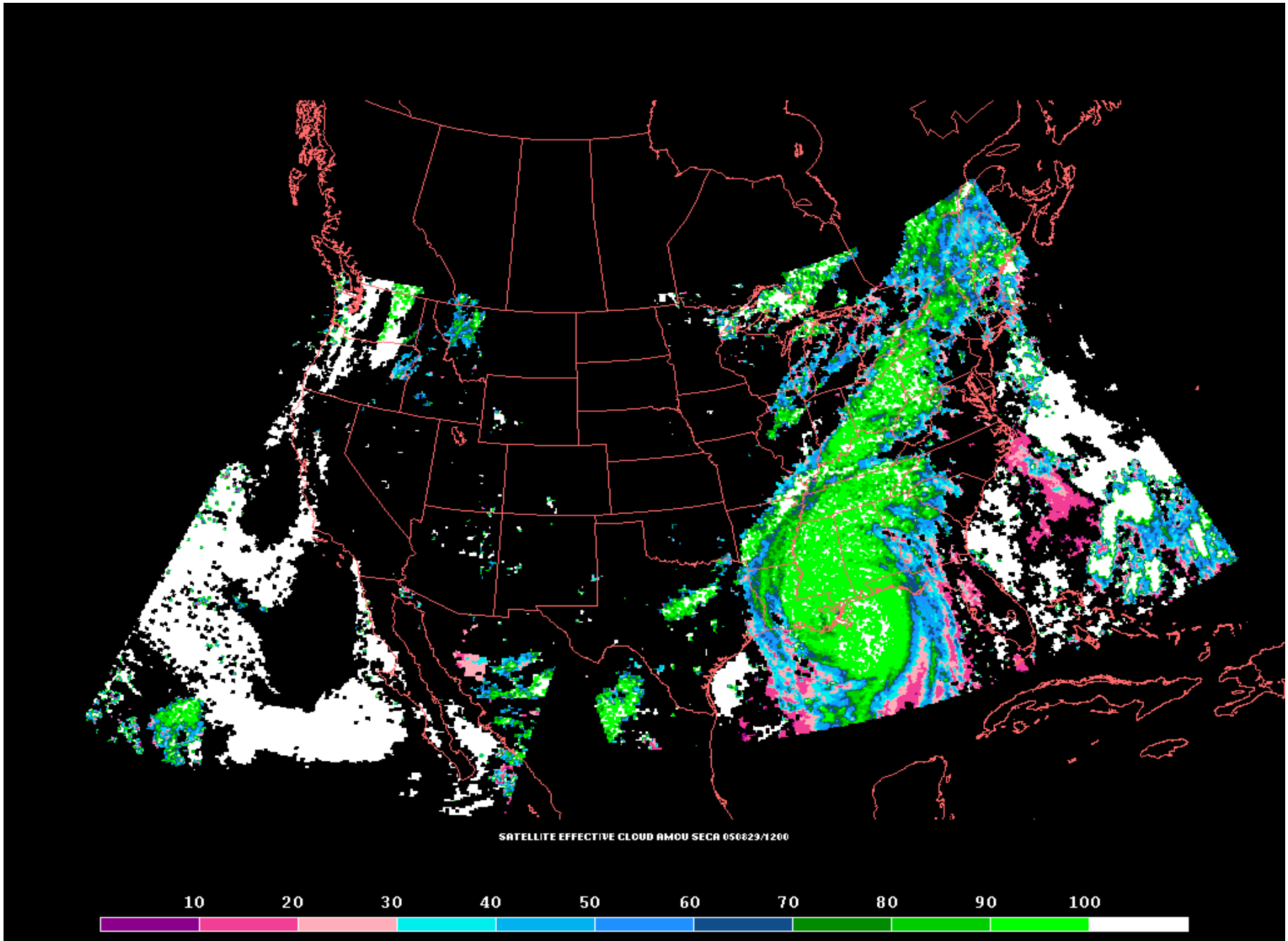
High-Resolution Geoclimatic Data



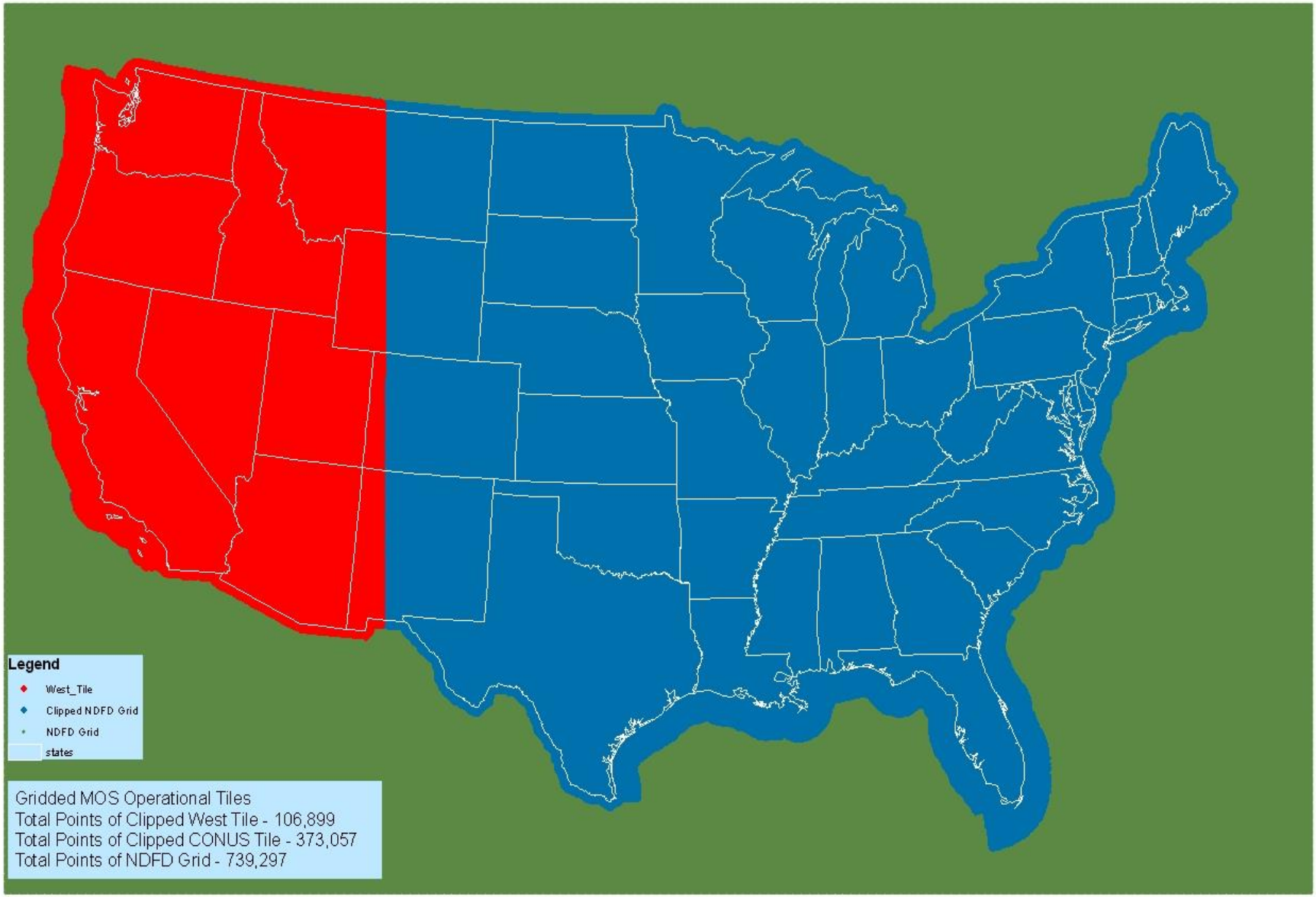
Remotely-sensed Precipitation Data



Satellite-based Effective Cloud Amount



CONUS – Western Tile Prototype



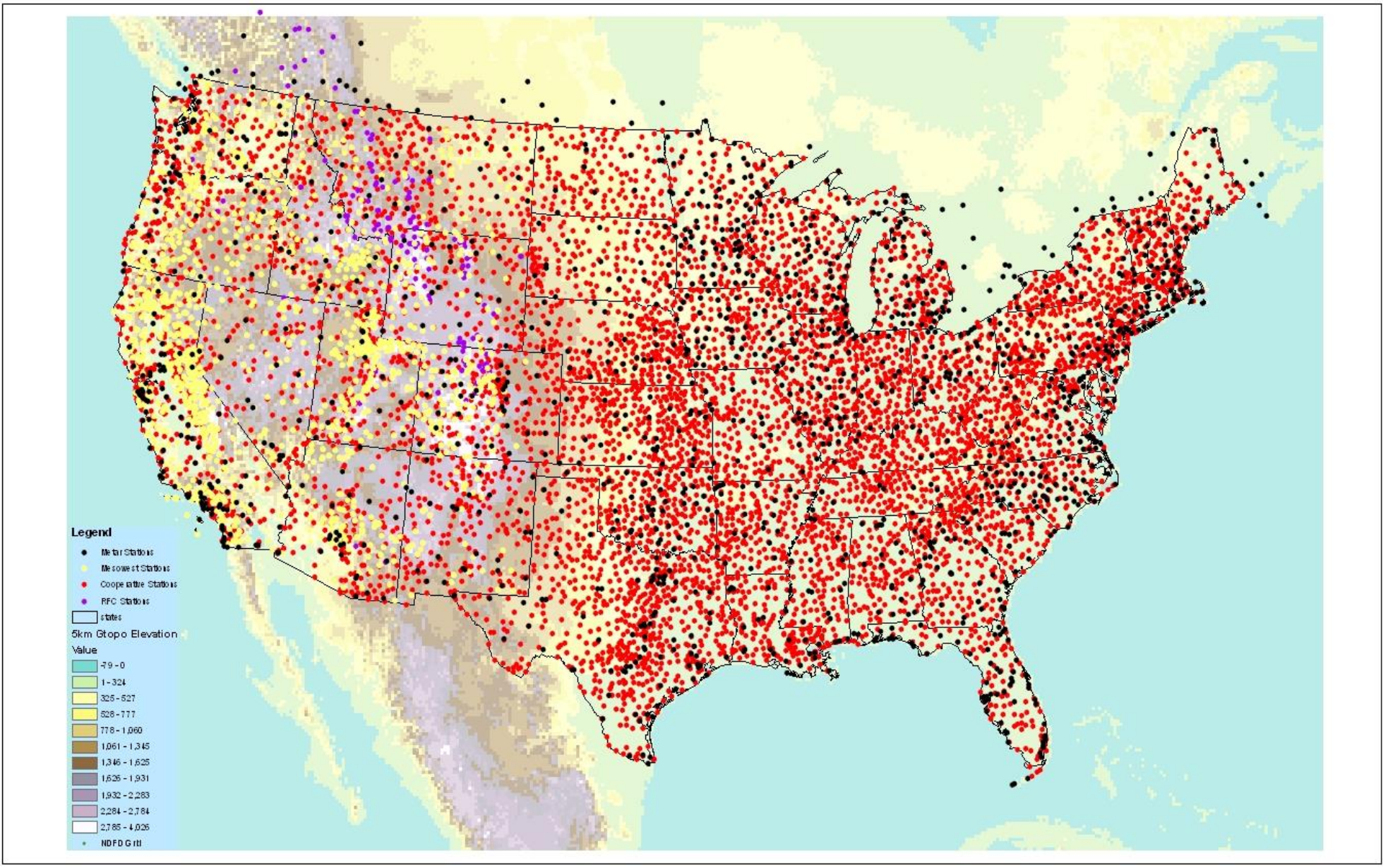
Prototype Weather Elements

- **00Z/12Z cycles**
  - **Temperature, every 3 h to 192-h projection**
  - **Dewpoint, every 3 h to 192-h projection**
  - **Max temperature, day 1 through day 8**
  - **Min temperature, day 1 through day 8**

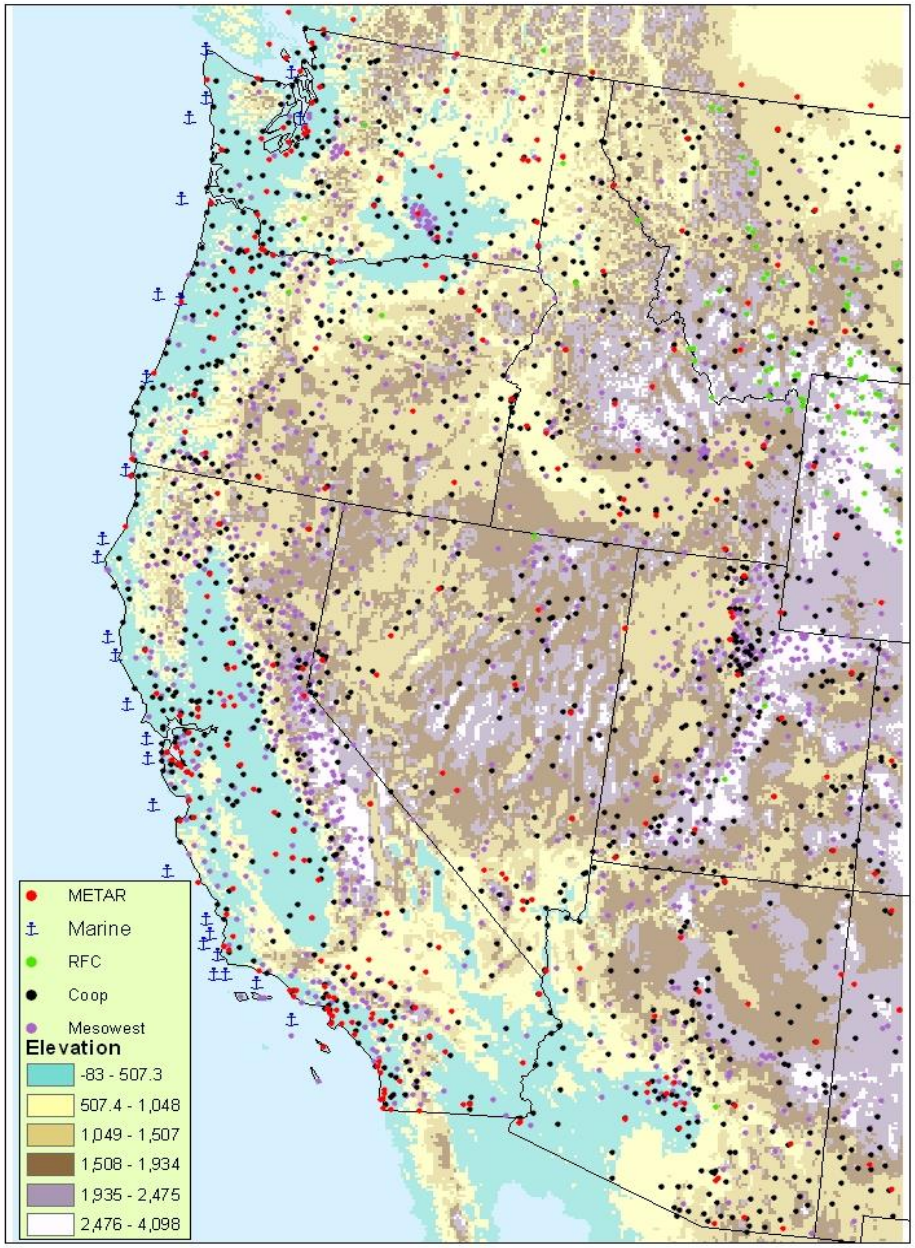
Diverse Observational Systems

- **METAR**
- **Buoys/C-MAN locations**
- **Mesowest sites (RAWS/SNOTEL primarily)**
- **NOAA cooperative observer network**
- **RFC-supplied sites**

CONUS MOS Sites



Western CONUS



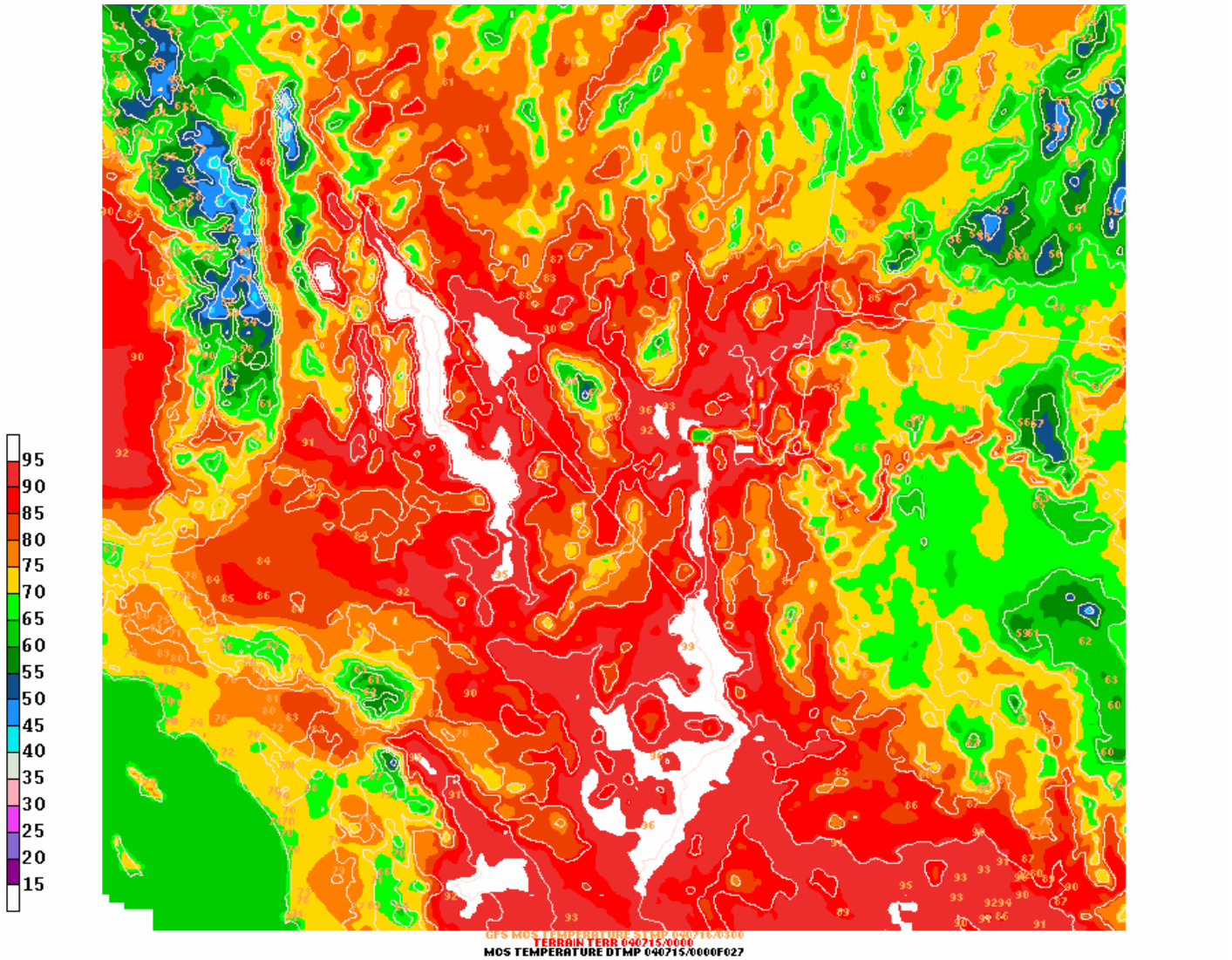
BCDG Analysis

- Method of successive corrections
- Land/water gridpoints treated separately
- Elevation (“lapse rate”) adjustment

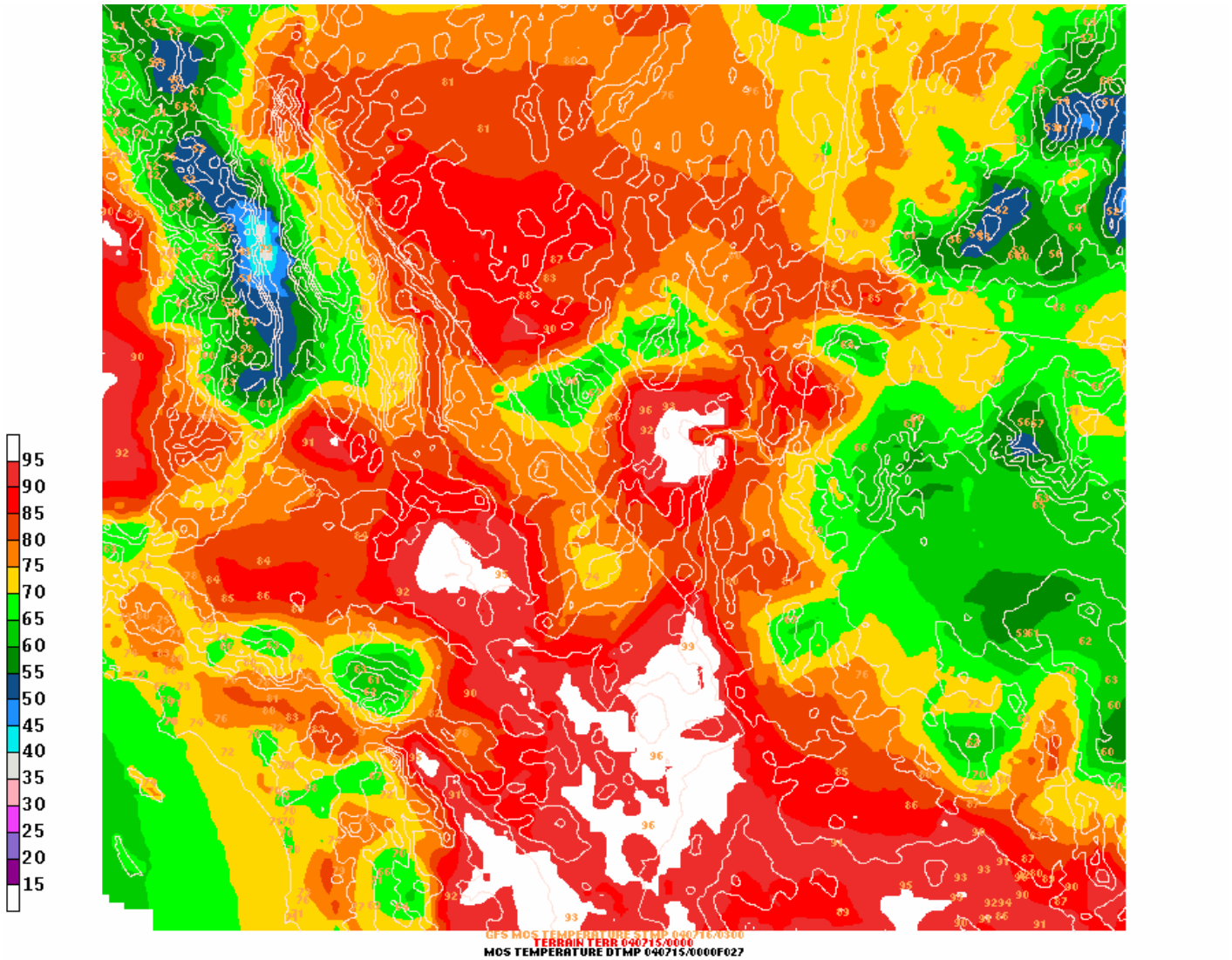
Goodness of Fit by Using Terrain

VARIABLE	NO. STA.	MAE (°F) (ALL)	MAE (°F) (WITHHELD)
TMRW'S MAX (terr.)	2621	1.11	3.00
TMRW'S MAX (w.o.)	2621	1.38	4.08
27-H TMP (terr.)	1406	0.98	2.92
27-H TMP (w.o.)	1406	1.34	4.29

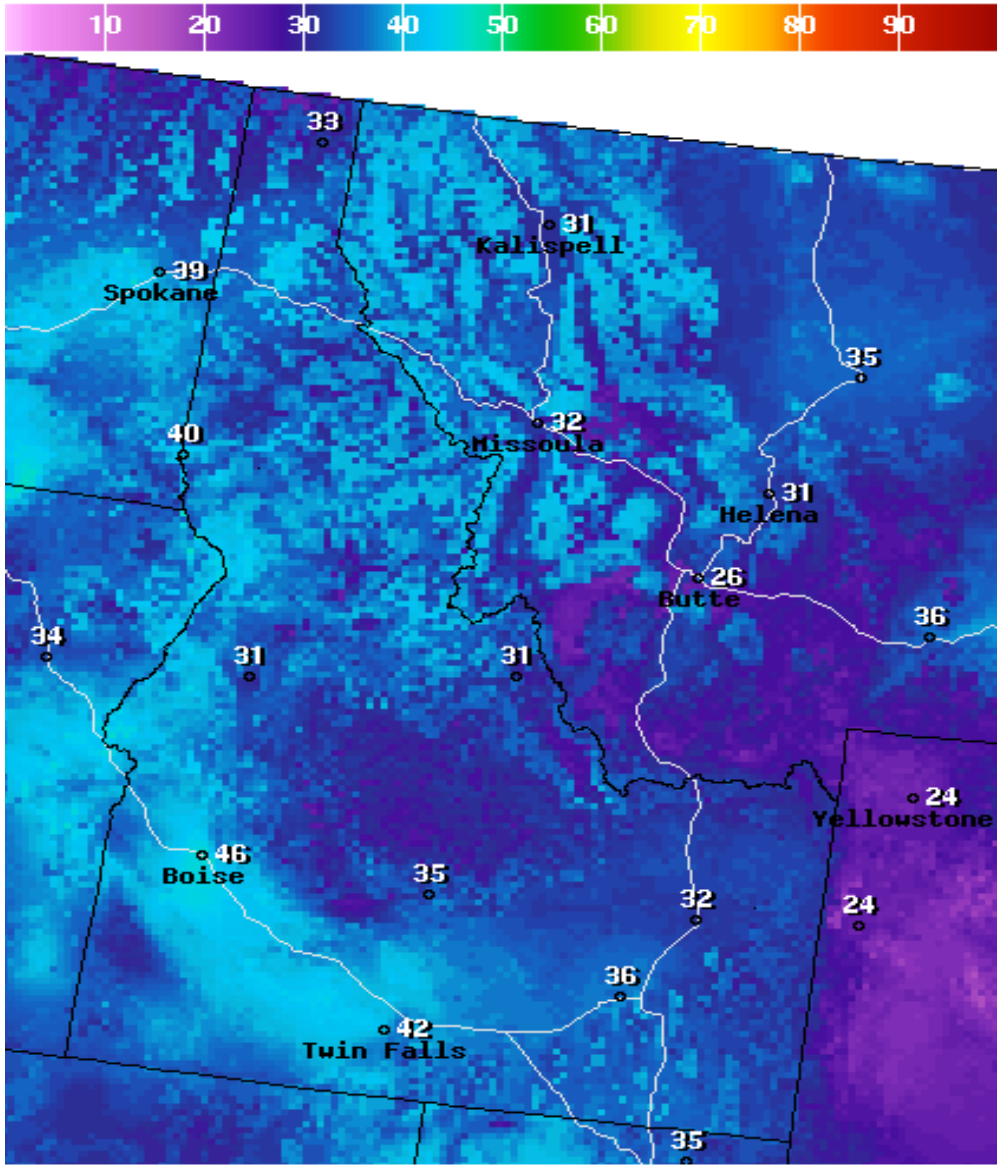
MOS Temperature Analysis (w. terrain)



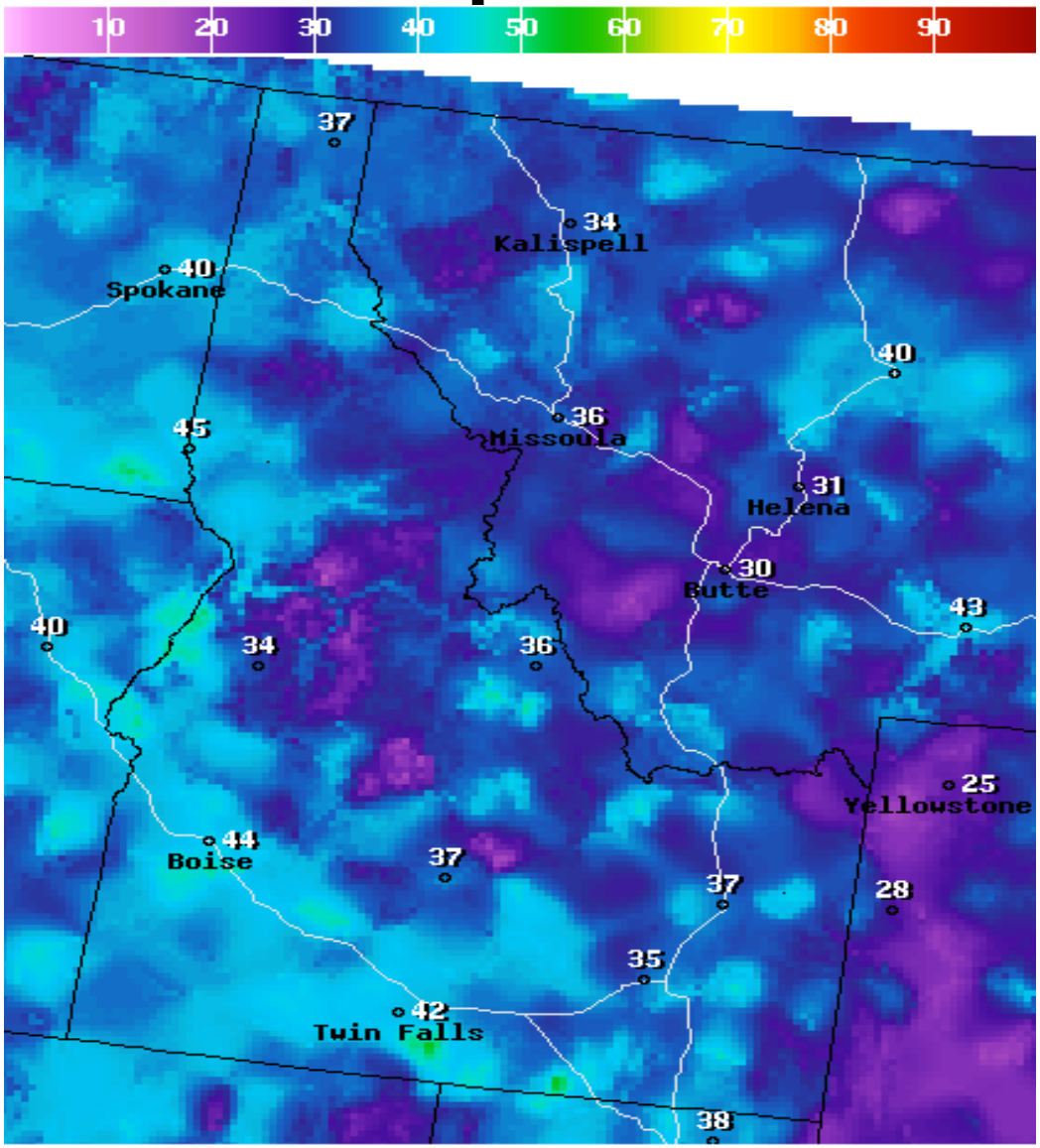
MOS Temperature Analysis (no terrain)



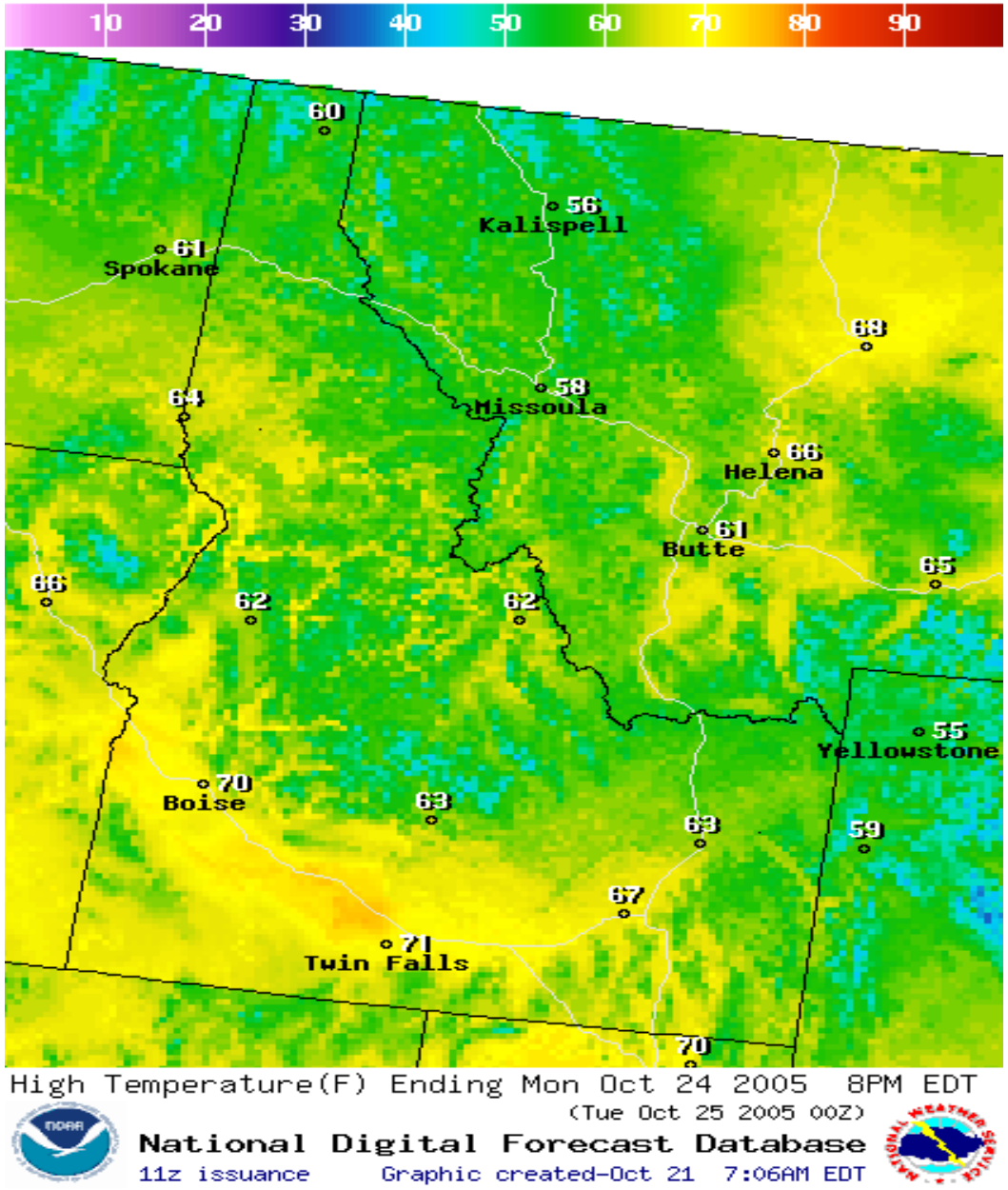
NDFD Min Temperature Forecast



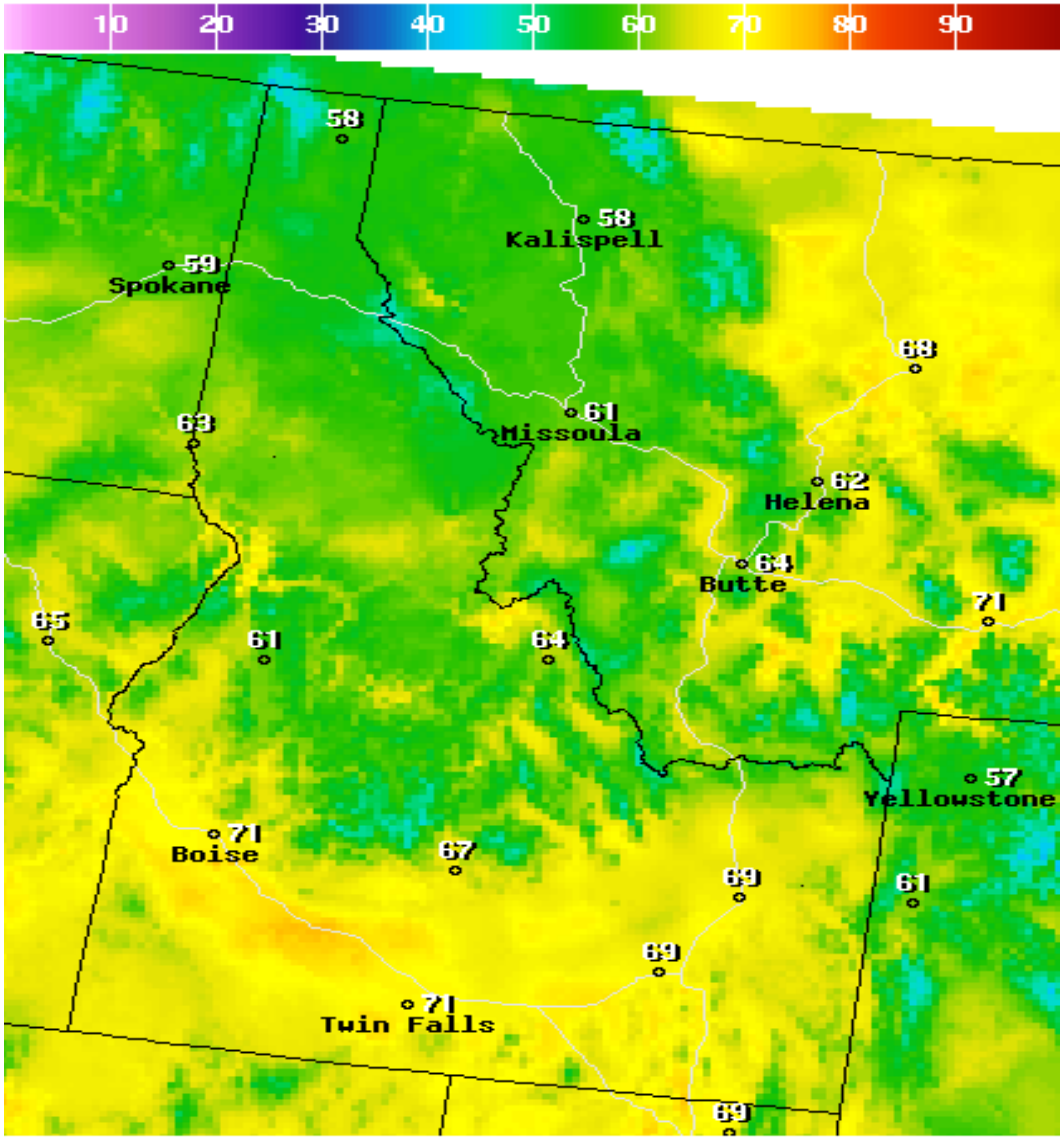
MOS Min Temperature Forecast



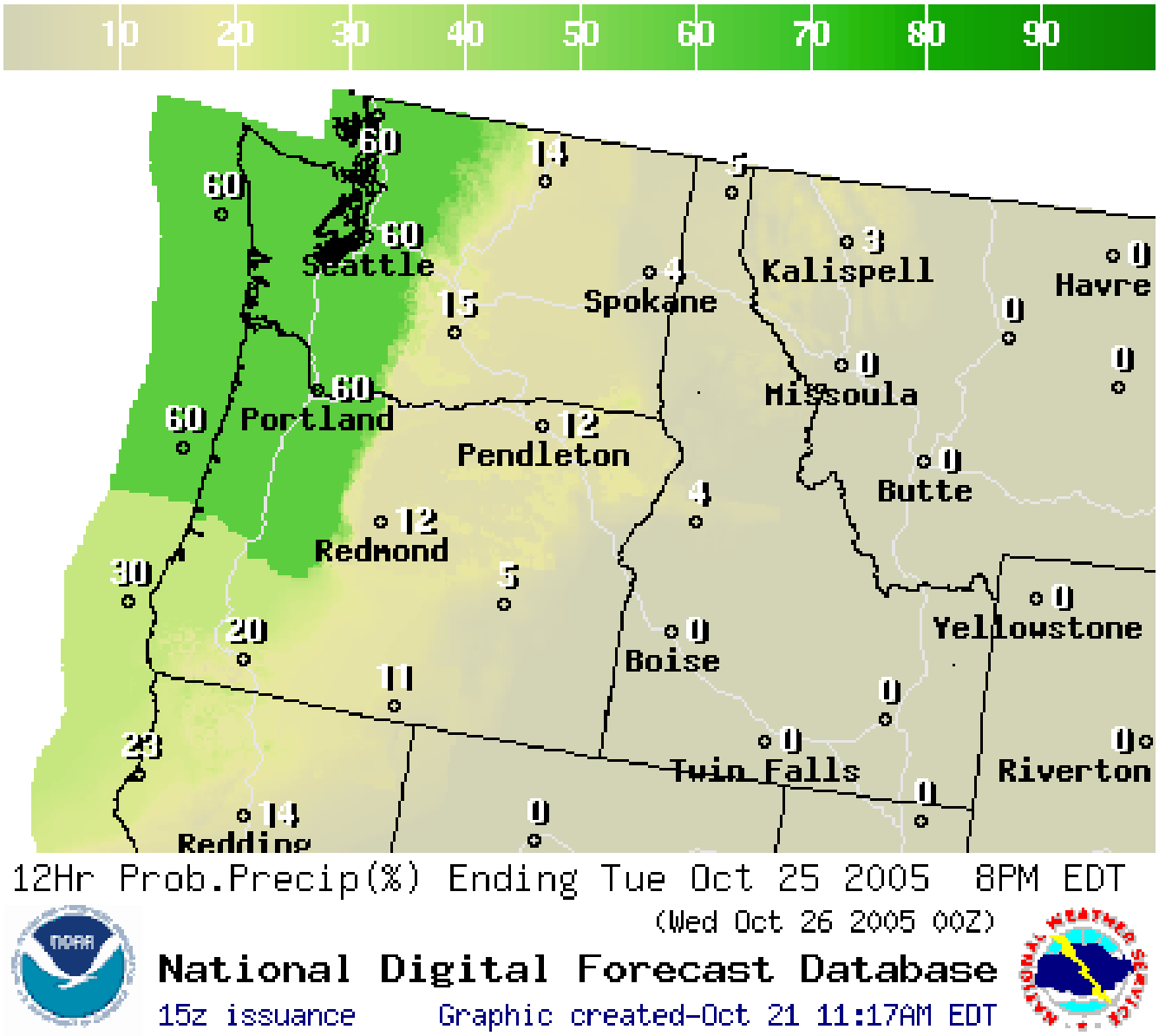
NDFD Max Temperature Forecast



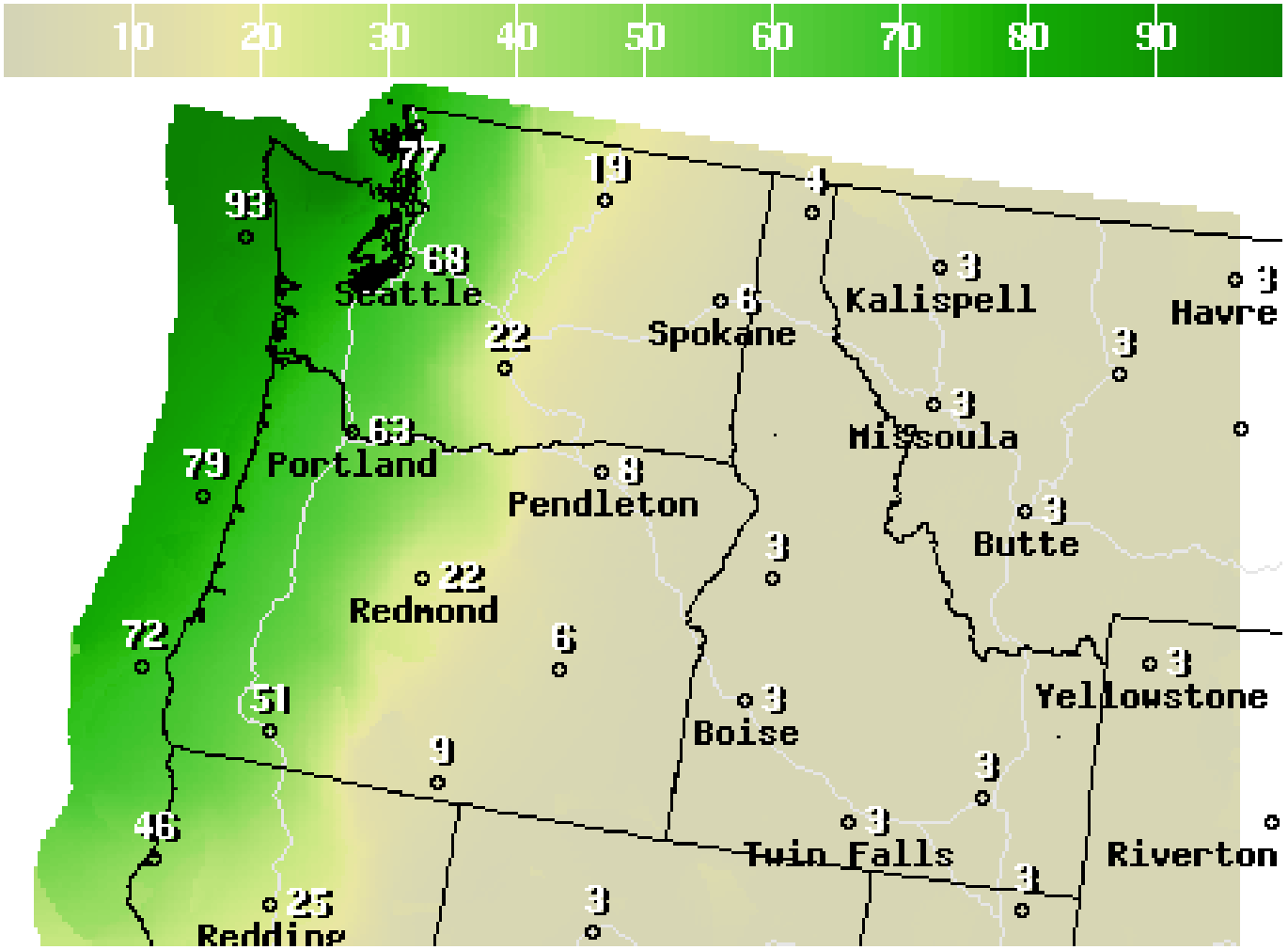
MOS Max Temperature Forecast



NDFD PoP Forecast



MOS PoP Forecast



Gridded MOS Products

- General information and documentation
  - http://www.nws.noaa.gov/mdl/synop/gmos.html
- Sample graphics (from gempak)
  - http://www.mdl.nws.noaa.gov/~smb/gmos
- NDGD Web Page (graphics ala NDFD)
  - http://weather.gov/mdl/synop/gridded/sectors/index.php
- NWS ftp server (grib2)
  - http://tgftp.nws.noaa.gov/SL.us008001/ST.expr/DF.gr2/DC.ndgd/GT.mosgfs/AR.conus

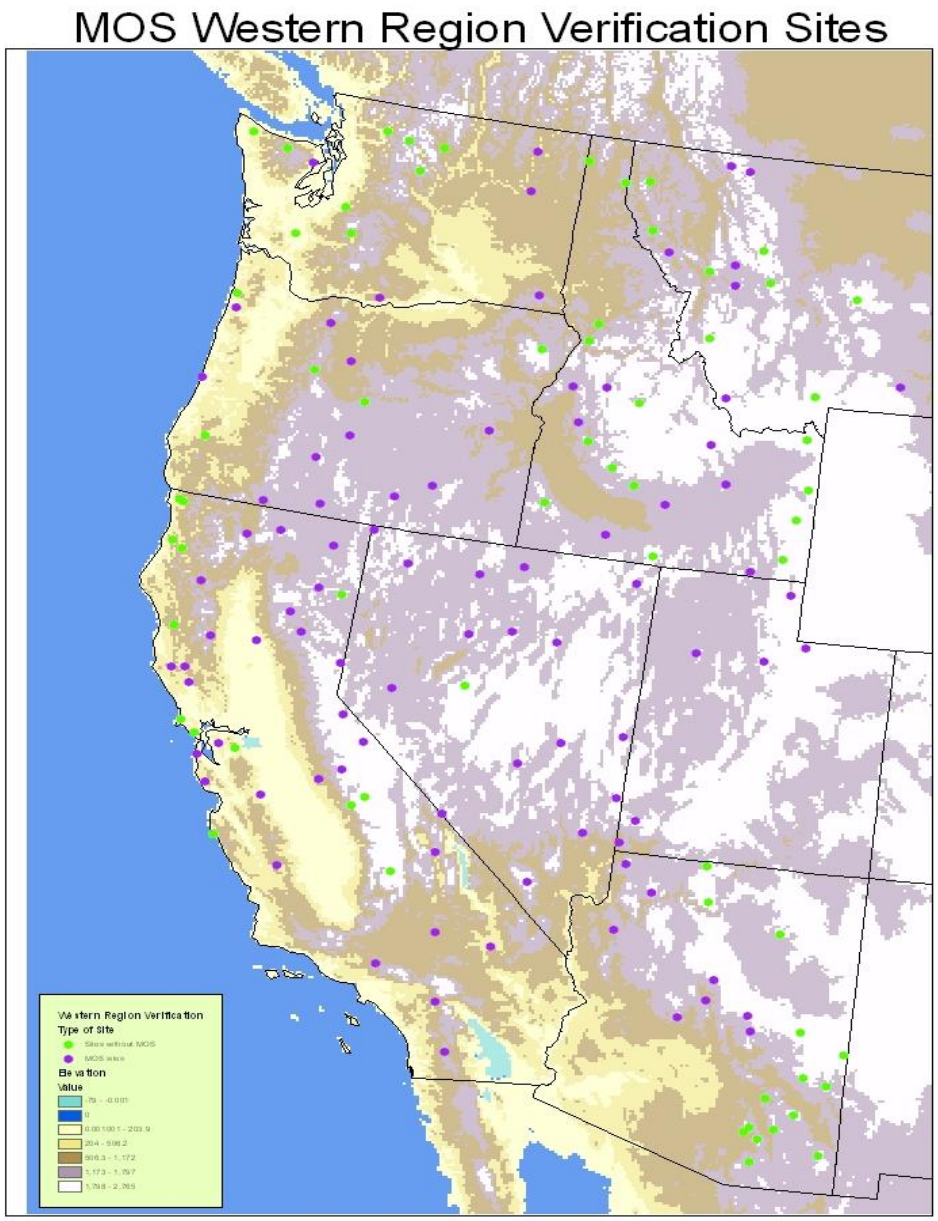
Future of Gridded MOS

- **Evaluation (objective & subjective)**
- **Expansion (area & elements)**
- **Improvement**
- **Use of remote-sensing observations**
- **Dissemination on SBN**

Objective Evaluation

- **Retrospective sample: December 2004 – September 2005**
- **Western CONUS only**
- **Comparison between NDFD, HPC, and MOS grids**
- **Max/min temperature and dew point only**
- **Selected sites – generally RAWS**

Western CONUS Verification Sites



Schedule

- **November 30, 2005 – wind dir. & speed, relative humidity, PoPs, tstm prob., and snowfall added to NDGD web site (as of 12/13/05, winds and snowfall have been delayed)**
- **January 31, 2006 – grib2 products sent on SBN (pending resolution of TOC moratorium)**
- **June 30, 2006 – CONUS grid completely populated**
- **September 30, 2006 – sky cover, precip. type, qpf, and wind gusts added to product suite**
- **September 30, 2007 – Alaska grids available**

Issues

- **Quality of observations**
  - **Site representativeness**
  - **Sampling**
  - **Skewed samples**
  - **Instrumentation bias**
  - **Small sample, inconsistent in time**
- **Inversions**
- **Winds**
- **Quality Assurance**