



Gridded MOS – A Prototype System

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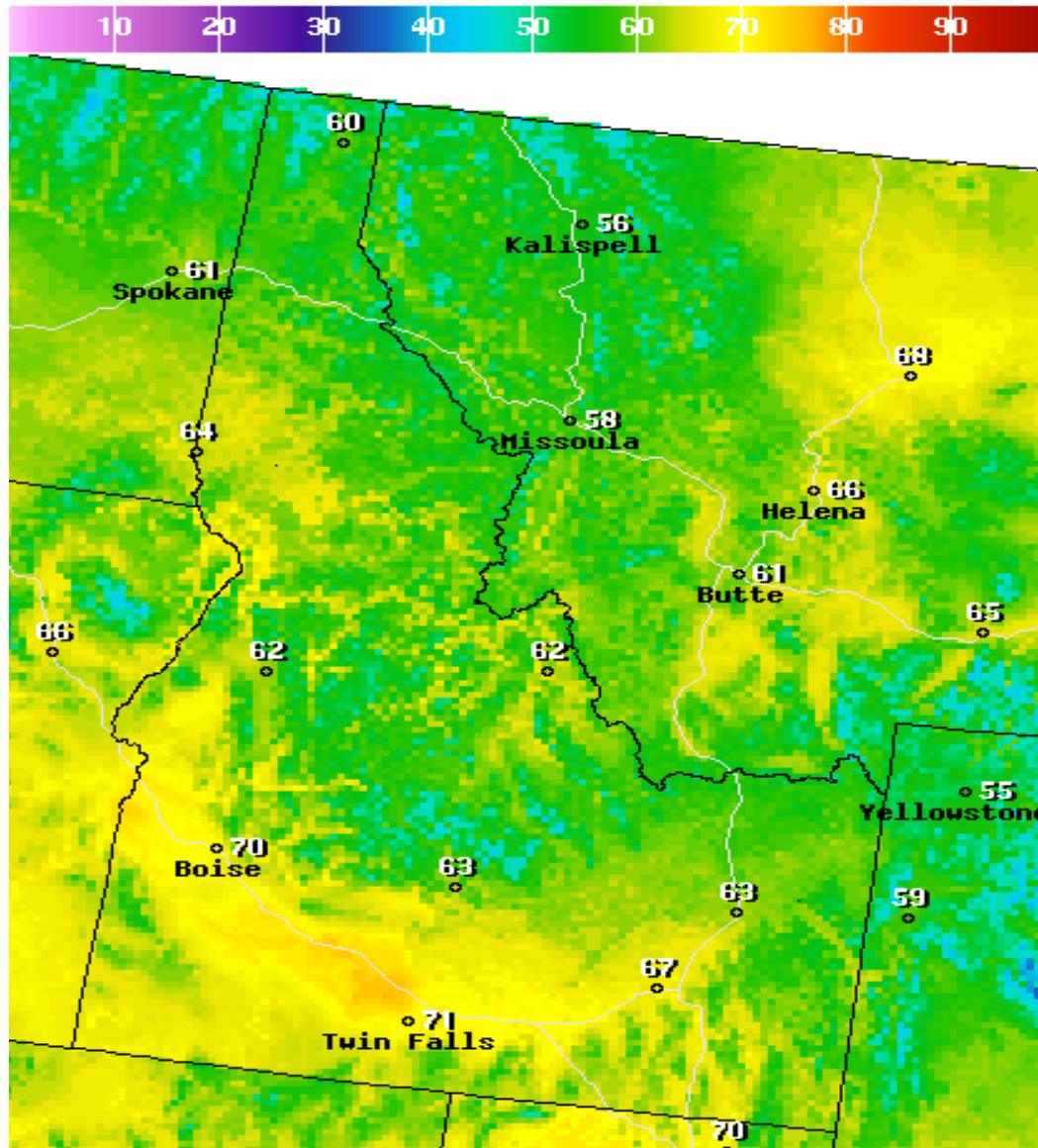
Revolution

DEFINITION:

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

(Webster's Dictionary, 1974)

NWS Revolution



High Temperature(F) Ending Mon Oct 24 2005 8PM EDT

(Tue Oct 25 2005 00Z)



National Digital Forecast Database

11z issuance

Graphic created-Oct 21 7:06AM EDT



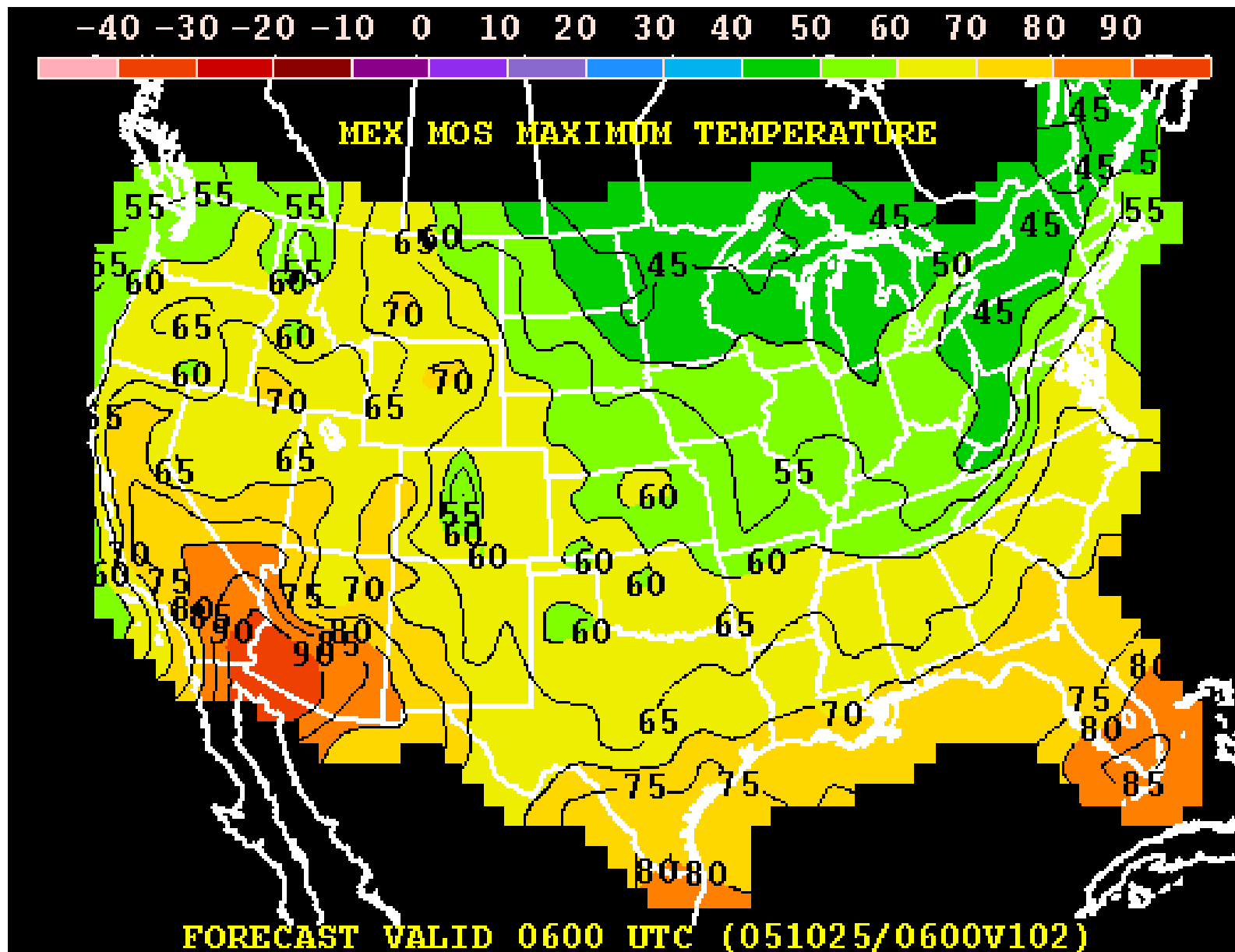
Traditional Short-Range MOS Guidance

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											

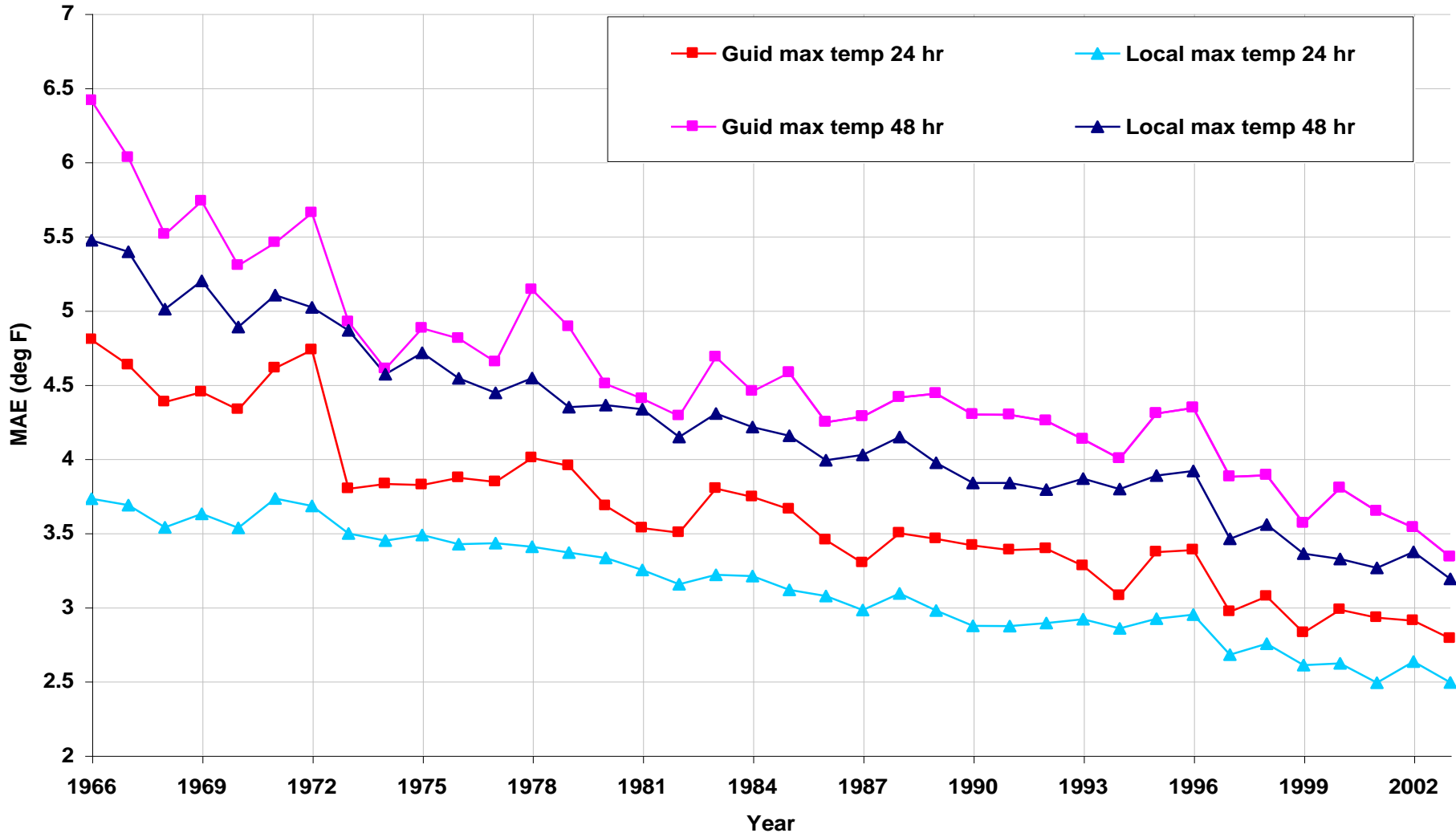
Traditional MOS Graphics



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)

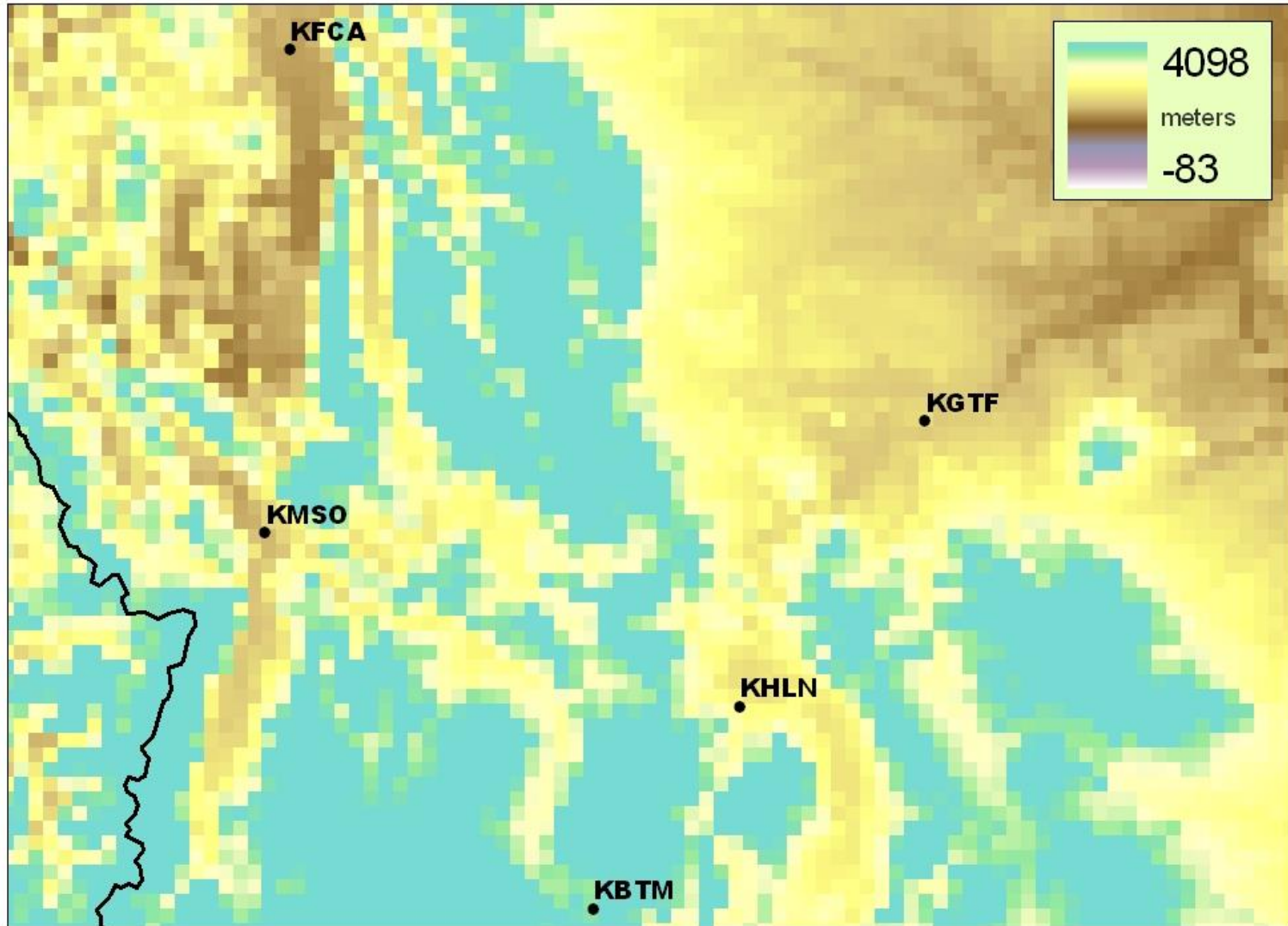


MDL Approach to Downscaling

- **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

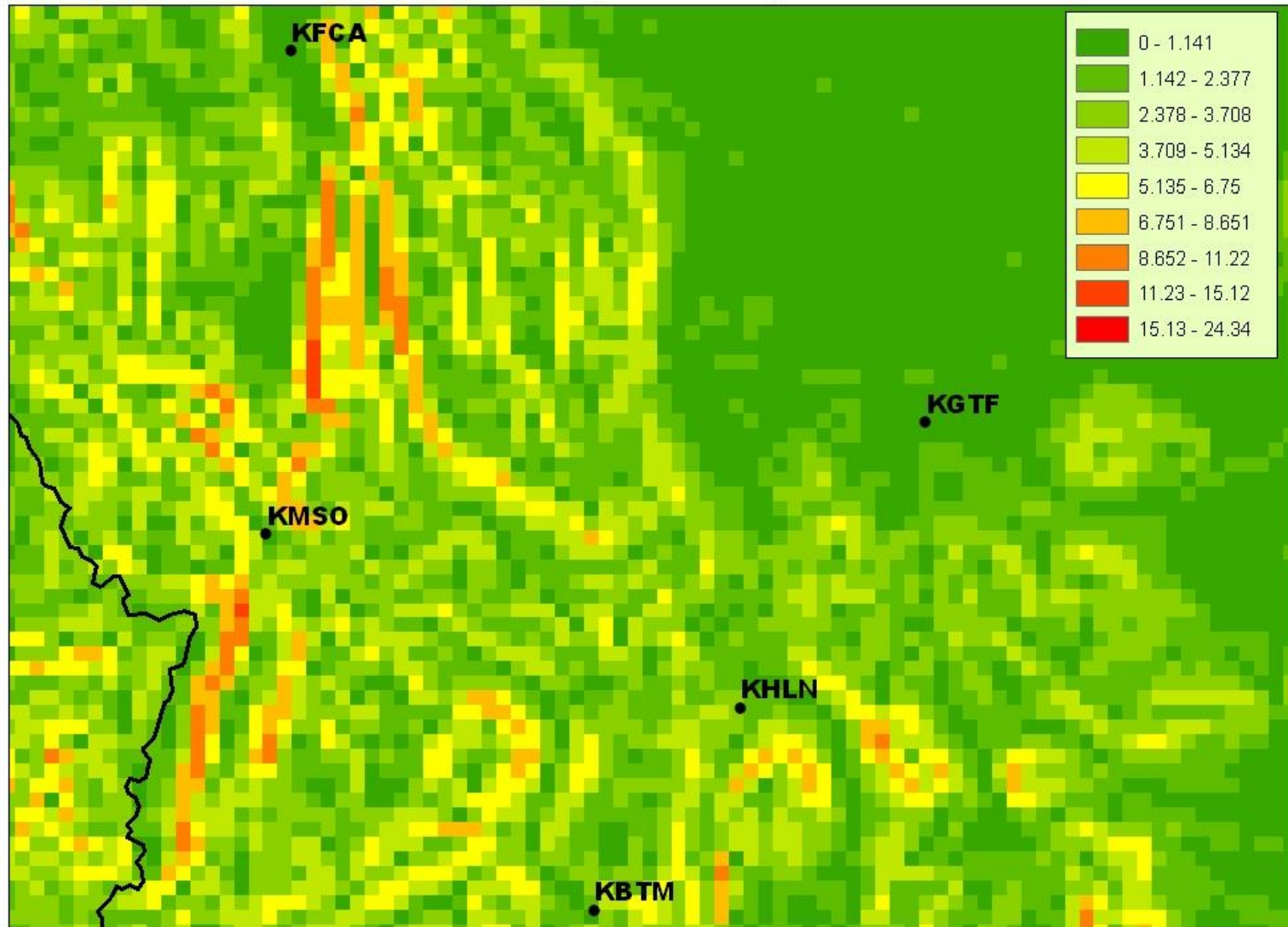
MOS Stations and 5km Elevation Heights



High-Resolution Geophysical Data

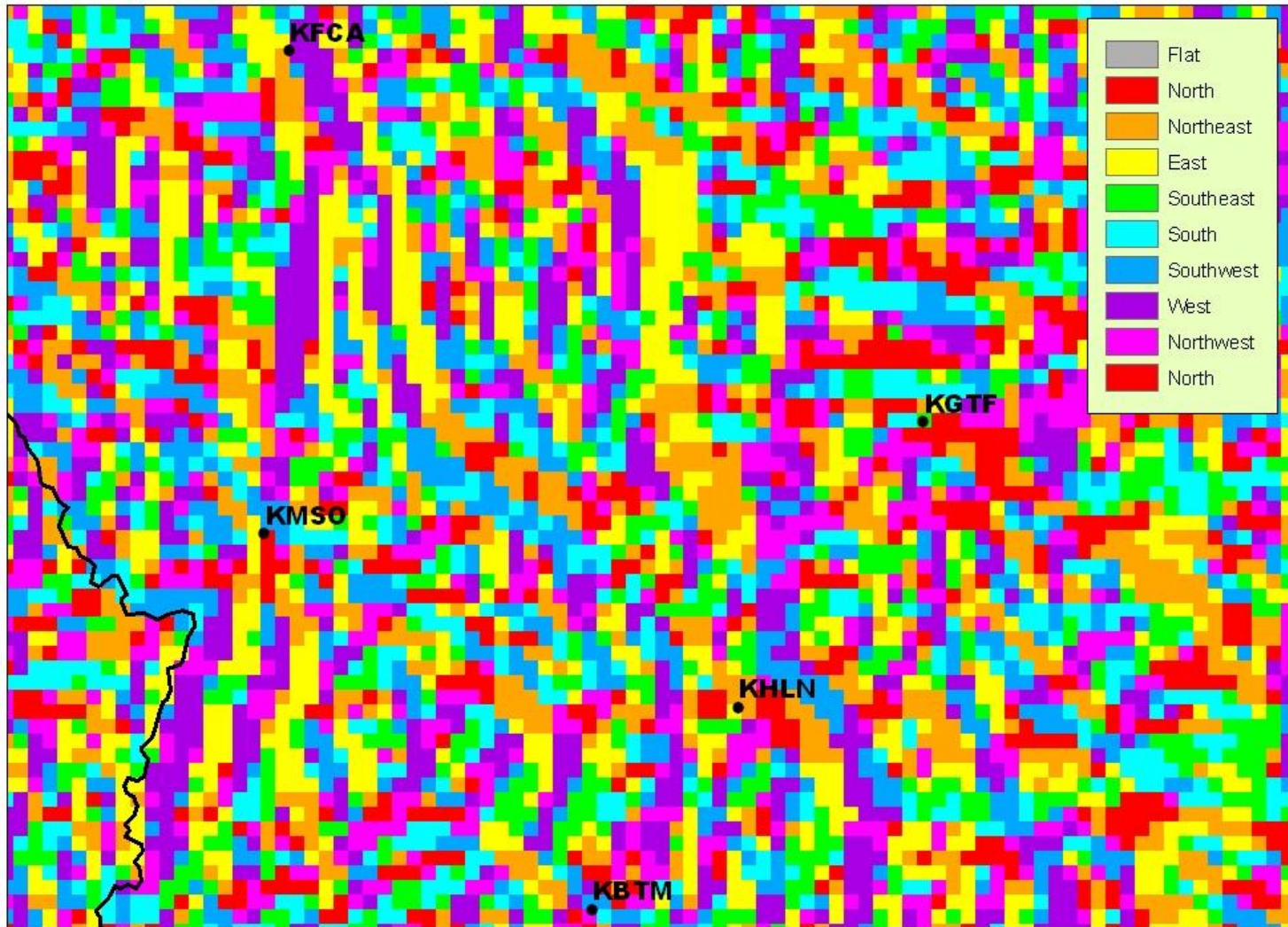
MOS Stations and 5km Slope

Rise/Run expressed as a percent



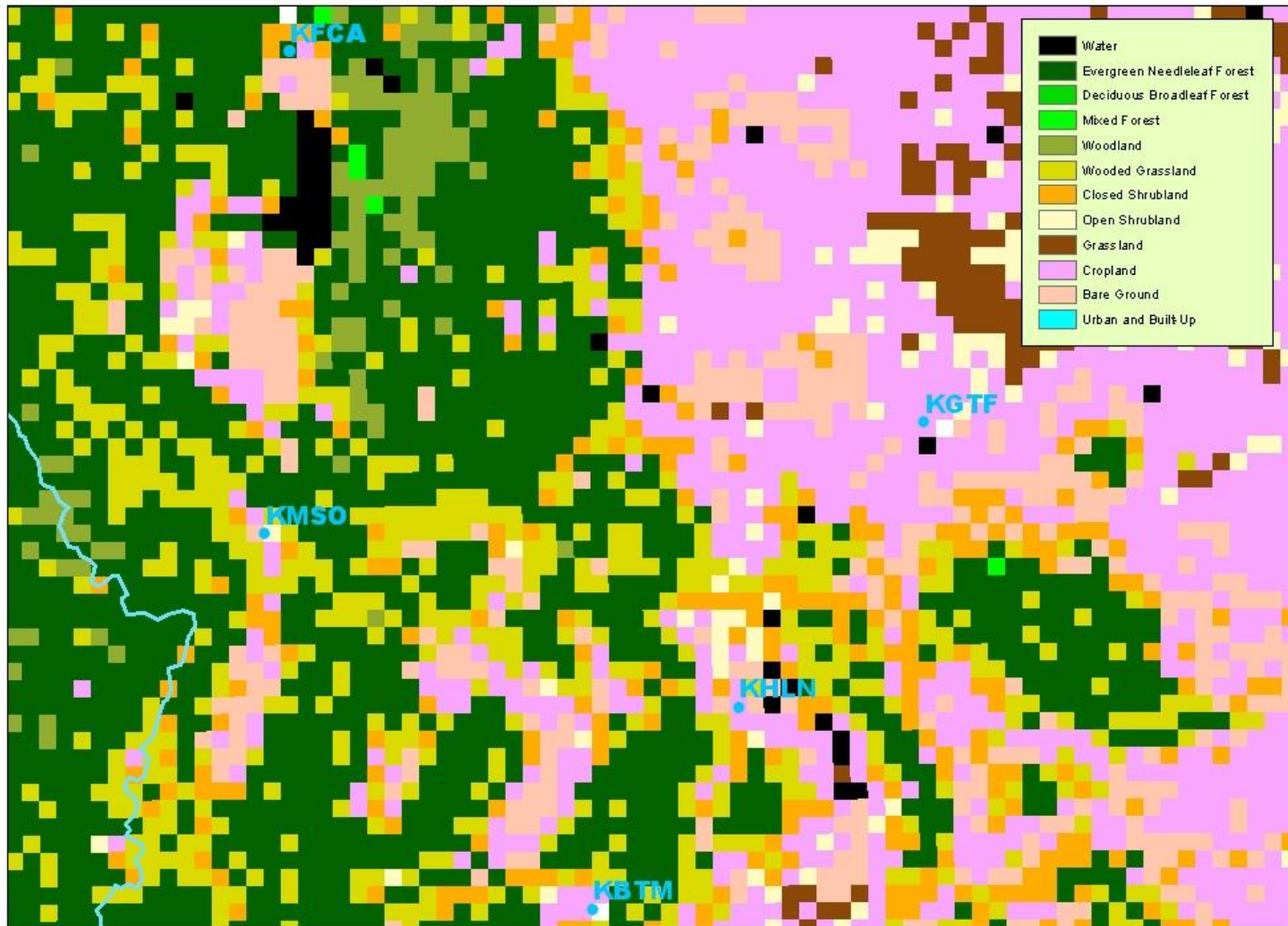
High-Resolution Geophysical Data

MOS Stations and 5km Aspect
compass direction of downward facing slope

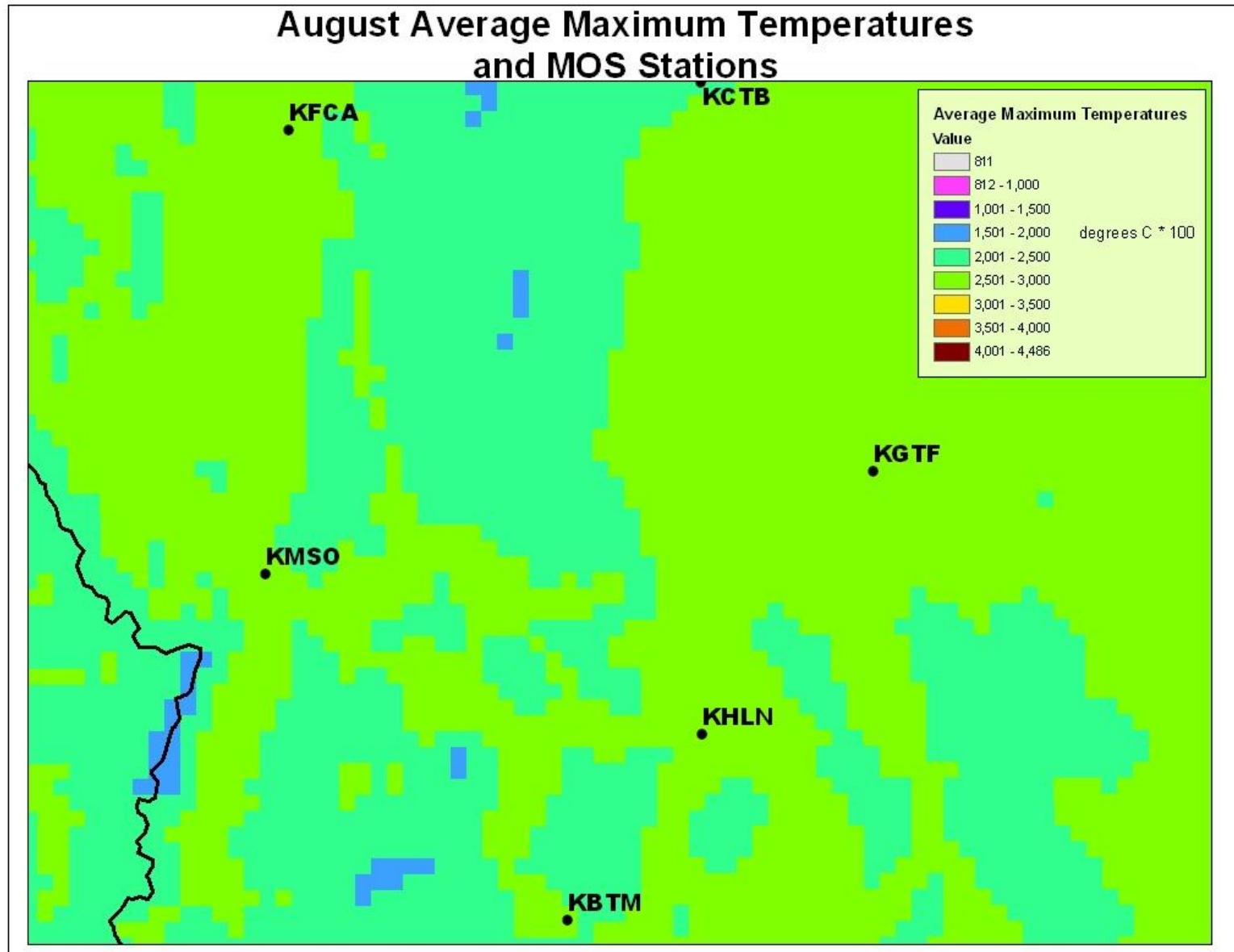


High-Resolution Geophysical Data

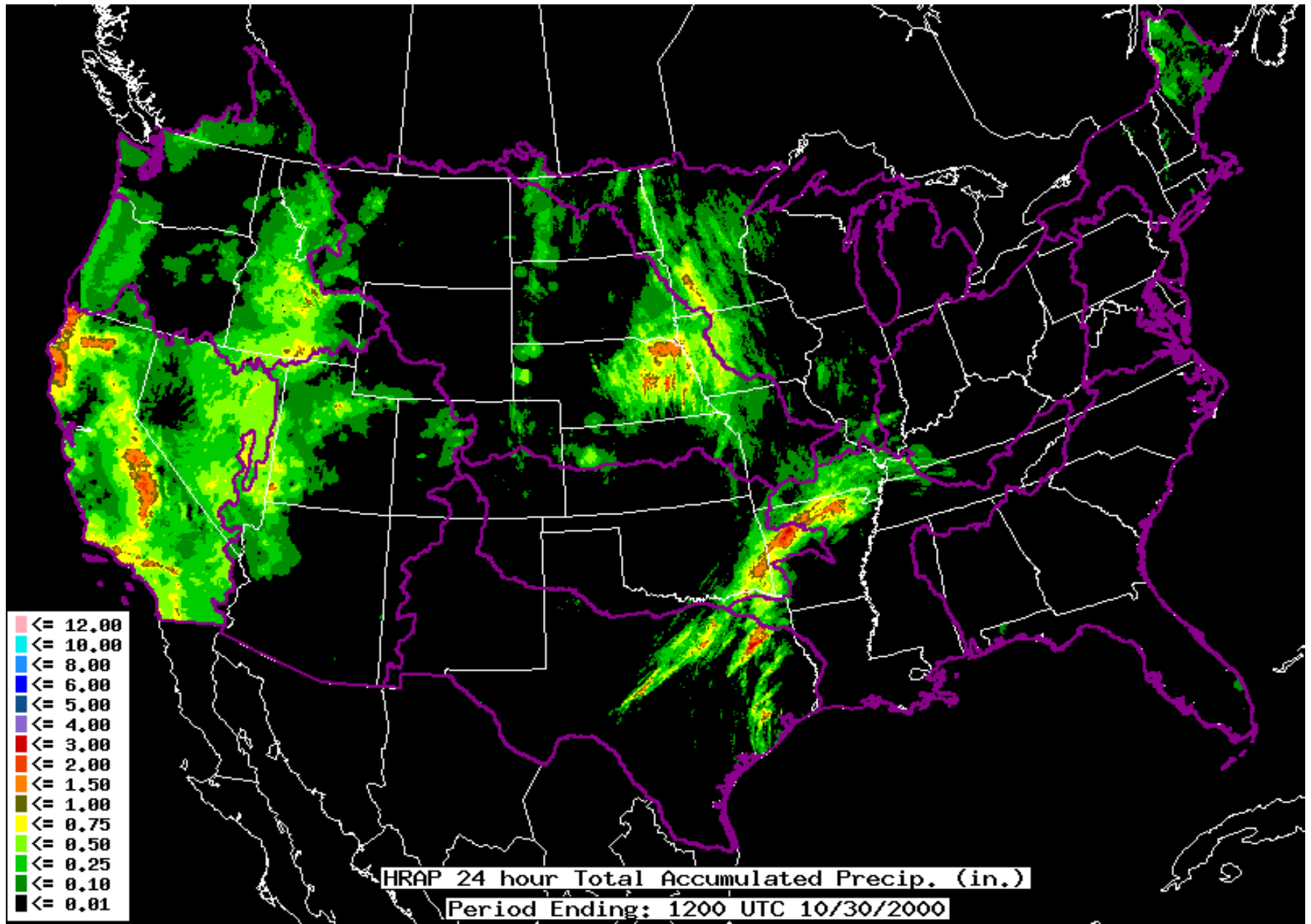
MOS Stations and 5km Land Cover



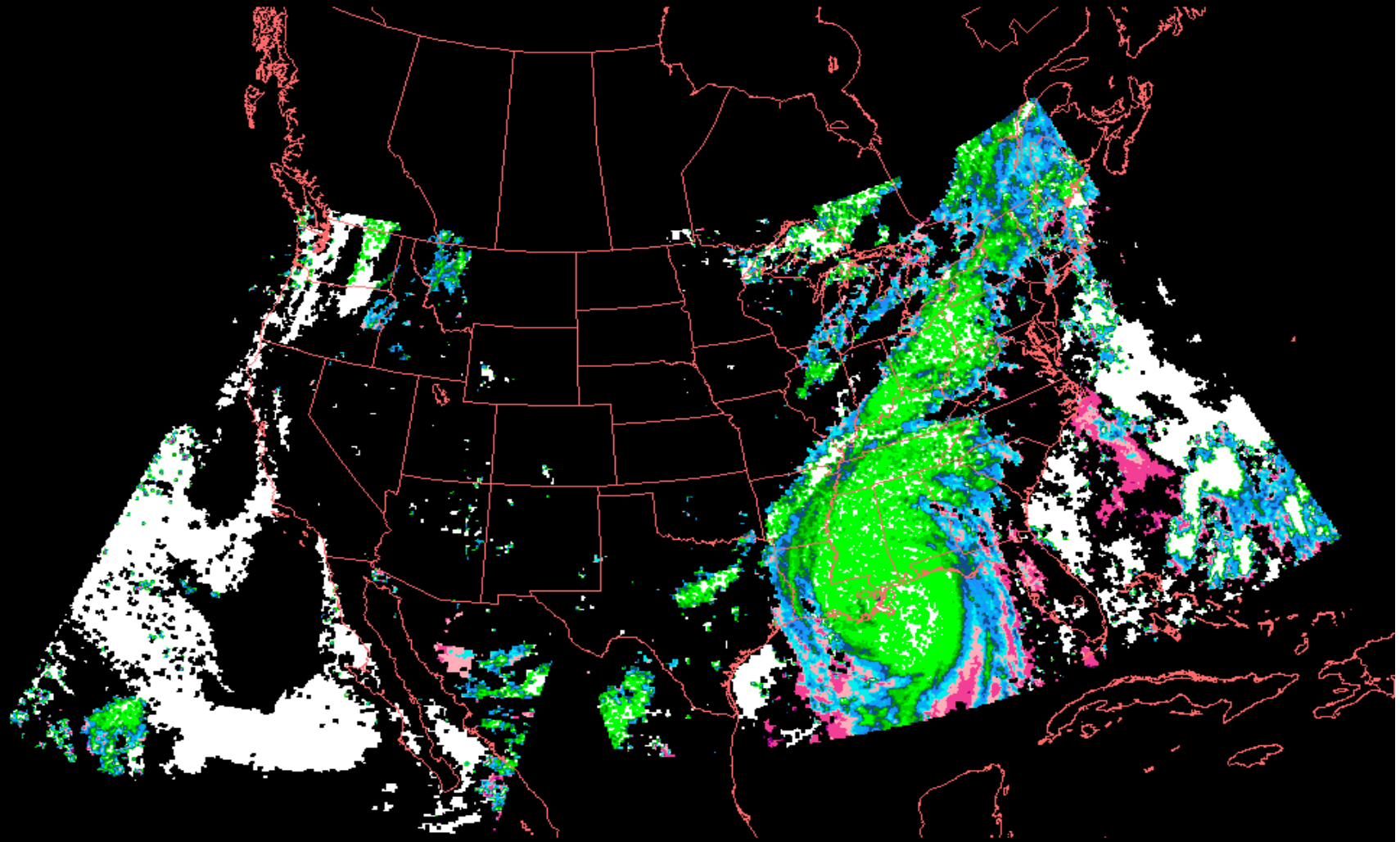
High-Resolution Geoclimatic Data



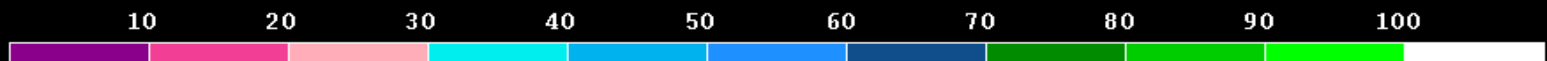
Remotely-sensed Precipitation Data



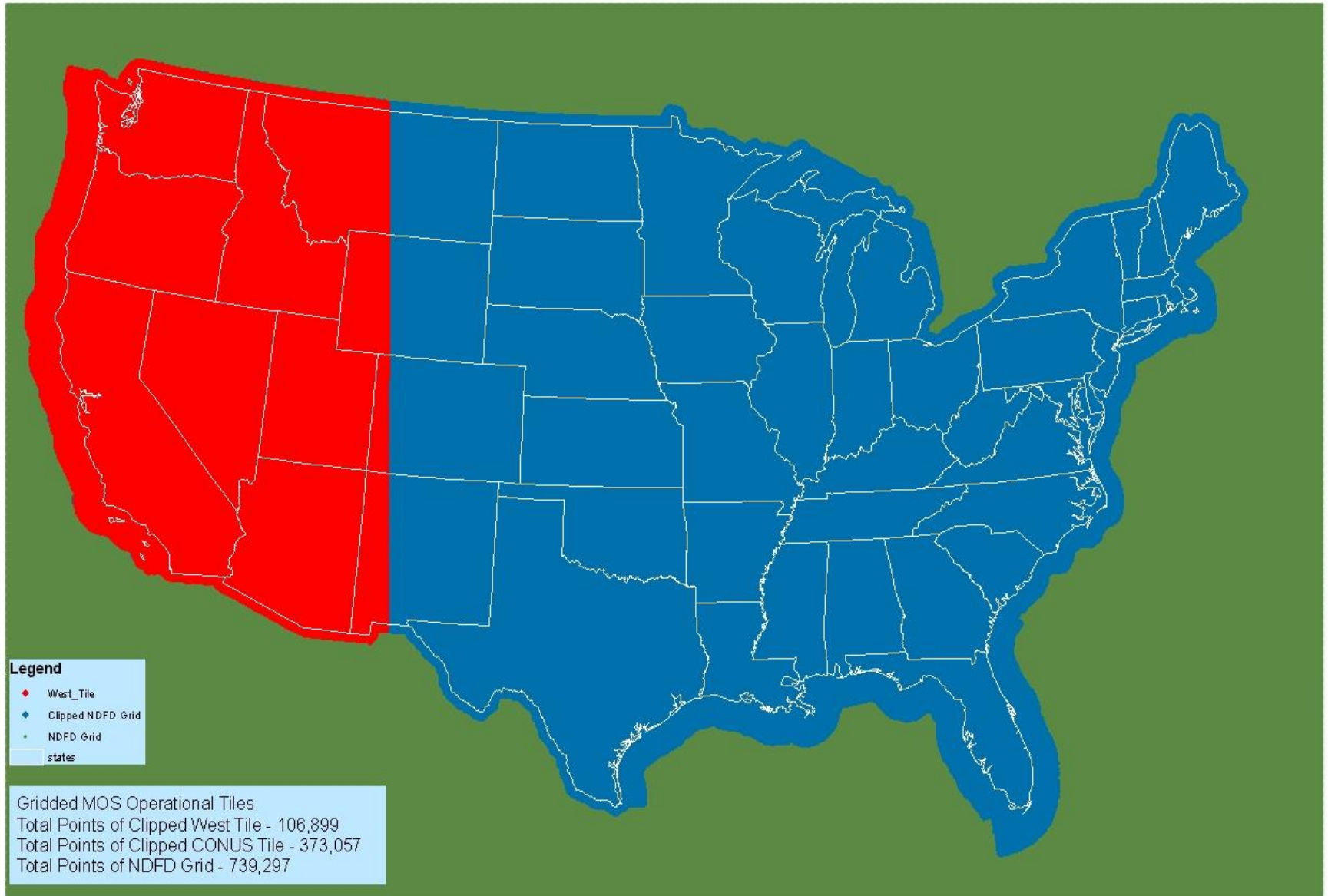
Satellite-based Effective Cloud Amount



SATELLITE EFFECTIVE CLOUD AMOU SECA 050829/1200



CONUS – Western Tile Prototype



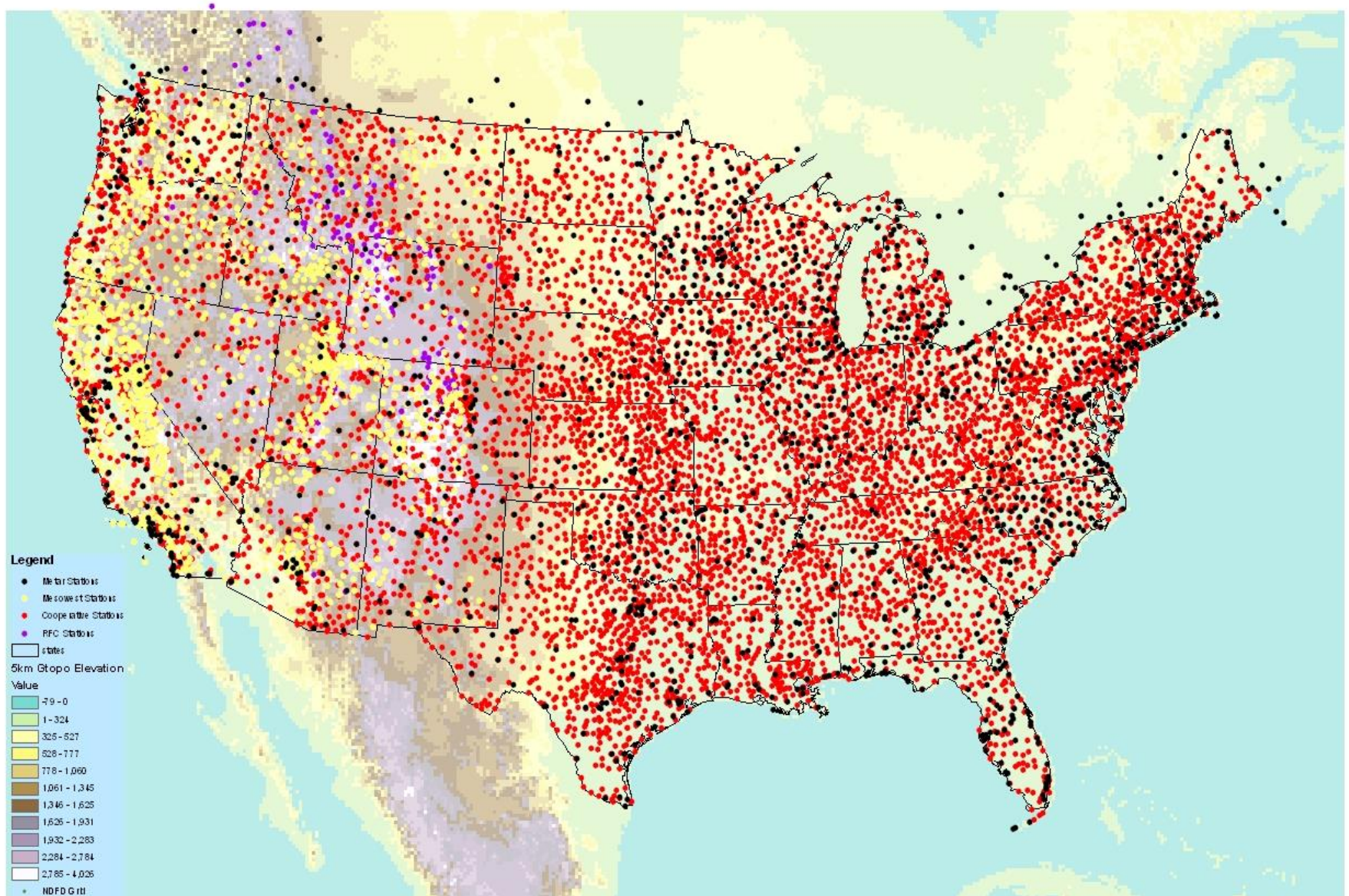
Prototype Weather Elements

- **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**

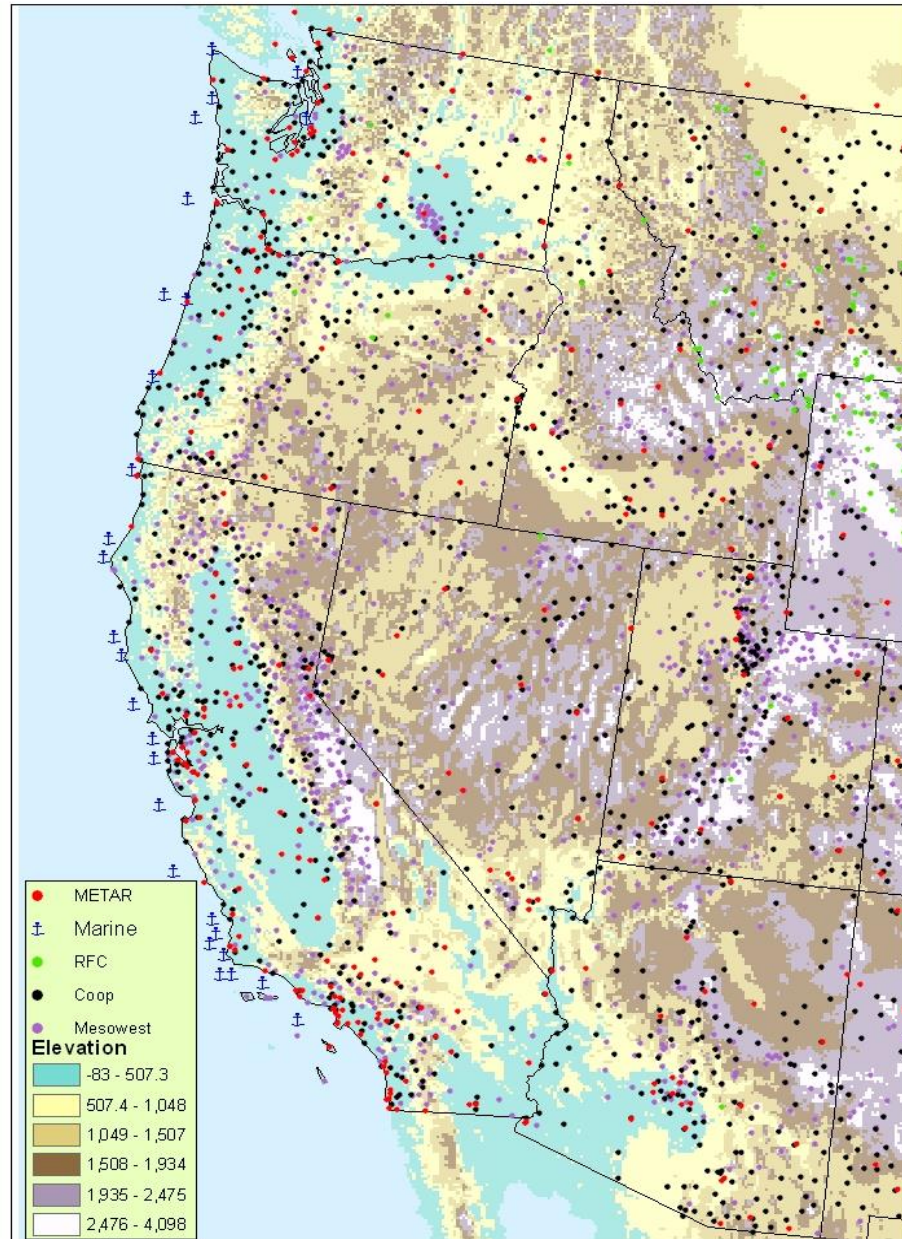
Diverse Observational Systems

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

CONUS MOS Sites



Western CONUS



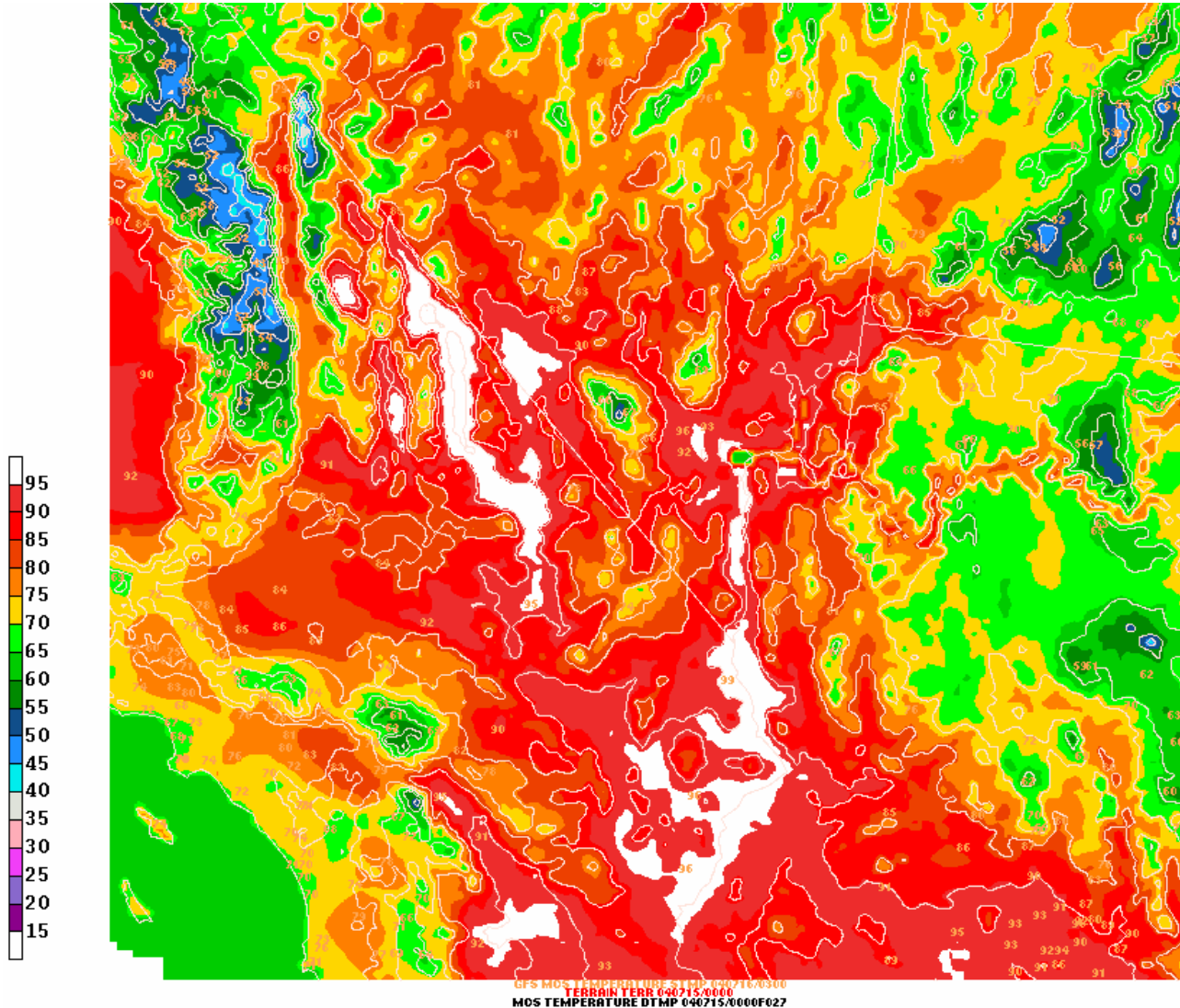
BCDG Analysis

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

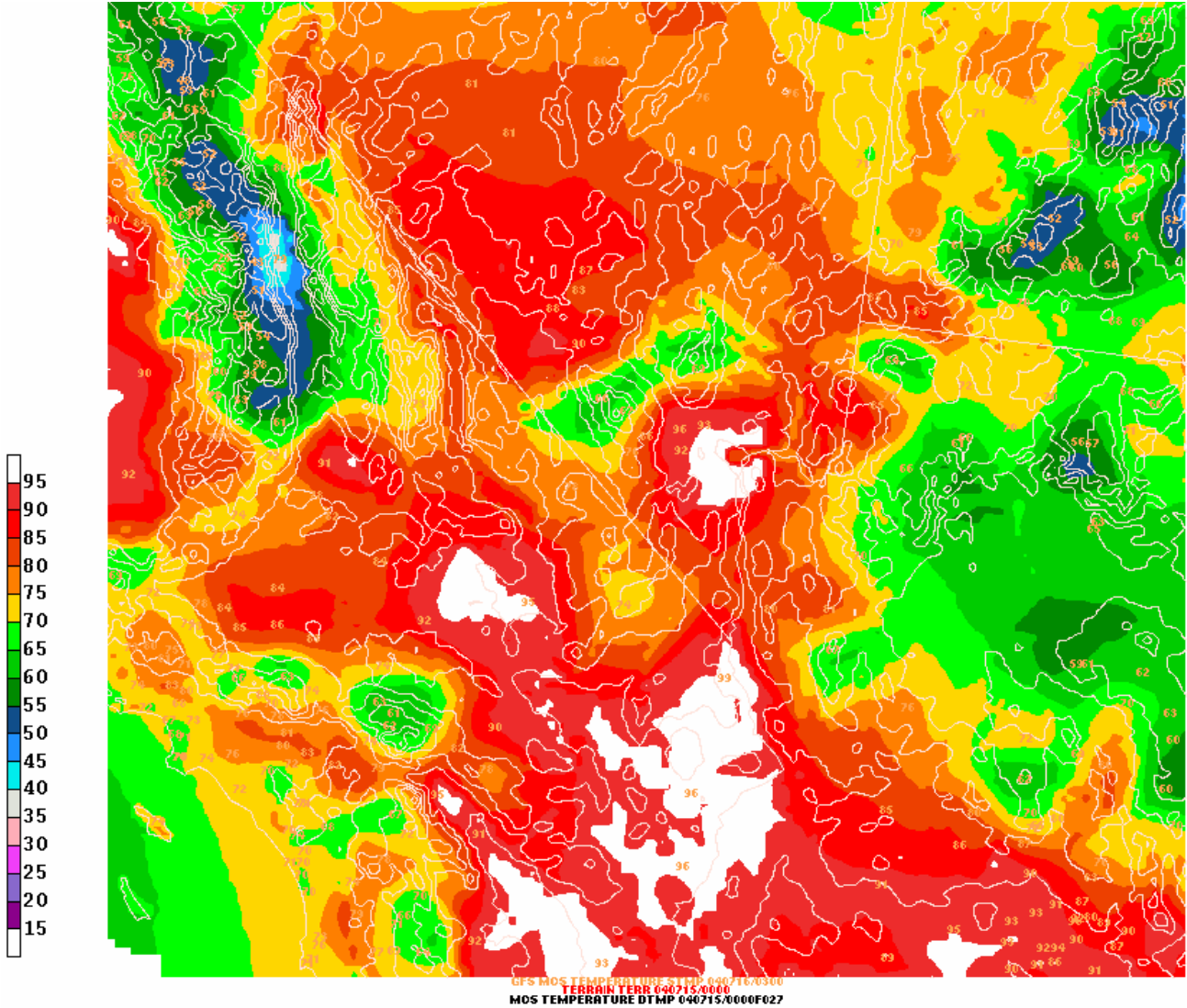
Goodness of Fit by Using Terrain

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

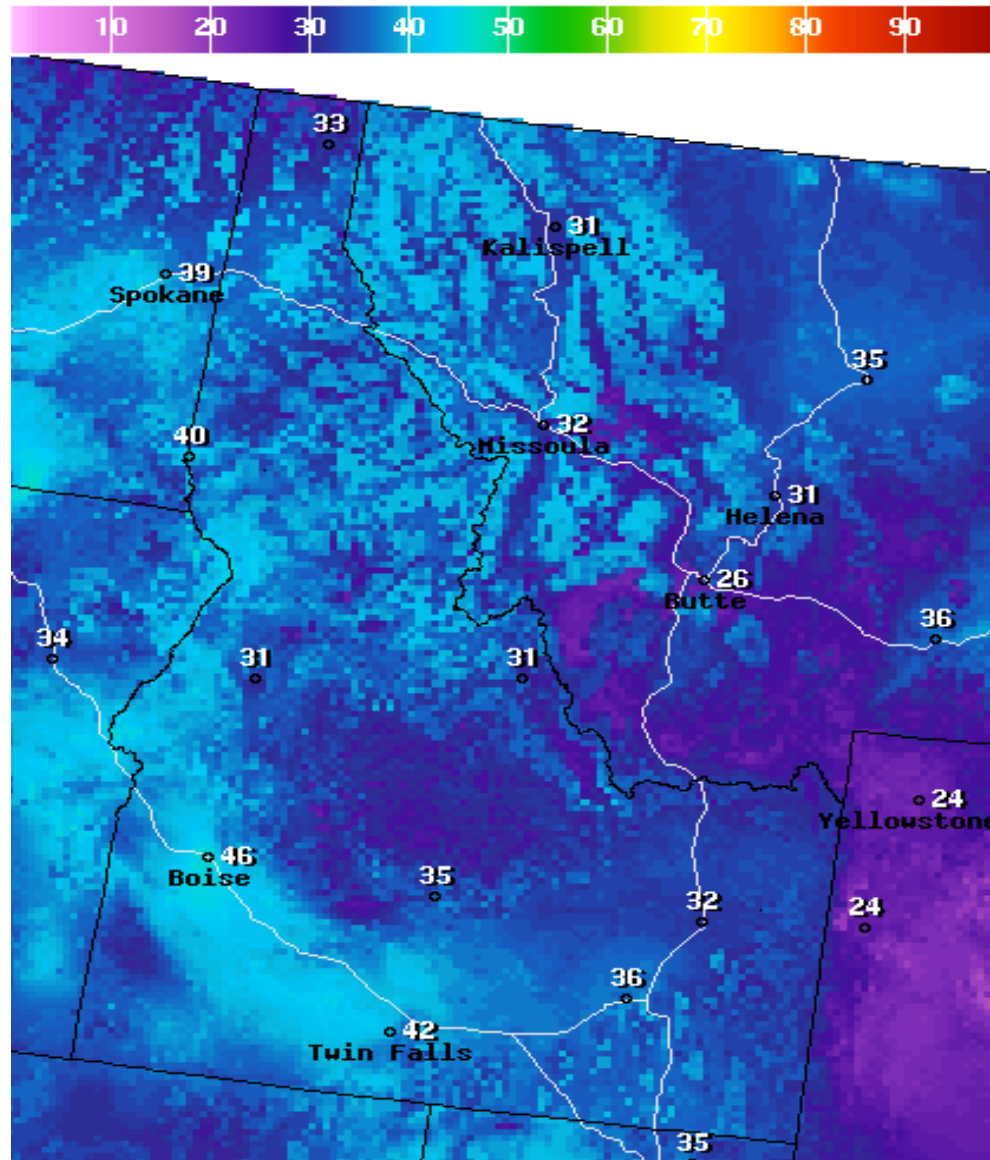
MOS Temperature Analysis (w. terrain)



MOS Temperature Analysis (no terrain)



NDFD Min Temperature Forecast



Low Temperature(F) Ending Mon Oct 24 2005 8AM EDT
(Mon Oct 24 2005 12Z)



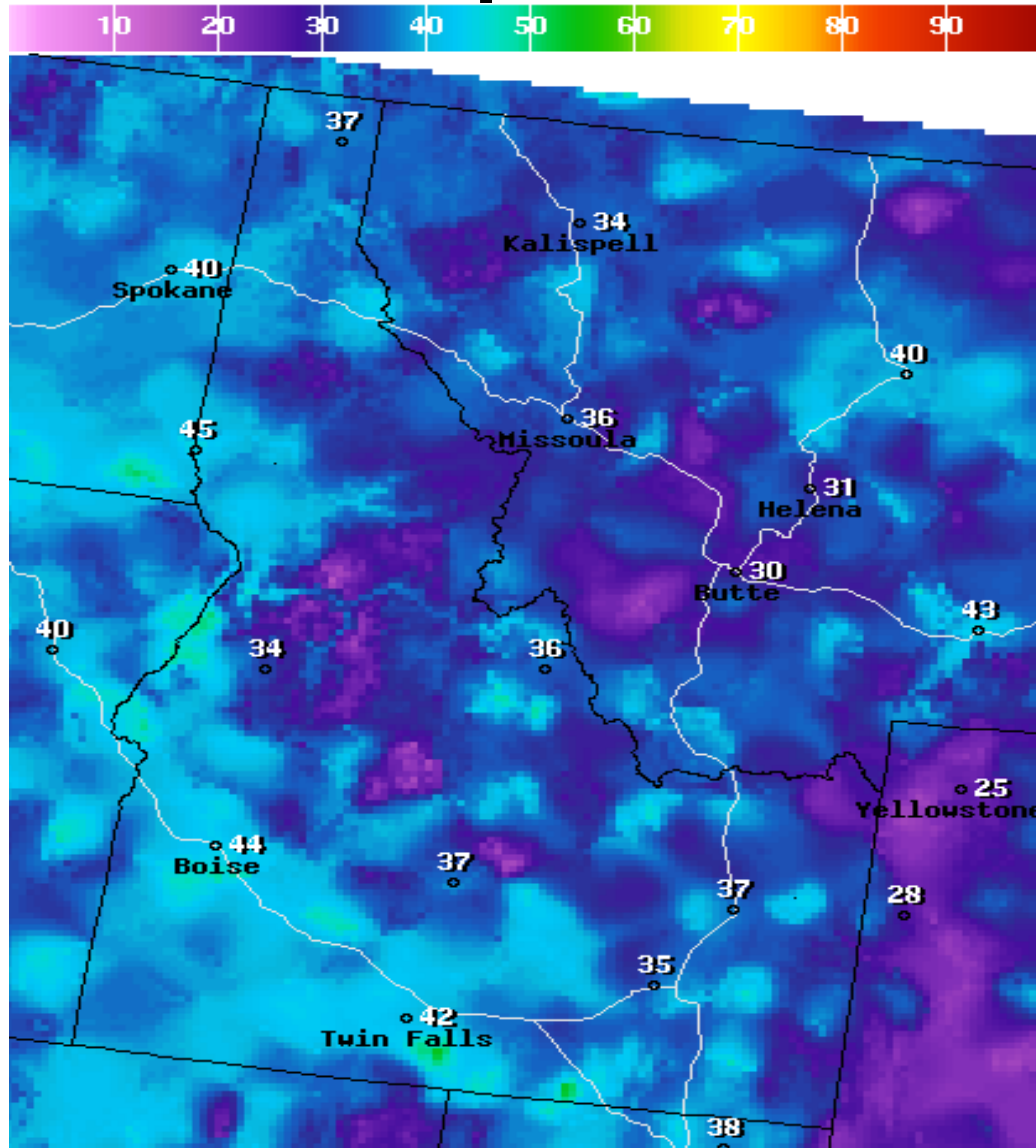
National Digital Forecast Database

11z issuance

Graphic created-Oct 21 7:06AM EDT



MOS Min Temperature Forecast



GFS-MOS Low Temp(F) Ending Mon Oct 24 2005 8AM EDT

Experimental

(Mon Oct 24 2005 12Z)



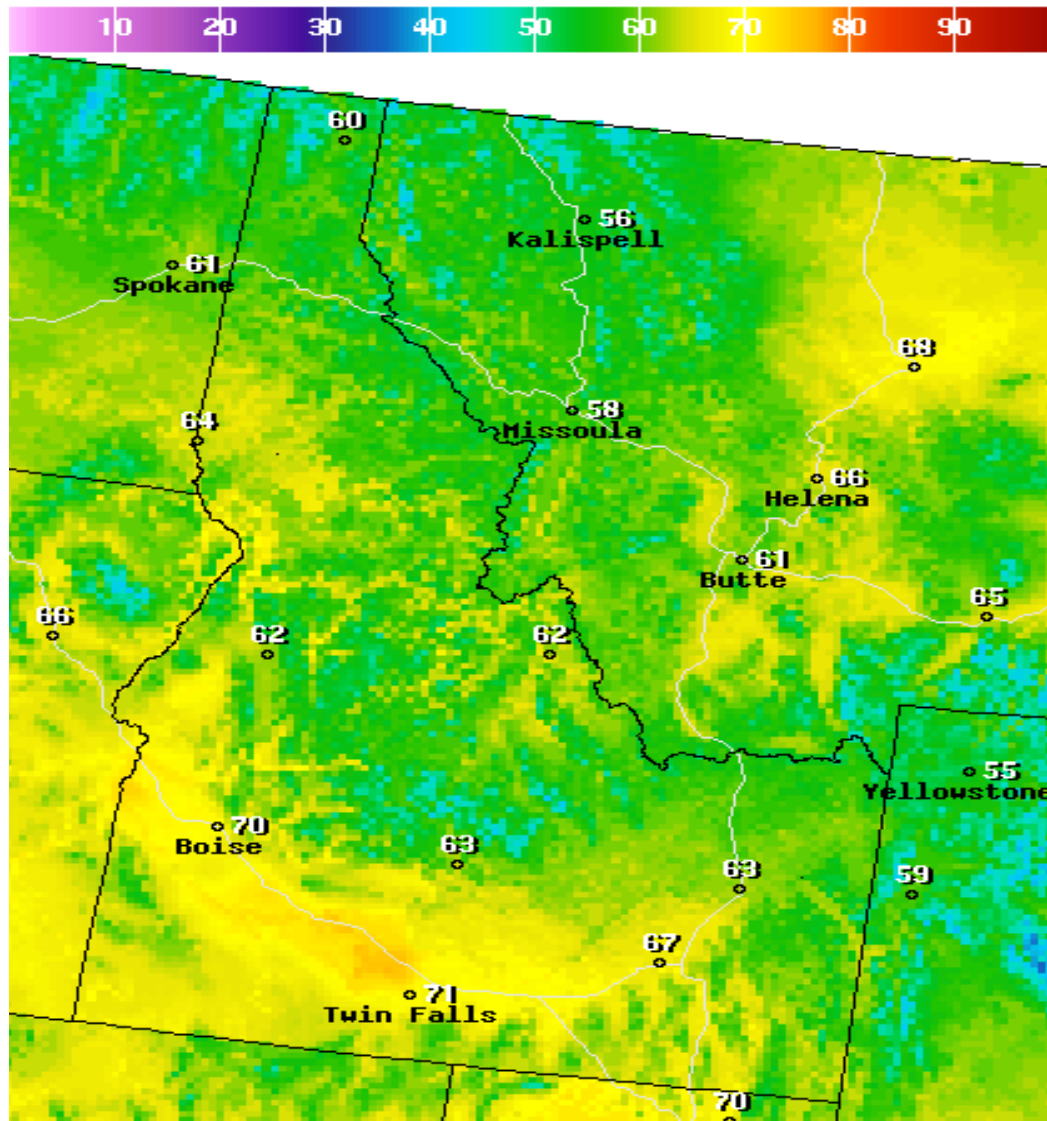
National Digital Guidance Database

00z model run

Graphic created-Oct 21 1:42AM EDT



NDFD Max Temperature Forecast



High Temperature(F) Ending Mon Oct 24 2005 8PM EDT

(Tue Oct 25 2005 00Z)



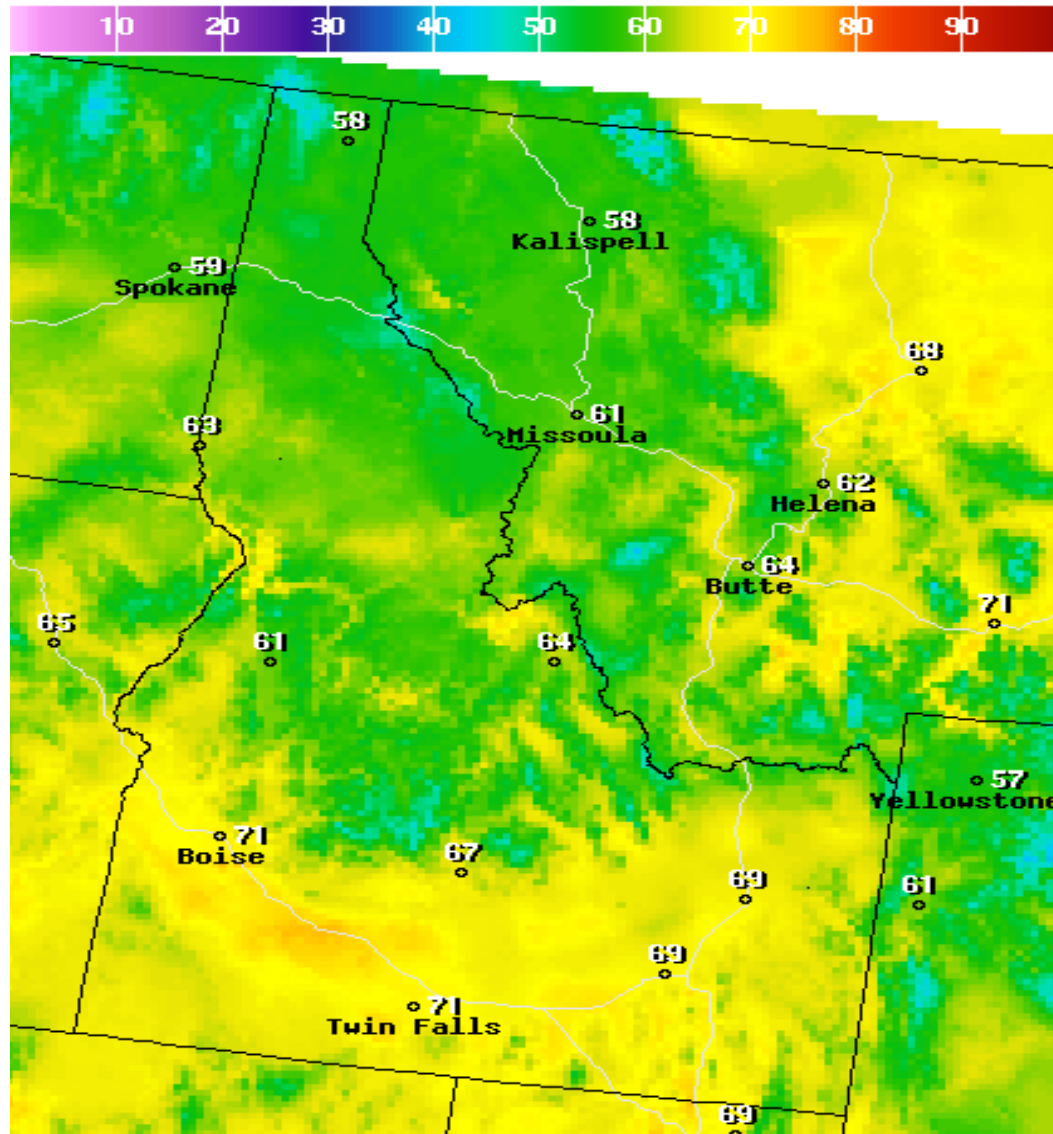
National Digital Forecast Database

11z issuance

Graphic created-Oct 21 7:06AM EDT



MOS Max Temperature Forecast



GFS-MOS High Temp(F) Ending Mon Oct 24 2005 8PM EDT

Experimental

(Tue Oct 25 2005 00Z)

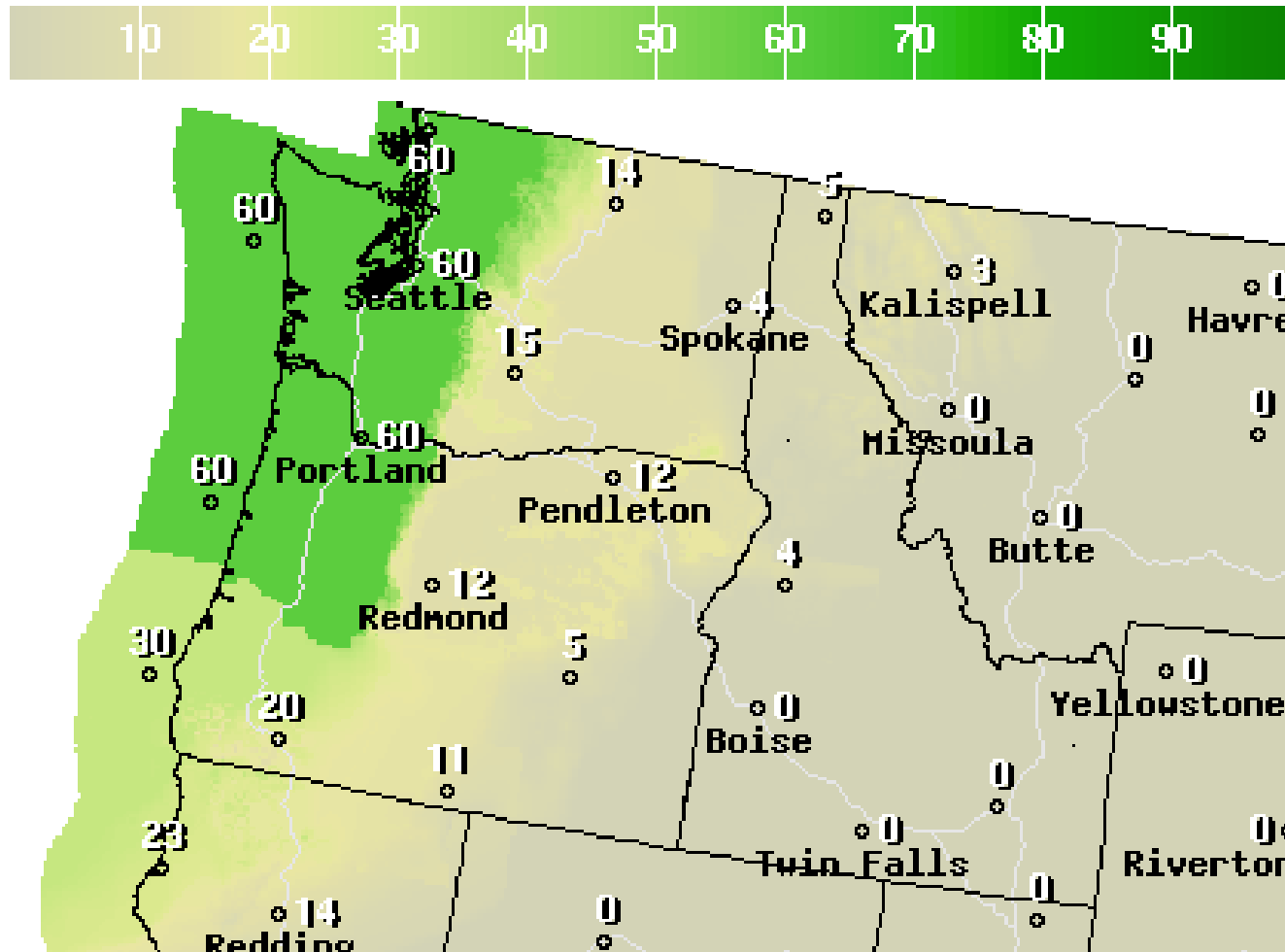


National Digital Guidance Database

00z model run Graphic created-Oct 21 1:42AM EDT



NDFD PoP Forecast



12Hr Prob.Precip(%) Ending Tue Oct 25 2005 8PM EDT

(Wed Oct 26 2005 00Z)



National Digital Forecast Database

15z issuance

Graphic created-Oct 21 11:17AM EDT



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

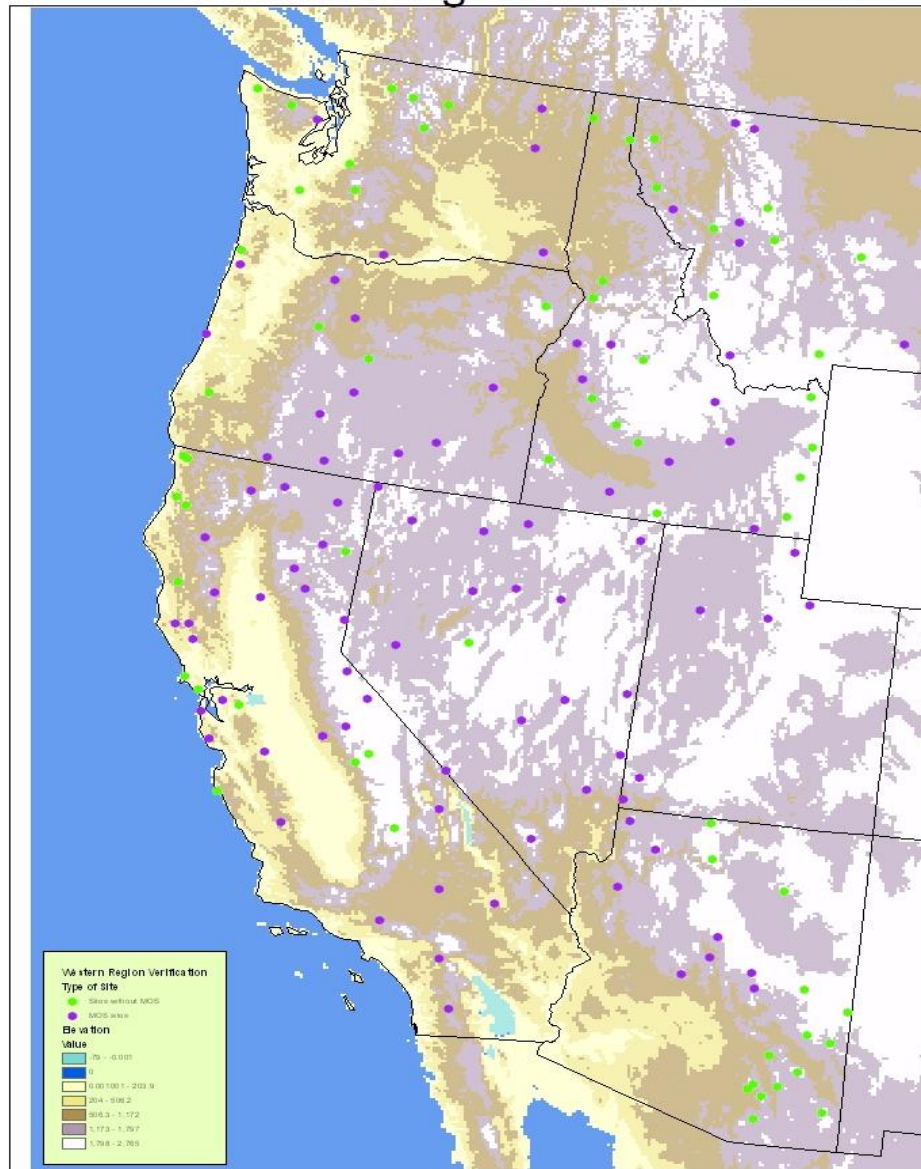
- **Evaluation (objective & subjective)**
- **Expansion (area & elements)**
- **Improvement**
- **Use of remote-sensing observations**
- **Dissemination on SBN**

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

MOS Western Region 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**