

November 2, 1999

PRELIMINARY RESULTS

Midwest Subregional Modeling:
1-Hour Attainment Demonstration



Basecase Results: Findings

Performance statistics generally consistent with USEPA recommended values

- Peak values underestimated on most of the 15 observed exceedance days (UAM-V peaks higher than CAMx peaks)
- Normalized bias generally negative (CAMx bias values higher than UAM-V bias values)
- Normalized bias within ± 5 - 15% on only about half of the 32 modeled days; but 10 of the 15 observed exceedance days

- Normalized gross error within 30 - 35% on every day

- New basecase (bas1) lower than previous basecase (bas10)

Modeled and observed spatial plots reasonably consistent

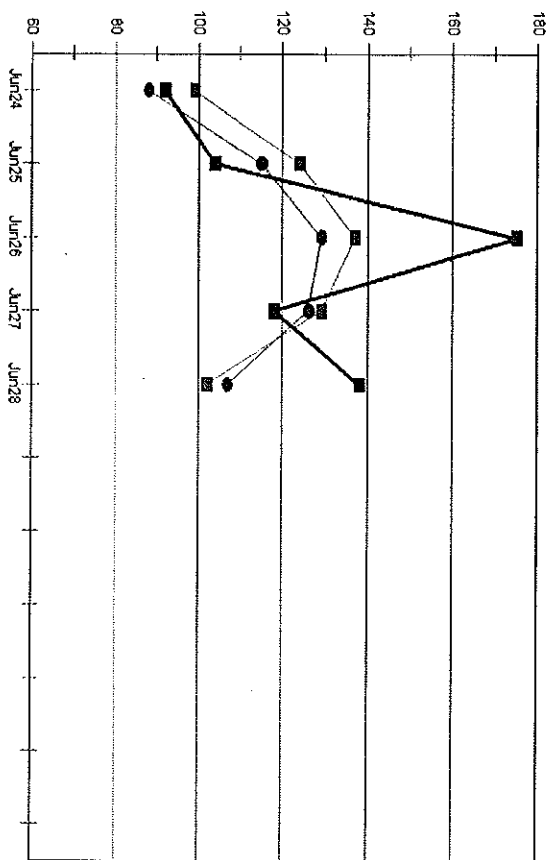
Model generally matches hour-to-hour, day-to-day variation in ozone concentrations

- High modeled ozone lags high observed ozone by one day

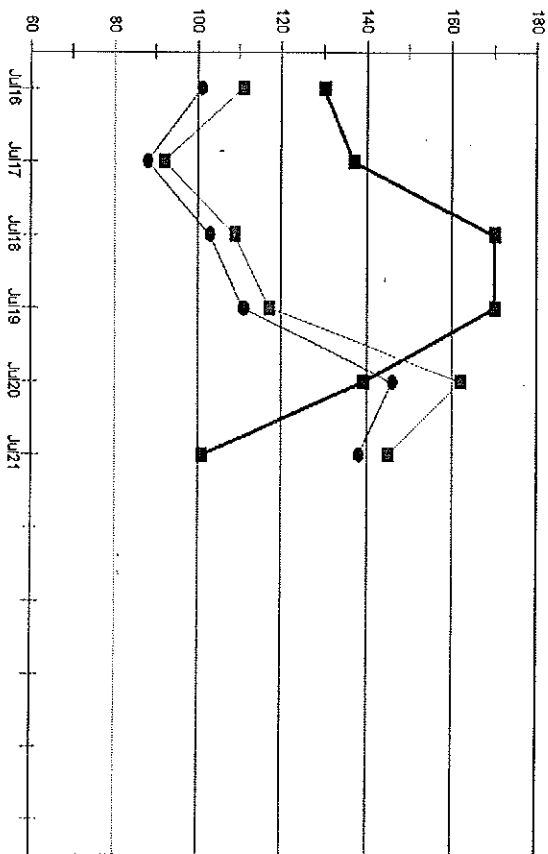
Model Performance Statistics - Lake Michigan Area (12 km)

	Peak Value				Mean Value				Normalized Bias				Normalized Cross Error			
	obs	uamv (bas10)	uamv (bas11v2)	camx (bas11v2)	obs	uamv (bas10)	uamv (bas11v2)	camx (bas11v2)	uamv (bas10)	uamv (bas11v2)	camx (bas11v2)	uamv (bas10)	uamv (bas11v2)	camx (bas11v2)		
Jun24	92	104	99	88	69	57	54	57	-17.6	-22.1	-17.7	19.7	23.2	19.2		
Jun25	104	128	124	115	76	66	60	62	-13.2	-19.9	-17.5	19.3	23.6	22.0		
Jun26	175	142	137	129	80	86	78	80	9.2	-0.1	1.6	25.4	23.5	24.0		
Jun27	118	140	129	126	73	80	75	81	11.6	3.8	12.0	21.2	17.5	20.2		
Jun28	138	120	102	107	75	68	63	69	-7.0	-14.5	-5.3	17.6	14.5	17.1		
Jul16	130	125	111	101	75	66	60	61	-13.4	-20.9	-17.6	17.5	22.3	19.4		
Jul17	137	106	92	88	74	62	56	59	-15.9	-22.9	-19.2	19.8	24.9	23.1		
Jul18	170	138	109	103	78	78	71	74	0.6	-6.2	-2.4	16.9	16.4	16.4		
Jul19	170	143	117	111	80	74	68	70	-6.2	-12.5	-9.5	21.9	22.1	21.5		
Jul20	139	171	162	146	75	91	83	85	21.2	11.7	15.3	27.5	22.0	24.9		
Jul21	101	152	145	138	70	89	82	86	28.5	19.7	24.5	34.5	30.9	32.2		
Jun15	125	82	84	82	74	52	50	52	-30.1	-32.5	-30.1	30.4	32.8	30.6		
Jun16	124	89	97	90	81	56	56	58	-31.3	-31.3	-28.9	31.4	31.5	29.1		
Jun17	145	128	130	114	81	61	61	63	-25.4	-26.0	-23.0	25.8	26.4	23.6		
Jun18	131	128	129	125	75	63	62	67	-16.9	-17.2	-10.2	18.2	18.8	14.6		
Jun19	118	115	118	107	74	62	61	66	-15.9	-16.9	-10.9	17.9	18.9	14.9		
Jun20	97	123	122	117	70	59	57	61	-14.7	-18.1	-11.3	20.2	21.1	17.2		
Jun21	112	122	123	119	73	61	58	64	-19.1	-22.5	-14.1	22.0	25.3	19.0		
Jun22	119	131	131	125	78	81	79	80	5.5	2.9	4.2	16.7	16.2	14.6		
Jun23	123	131	129	125	84	80	77	77	-2.6	-6.2	-6.2	16.9	17.7	18.4		
Jun24	166	144	136	138	83	87	82	84	4.9	-0.1	2.2	16.2	16.7	18.6		
Jun25	108	132	131	131	73	82	79	83	14.2	10.0	15.9	18.8	17.2	22.8		
Jul9	122	86	82	79	75	55	51	54	-26.0	-30.1	-26.7	26.0	30.2	26.9		
Jul10	106	93	98	85	70	52	49	54	-25.9	-29.2	-22.9	26.2	29.2	23.0		
Jul11	118	101	89	90	74	57	53	55	-22.1	-28.3	-24.7	24.8	28.7	25.4		
Jul12	146	122	121	118	86	76	73	76	-9.6	-12.8	-9.9	18.1	19.2	15.9		
Jul13	178	157	155	151	87	78	76	83	-8.7	-11.6	-3.6	16.8	17.8	15.4		
Jul14	150	141	140	145	83	81	79	88	-1.7	-3.4	7.3	15.0	14.6	16.8		
Jul15	154	150	161	160	74	86	86	94	16.9	17.2	28.5	22.4	23.9	31.7		
Jul16	92	129	137	132	69	87	86	89	25.6	24.5	29.7	27.6	27.2	31.5		
Jul17	88	91	91	89	66	47	45	50	-29.6	-32.0	-24.9	30.0	32.2	26.6		
Jul18	68	52	56	58	63	41	38	41	-35.1	-40.3	-34.6	35.1	40.3	34.6		

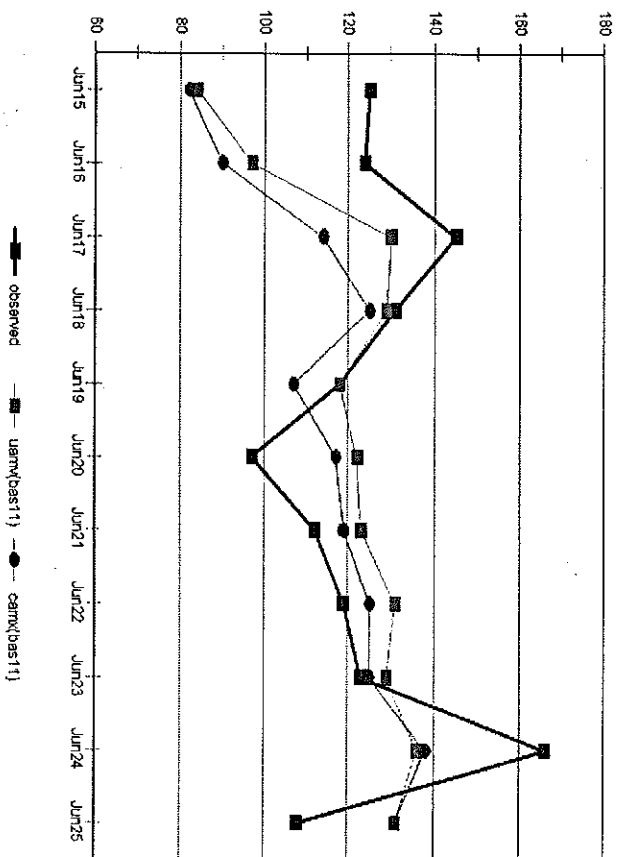
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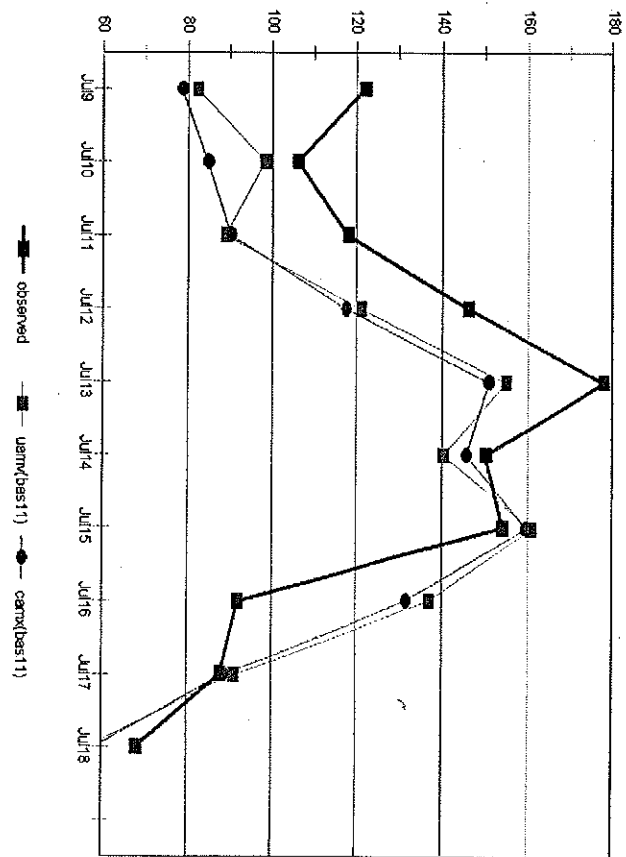
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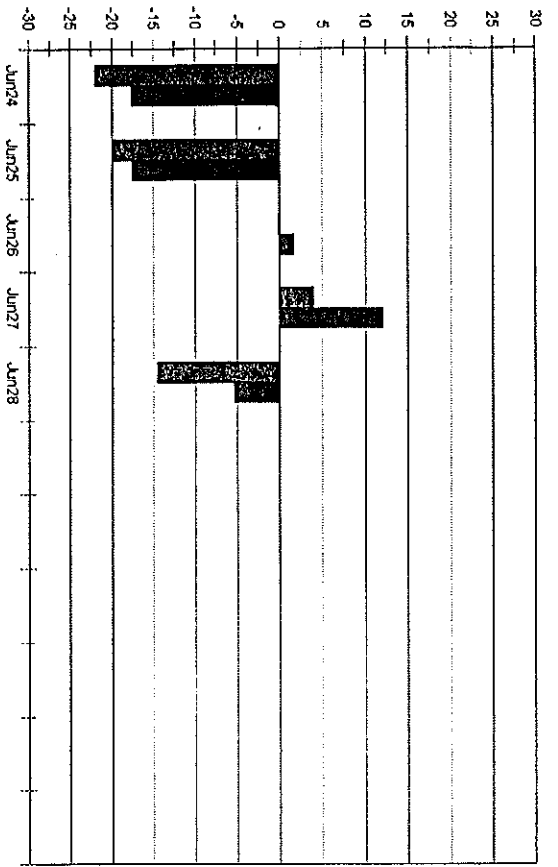
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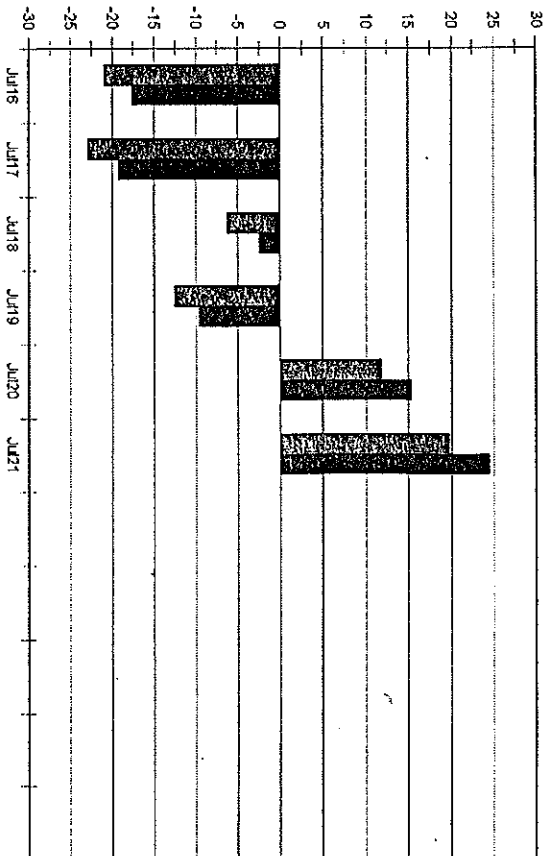
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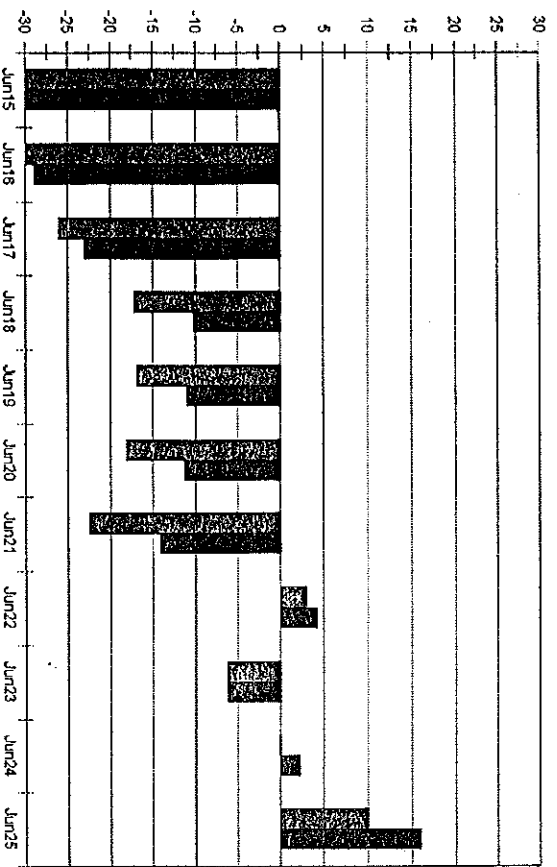
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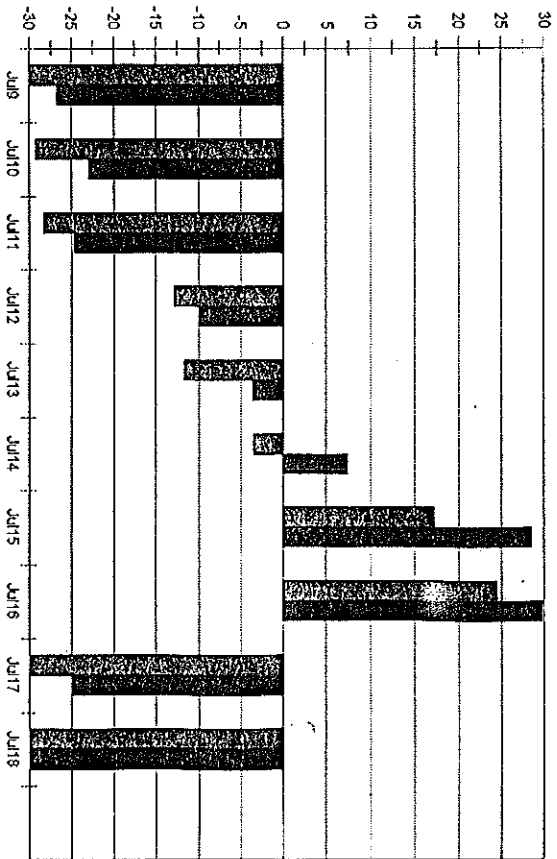
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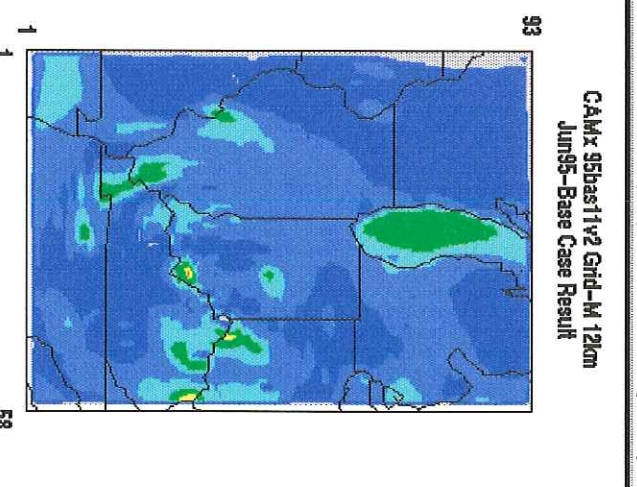
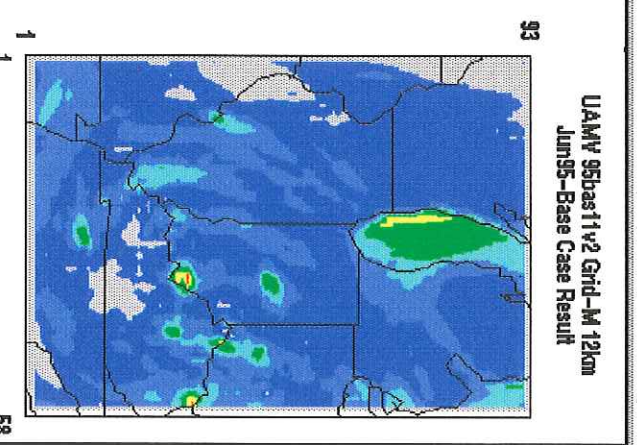
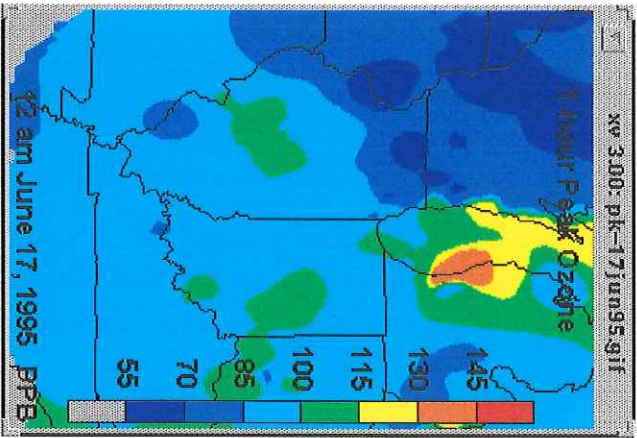
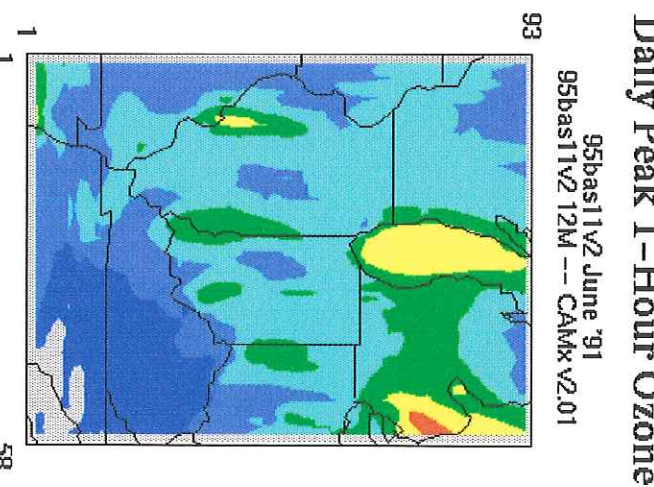
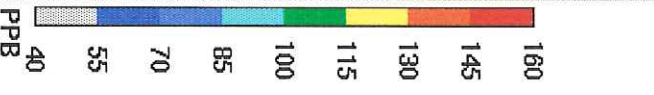
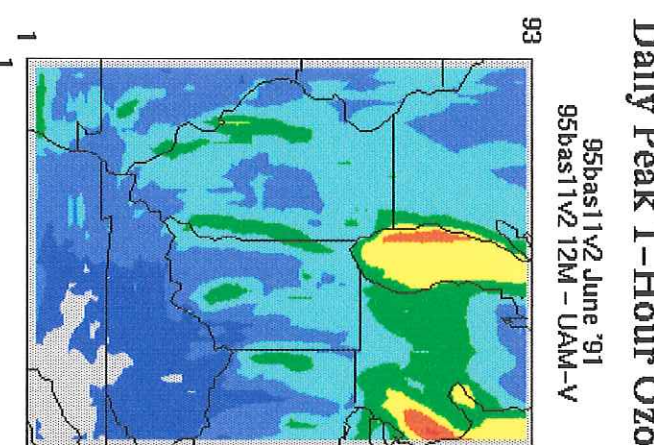
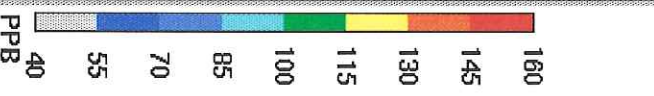
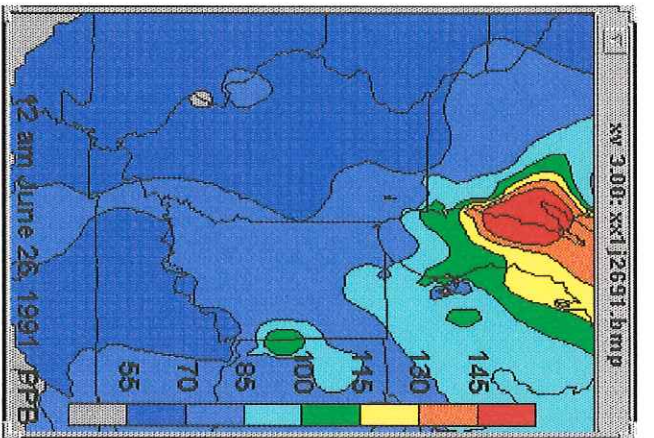


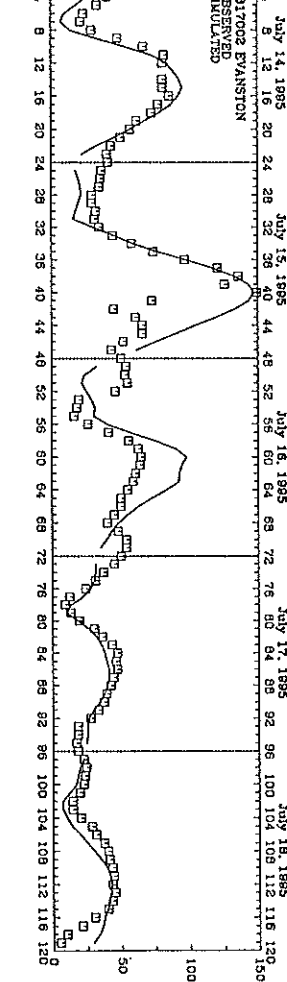
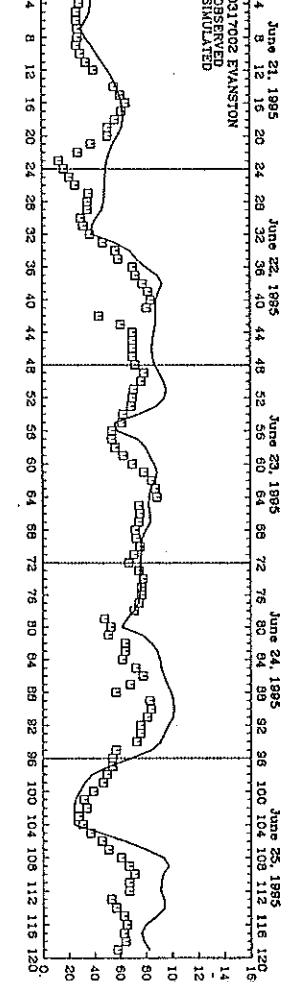
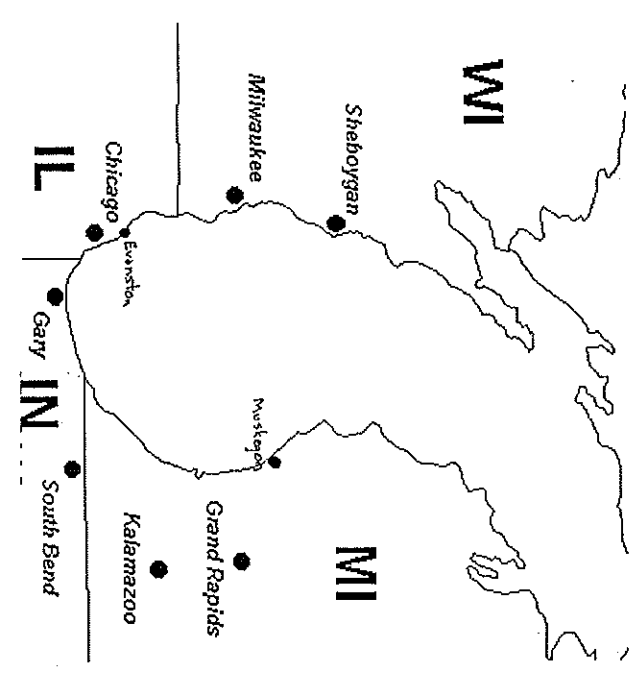
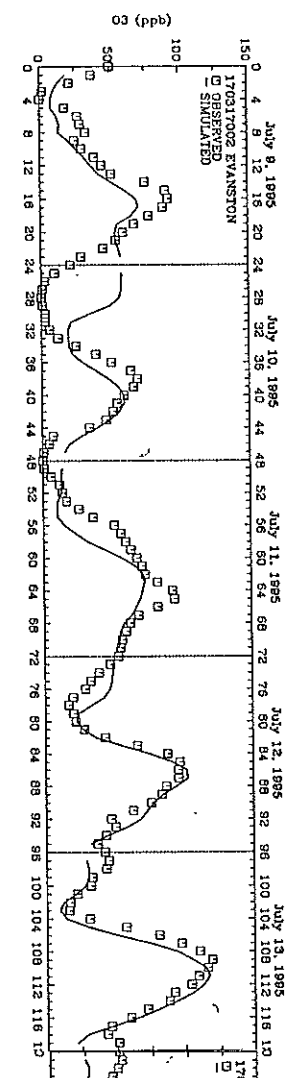
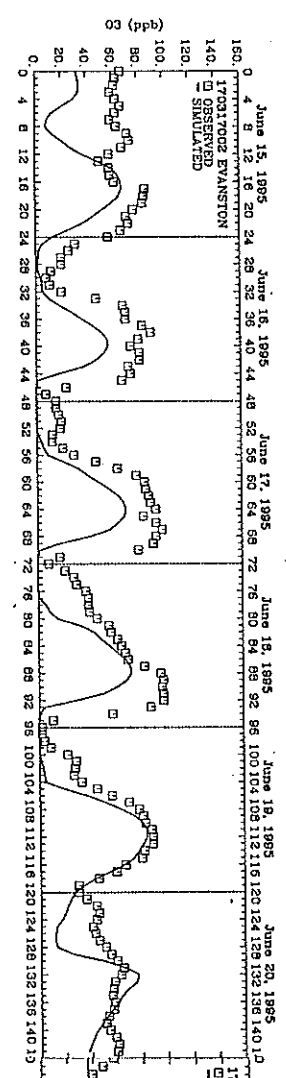
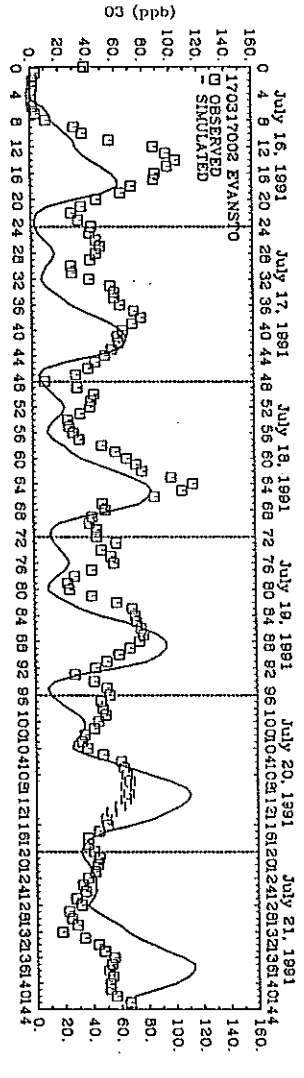
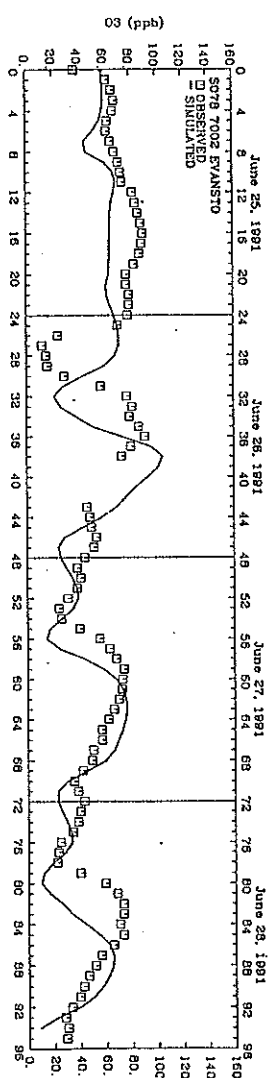
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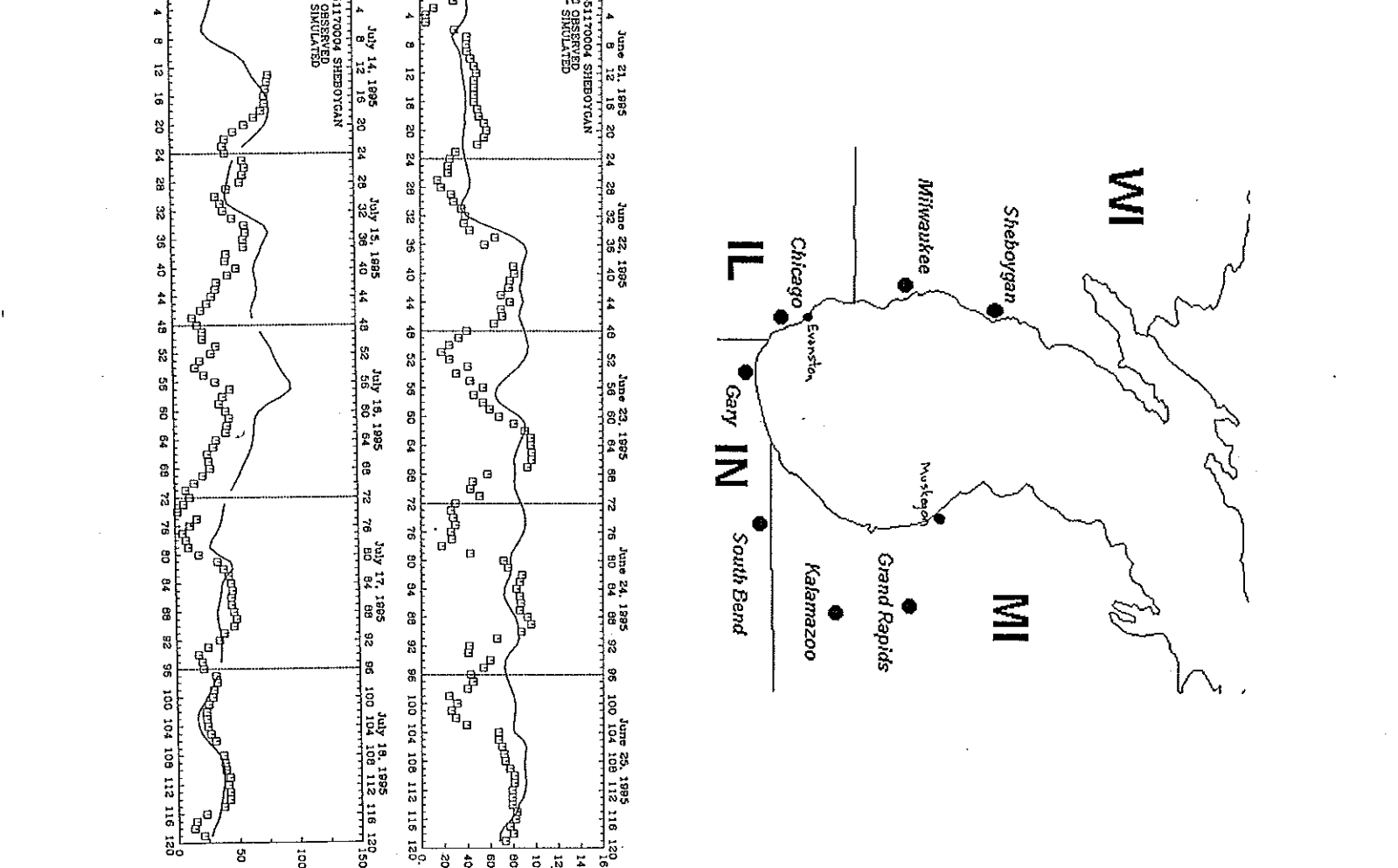
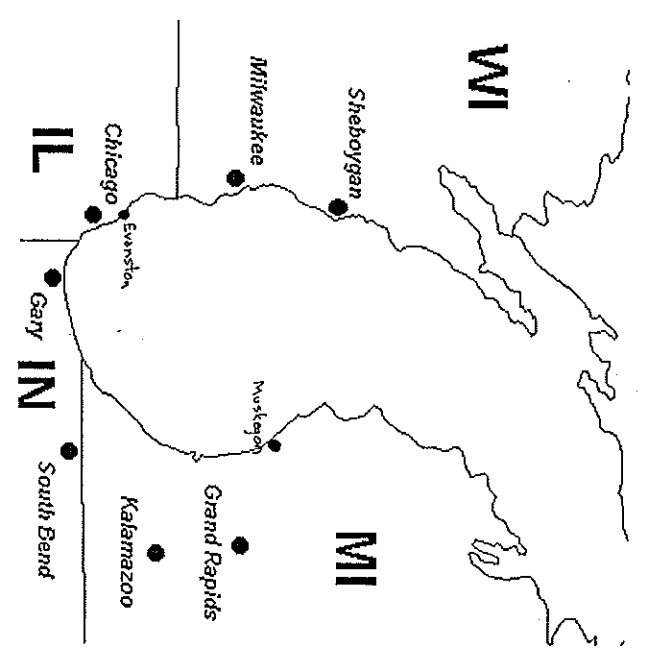
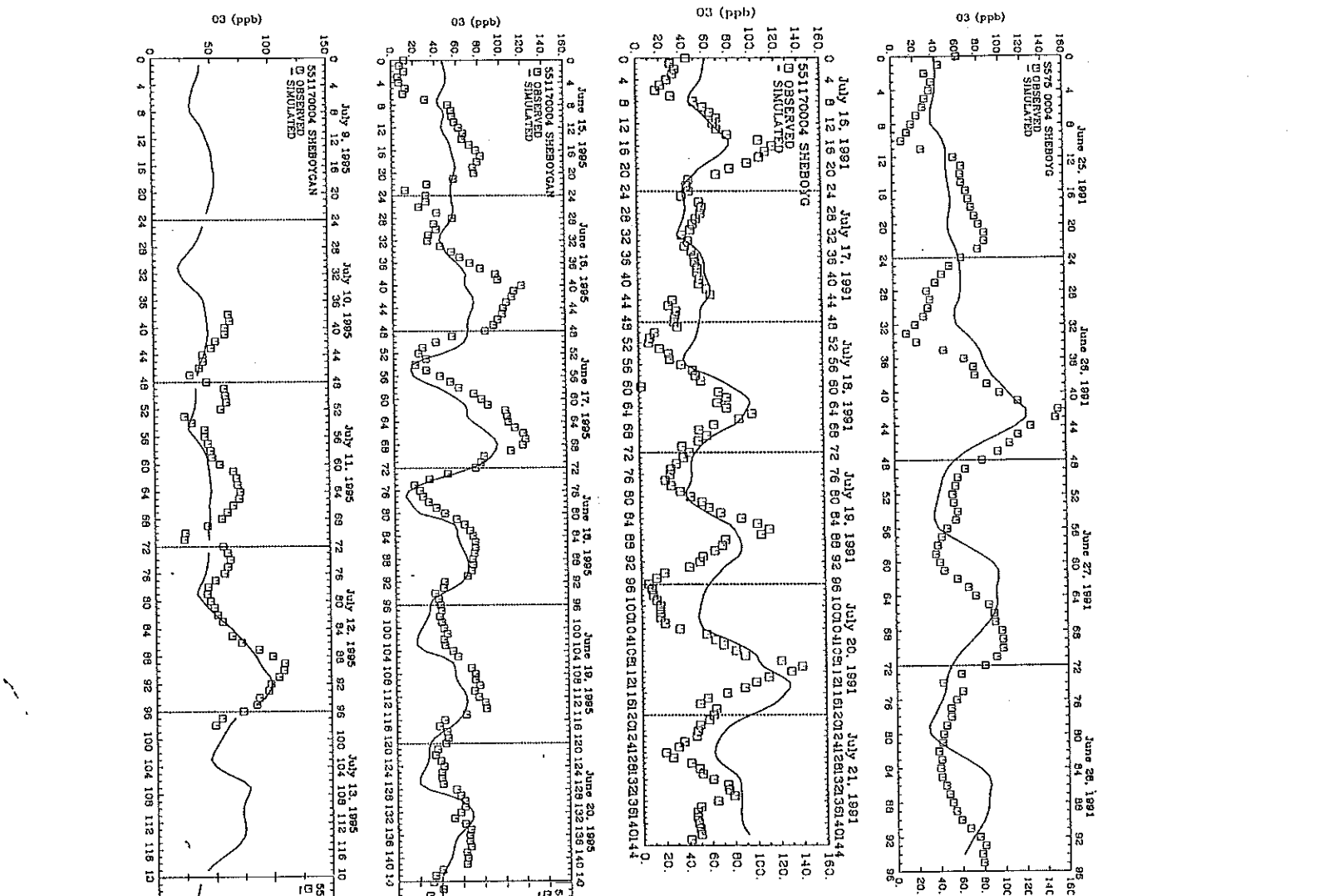


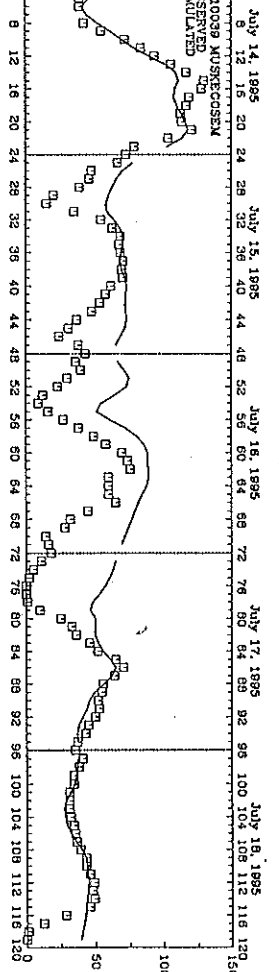
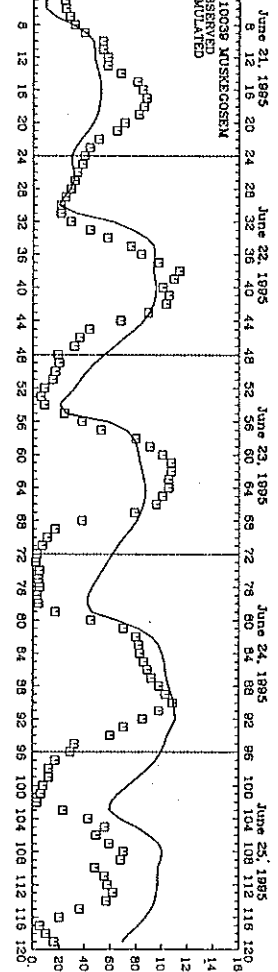
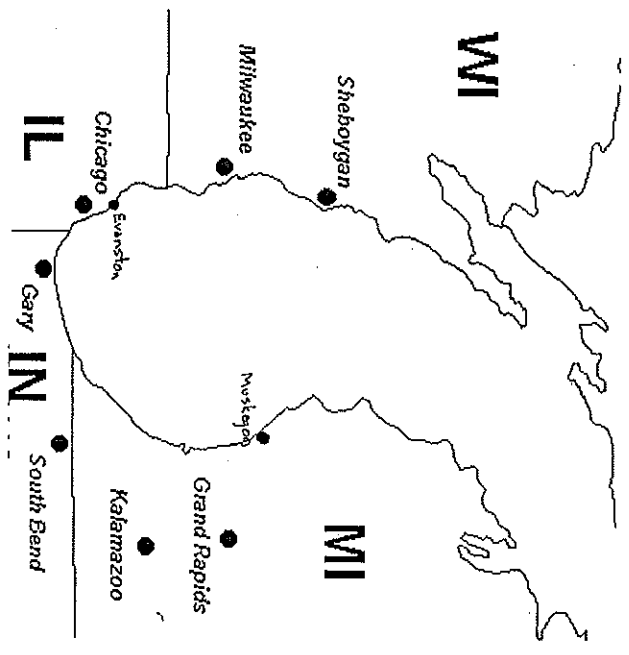
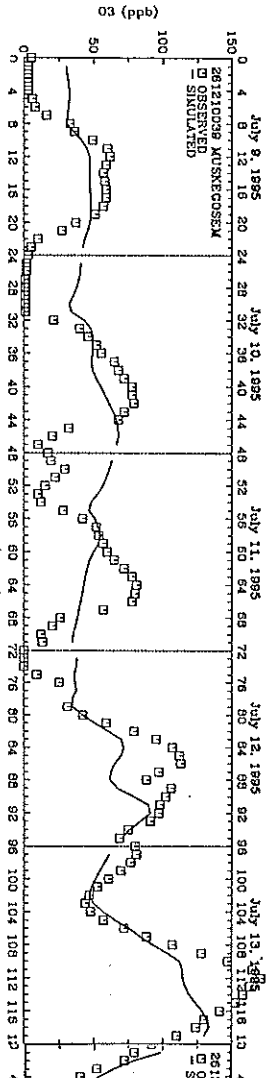
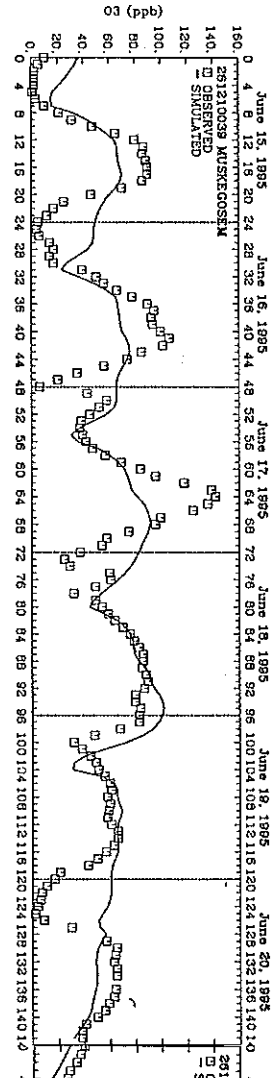
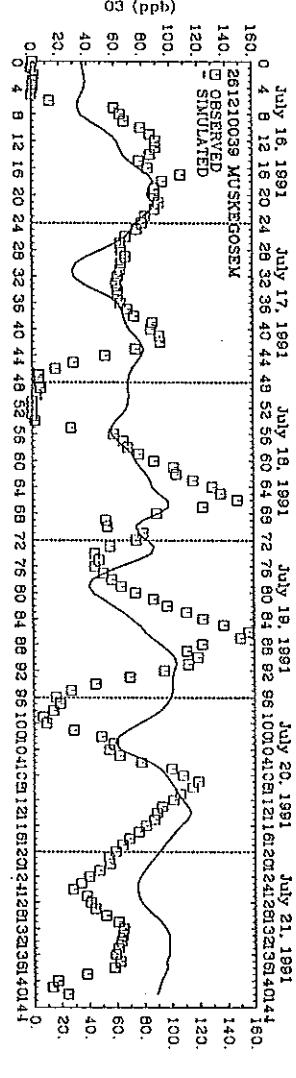
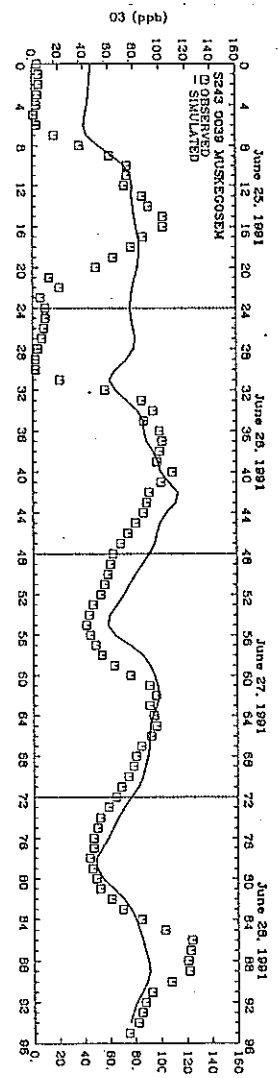
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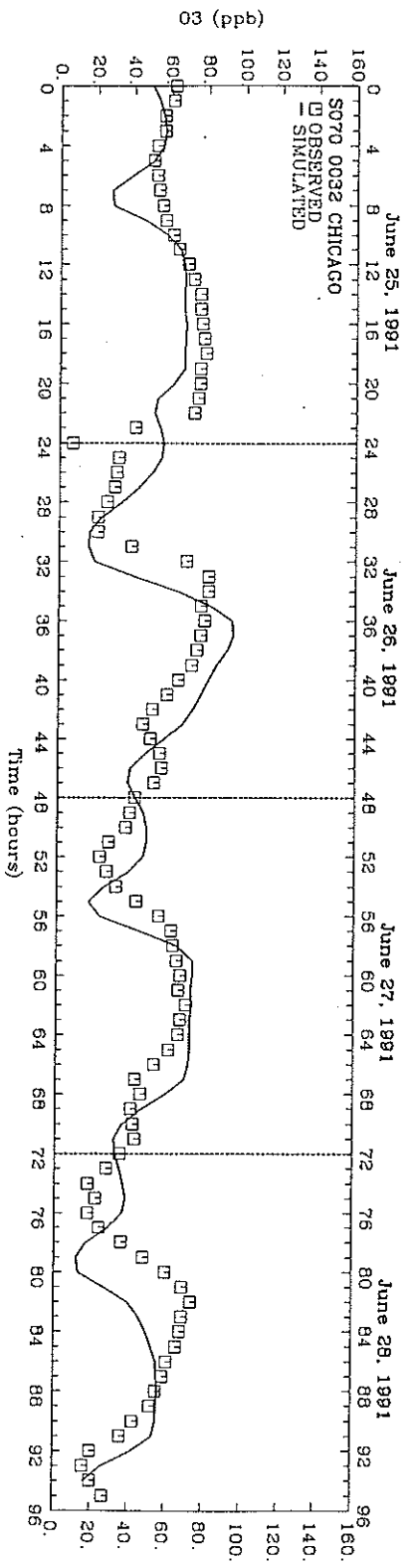
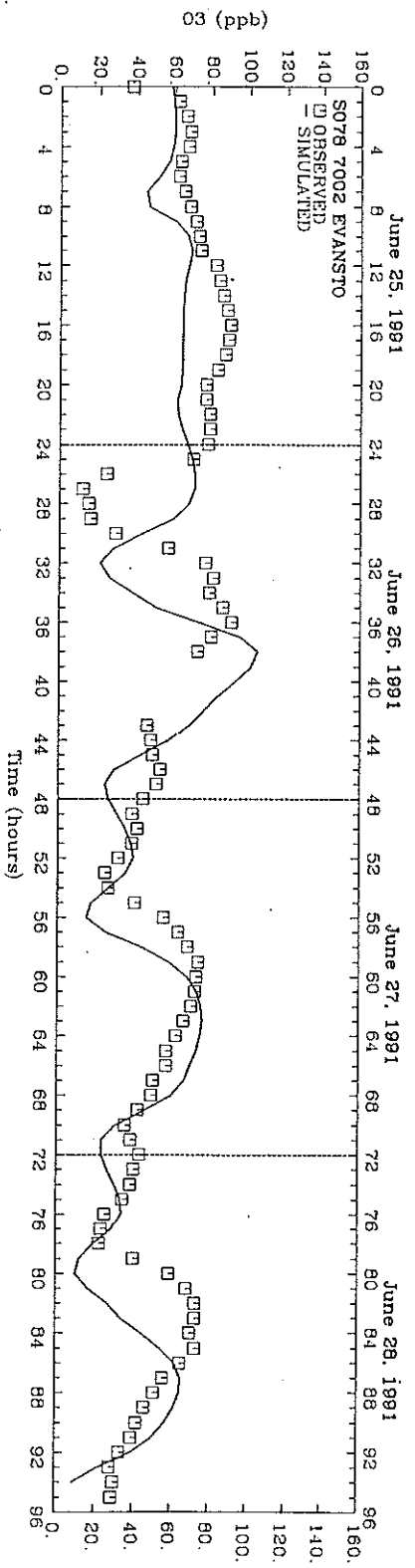
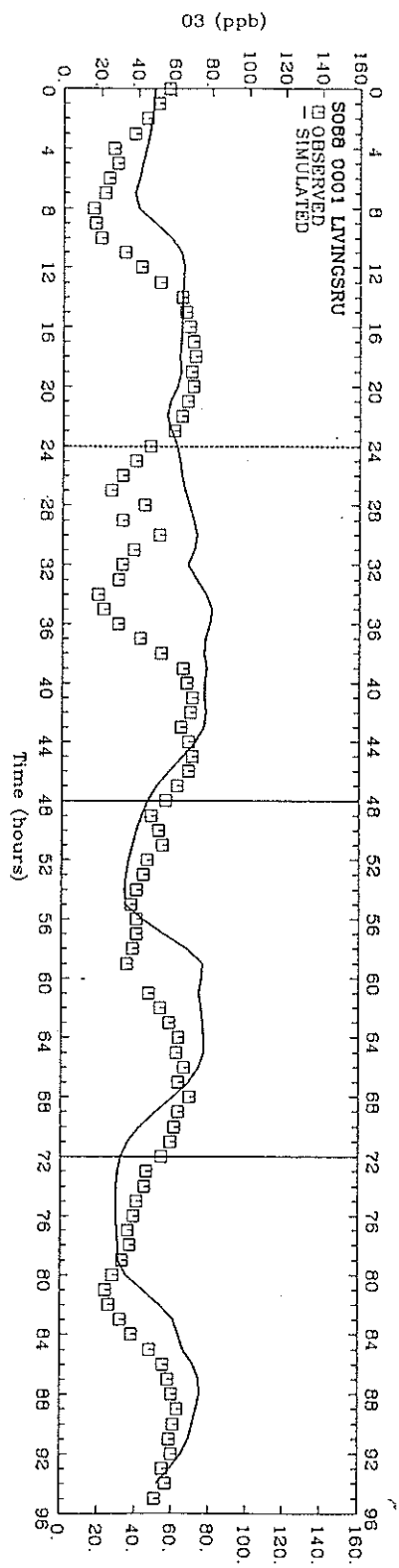




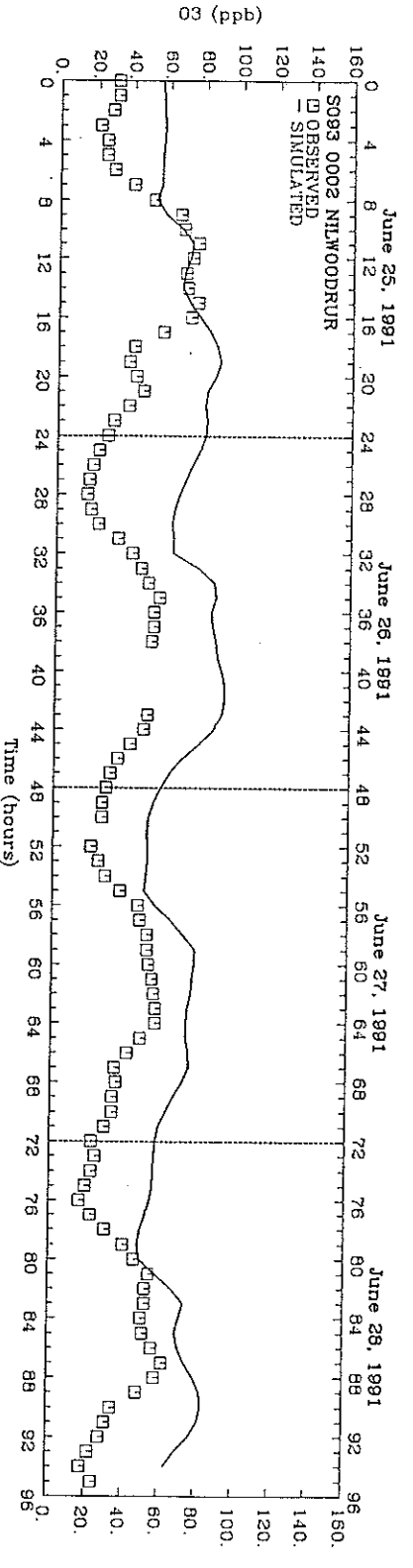
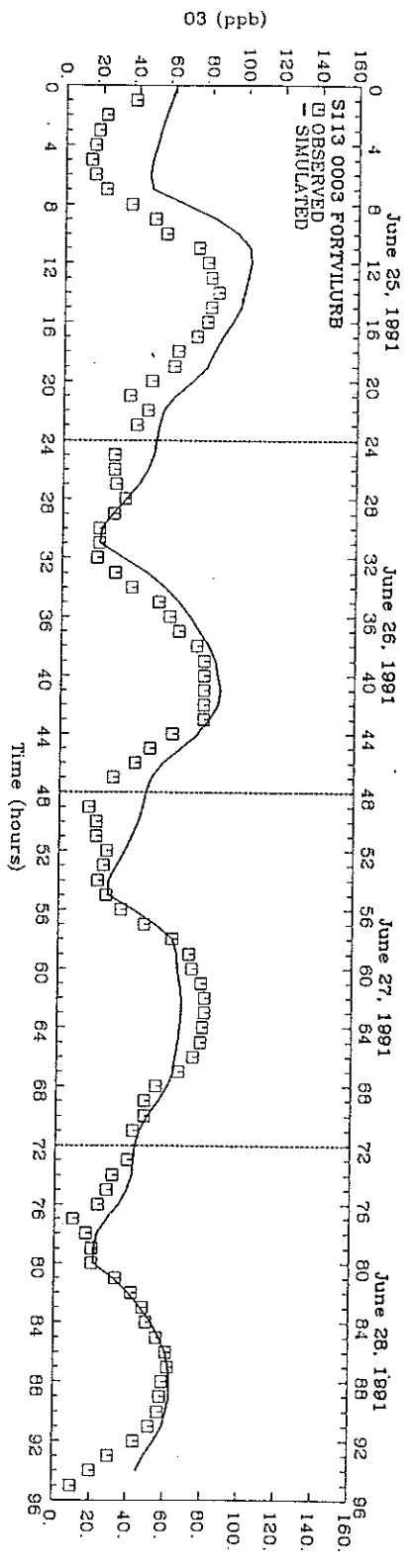
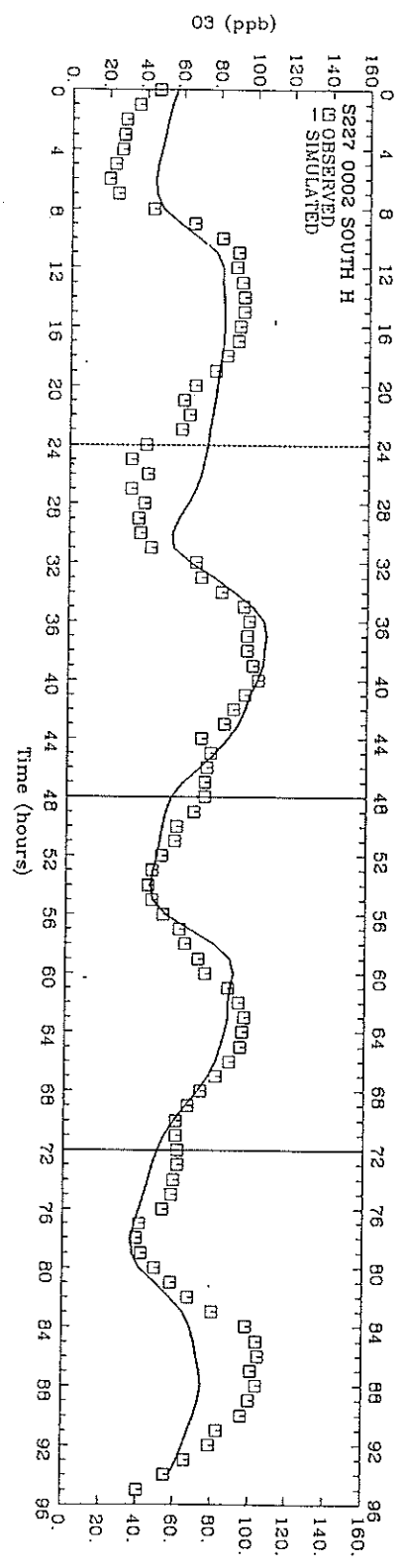




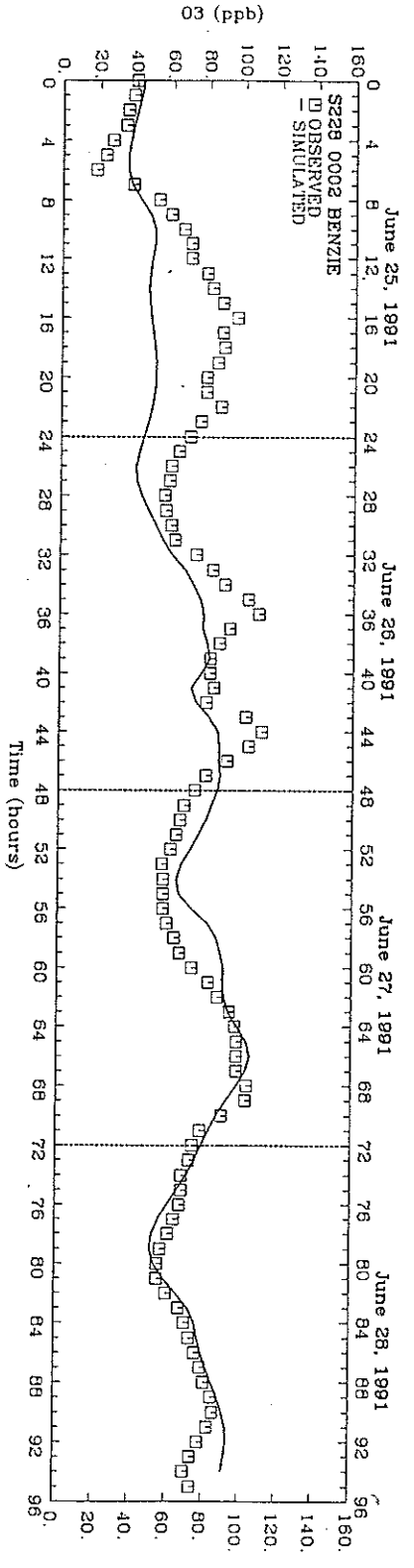
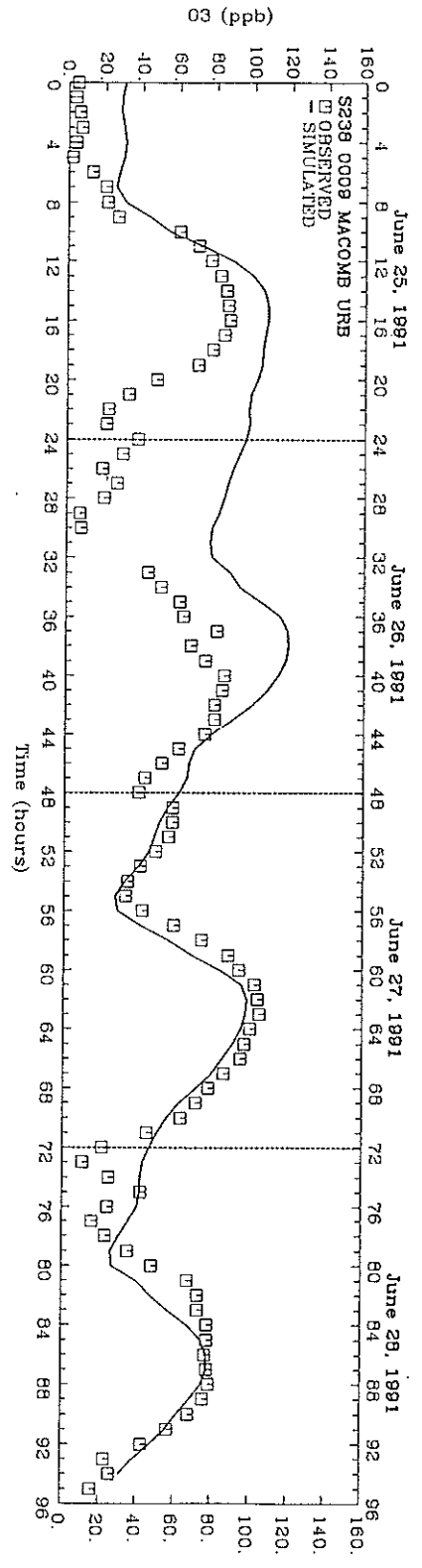
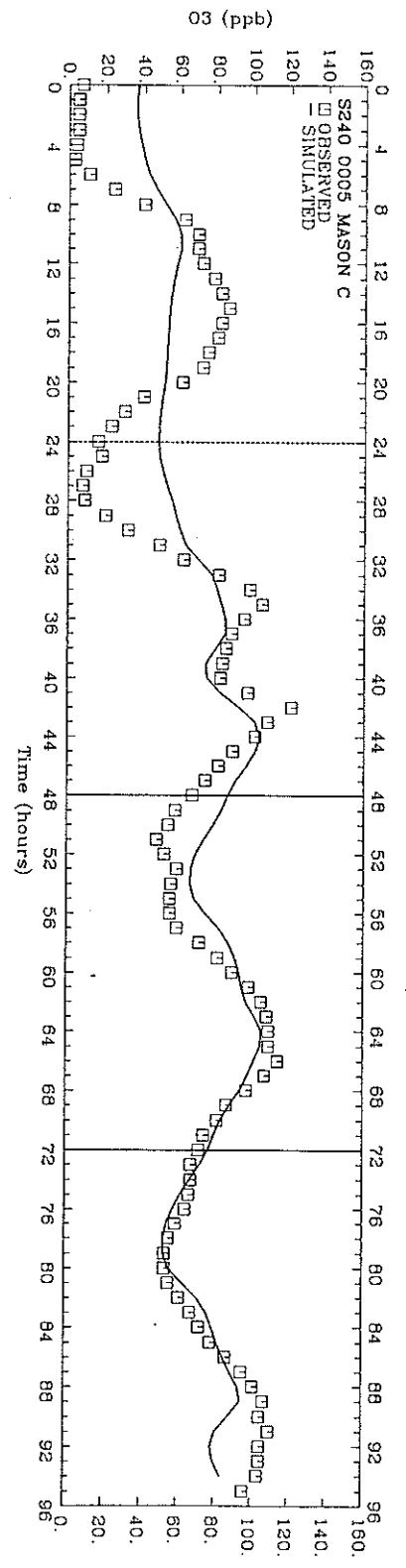
RESULTS
JUNE 1991



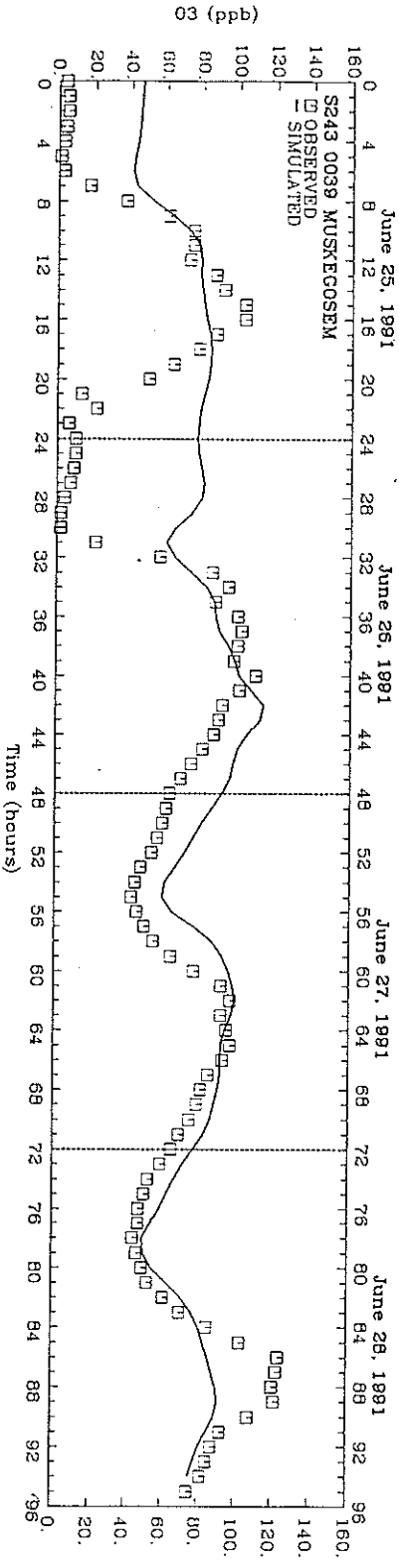
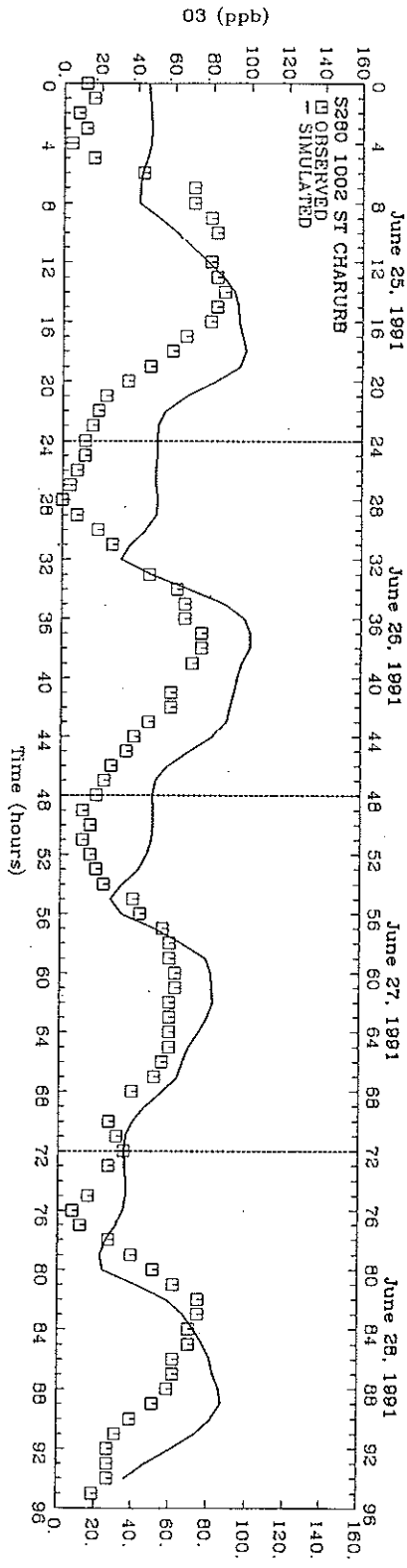
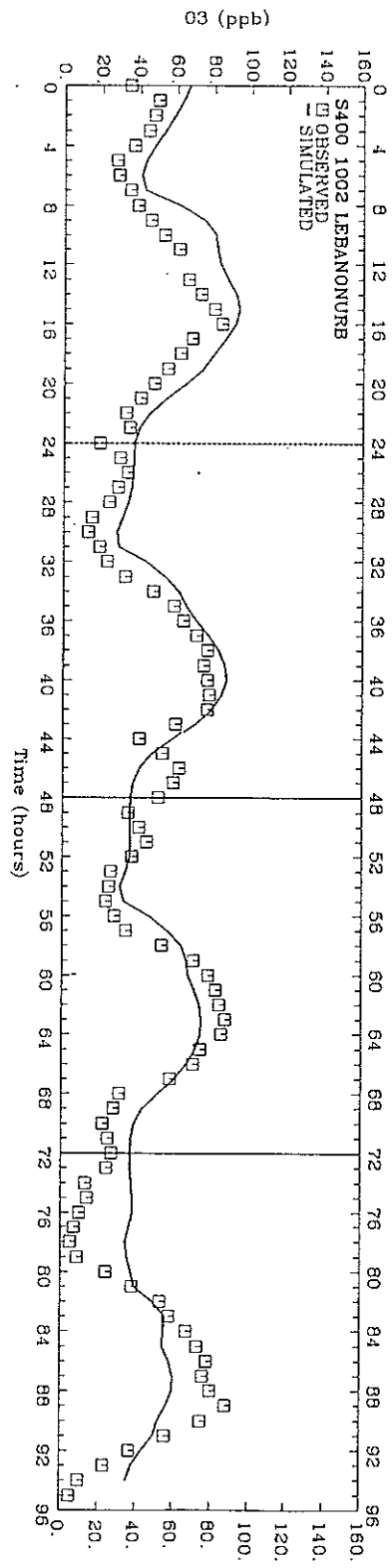
12M UAMV Model Ozone Predictions vs. Ambient Observations
 -- June 24-28, 1991 --



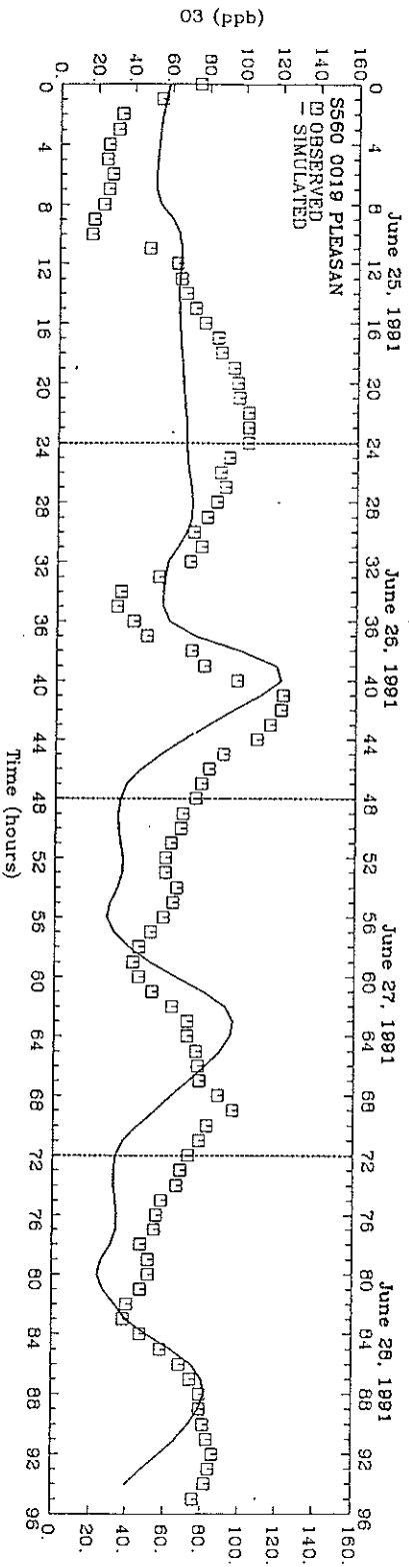
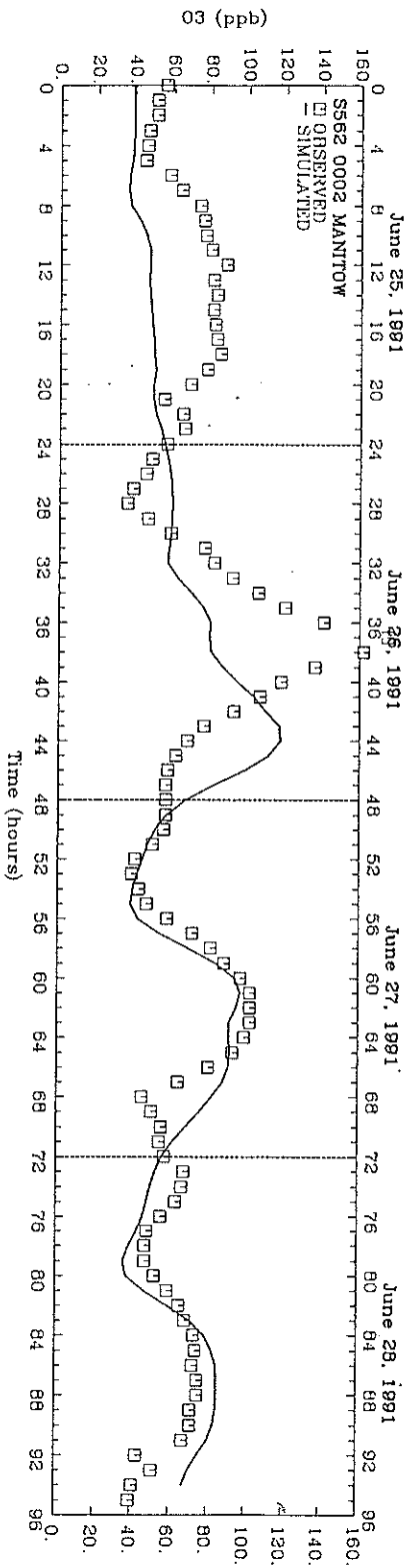
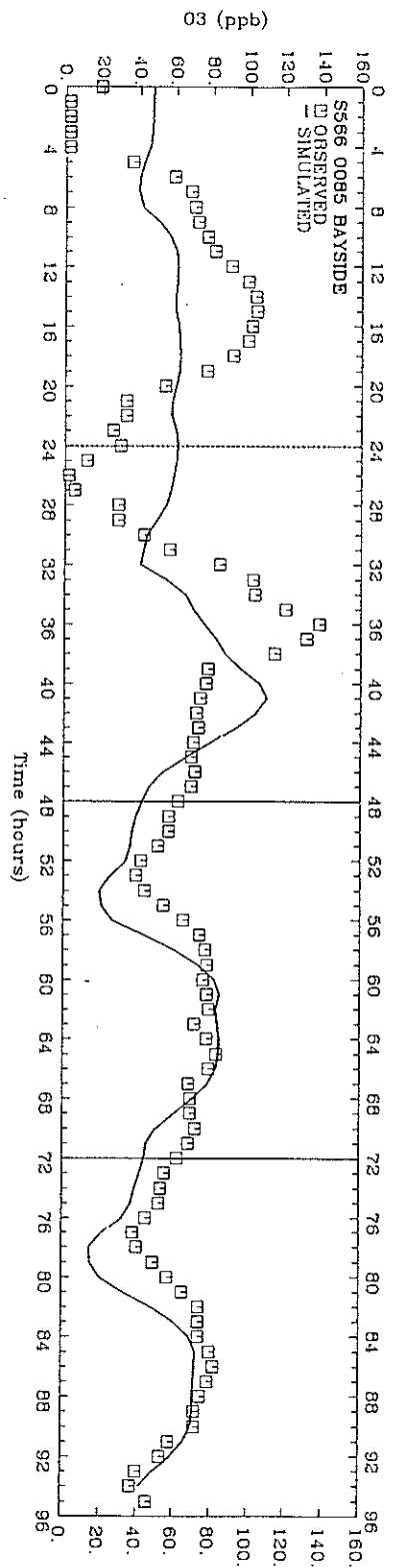
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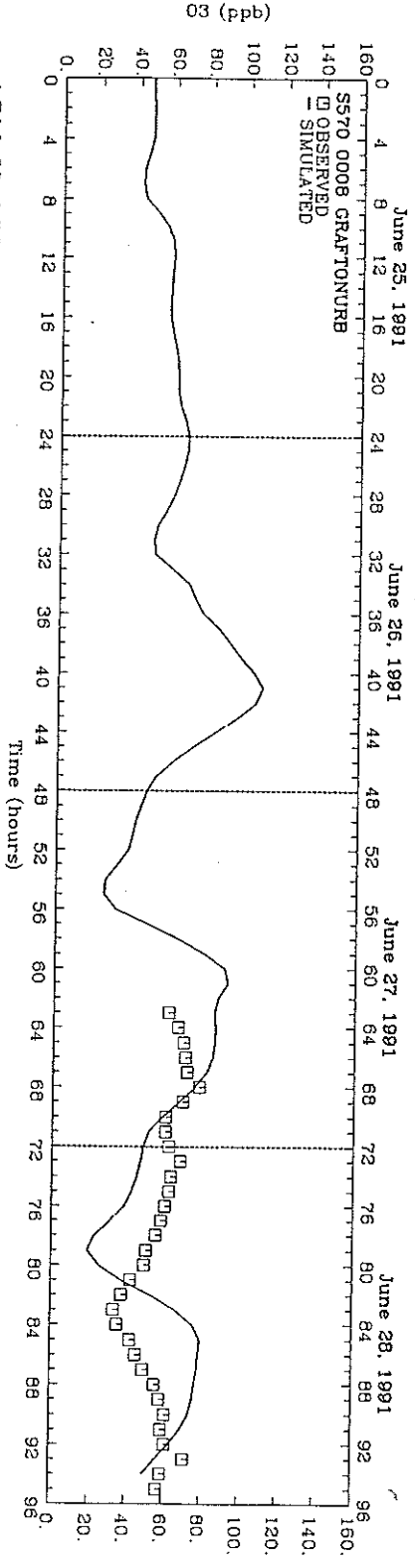
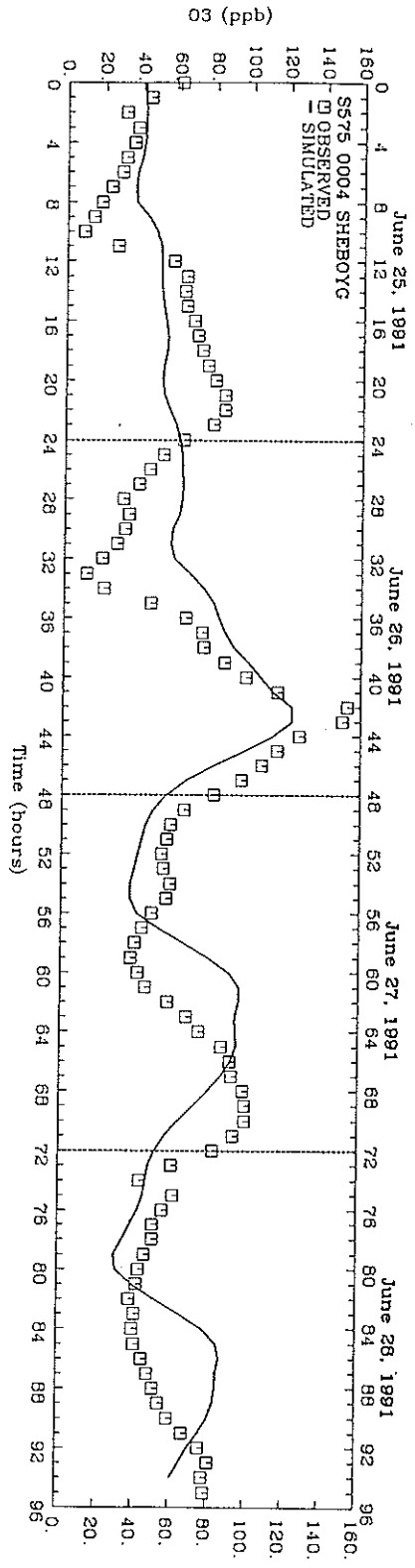
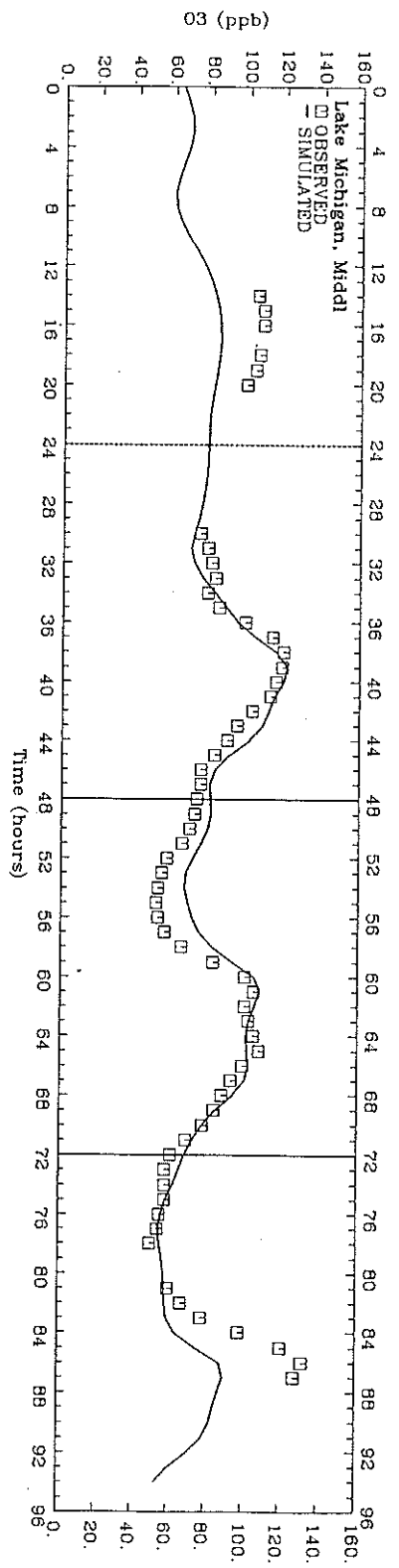
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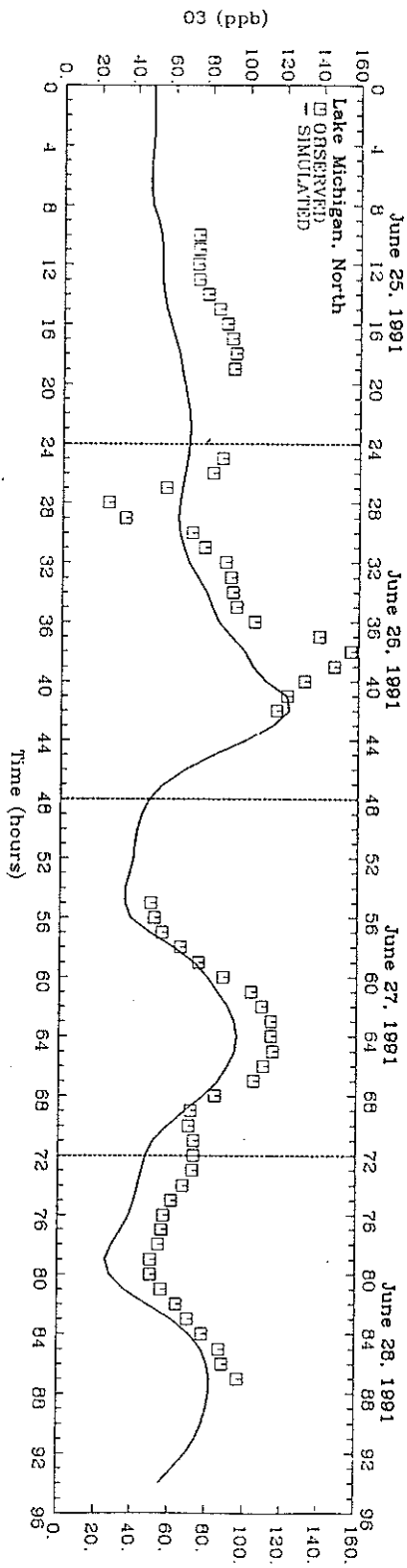
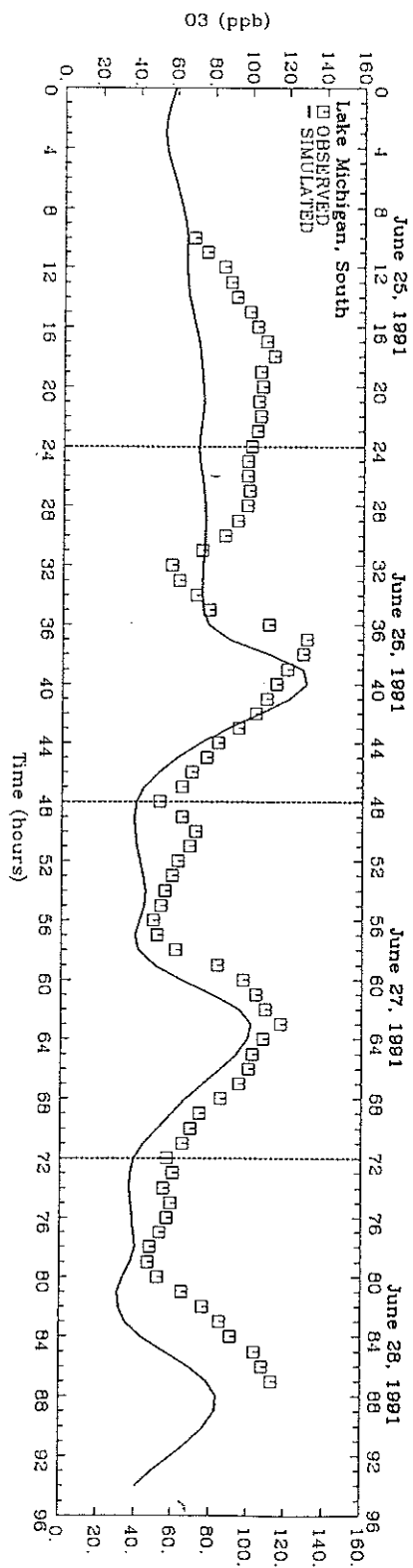
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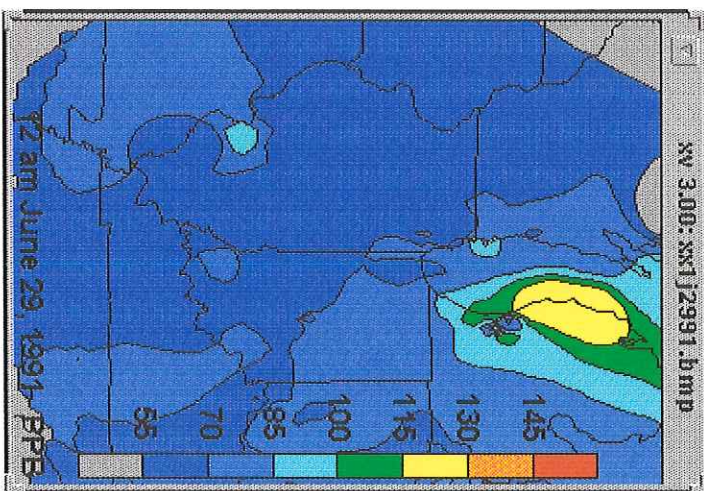
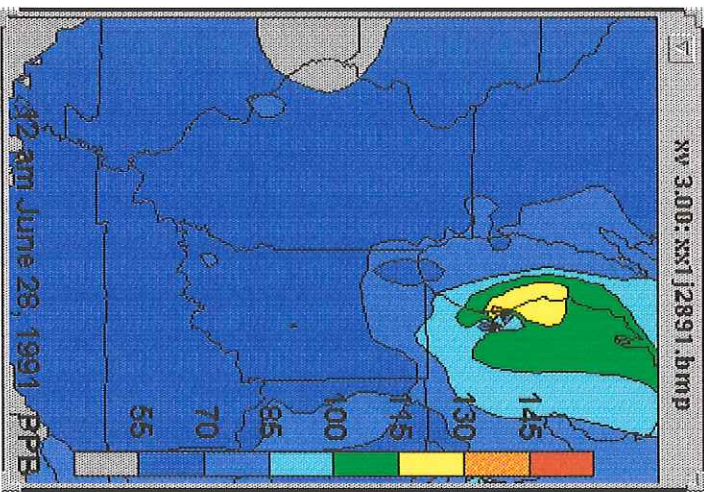
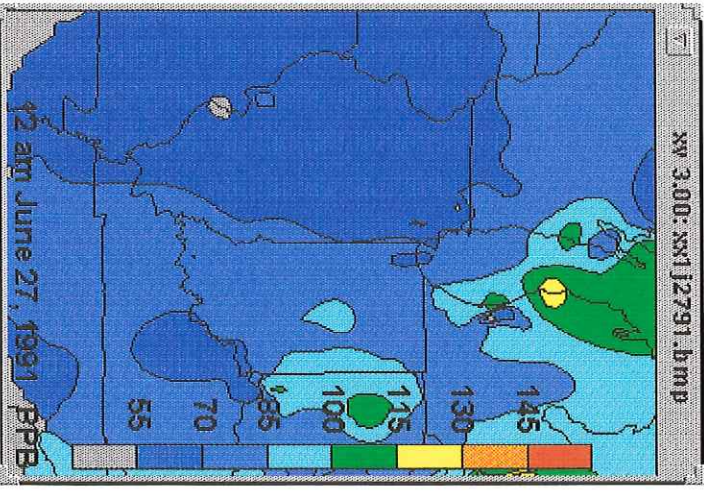
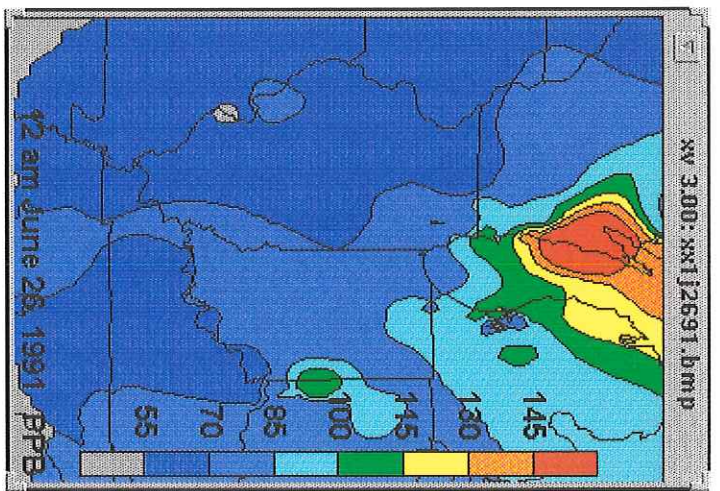
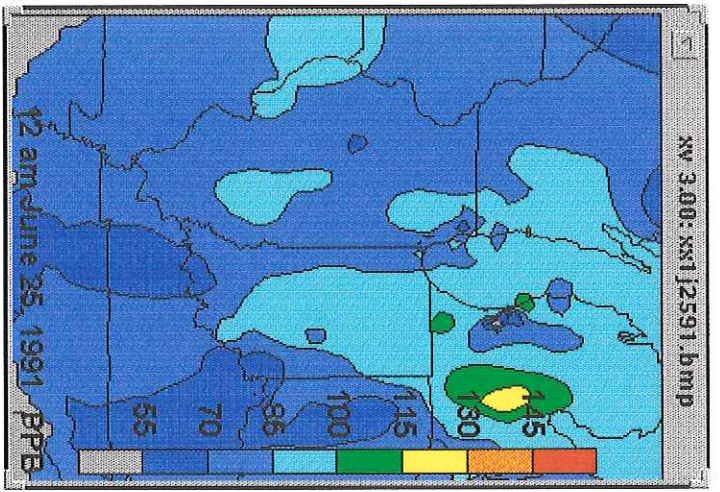
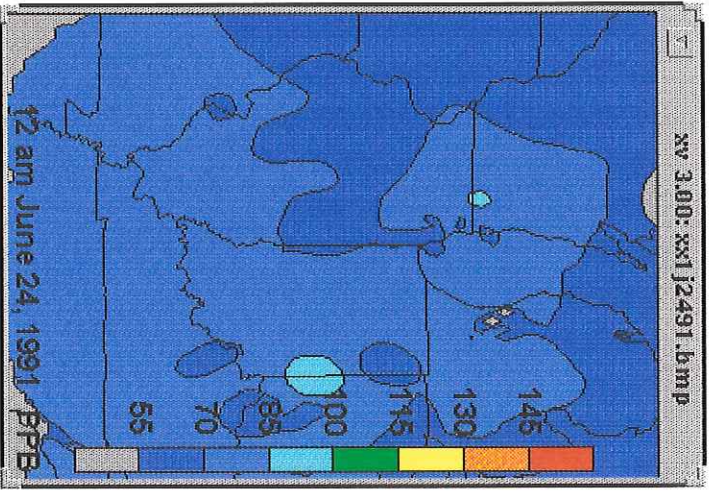
12M UAMV Model Ozone Predictions vs. Ambient Observations
 --- June 24--28, 1991 ---



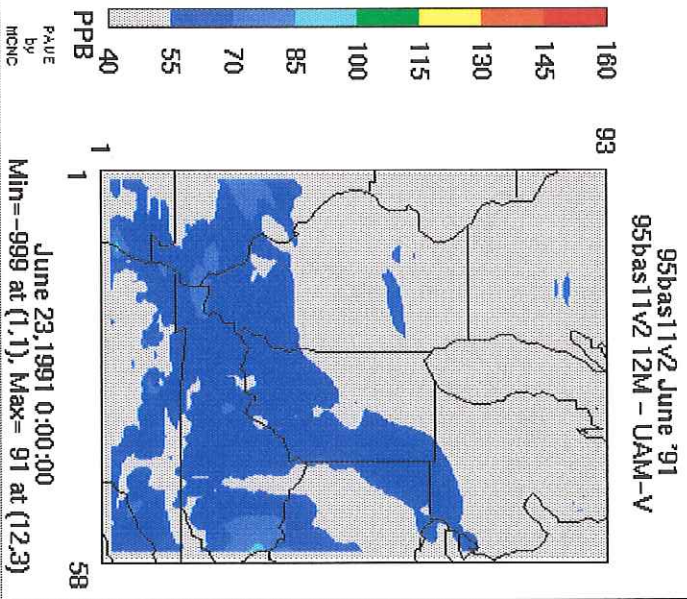
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 --- June 24-28, 1991 ---



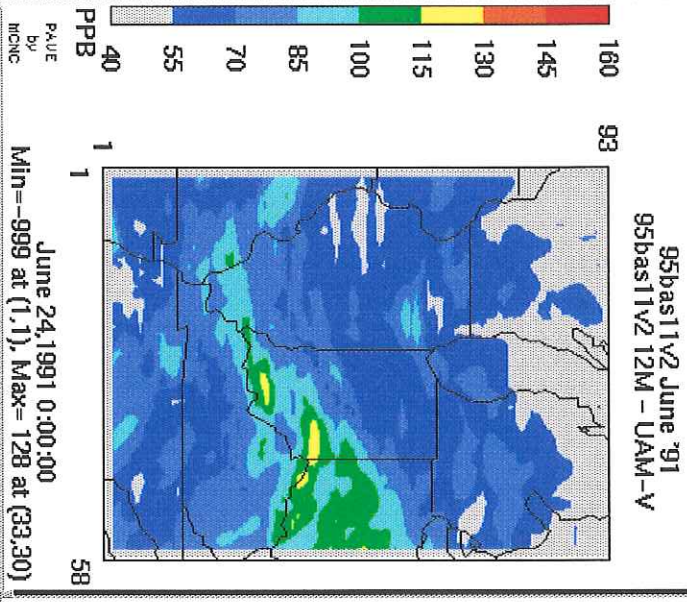
12M UAMV Model Ozone Predictions vs. Ambient Observations
 --- June 24-28, 1991 ---



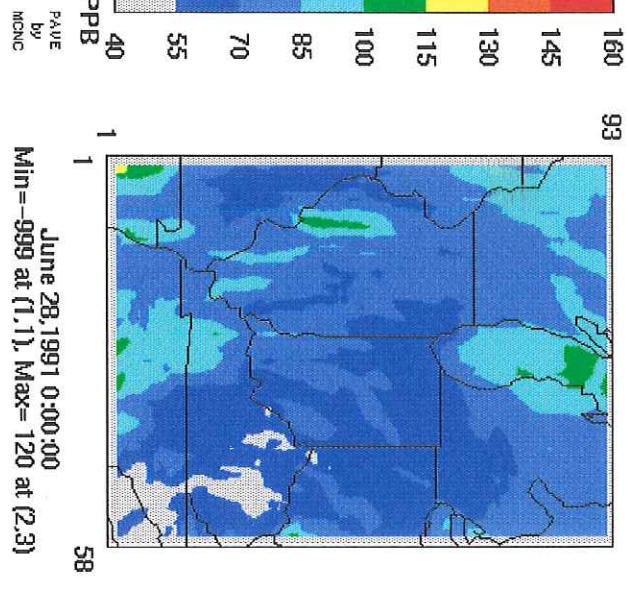
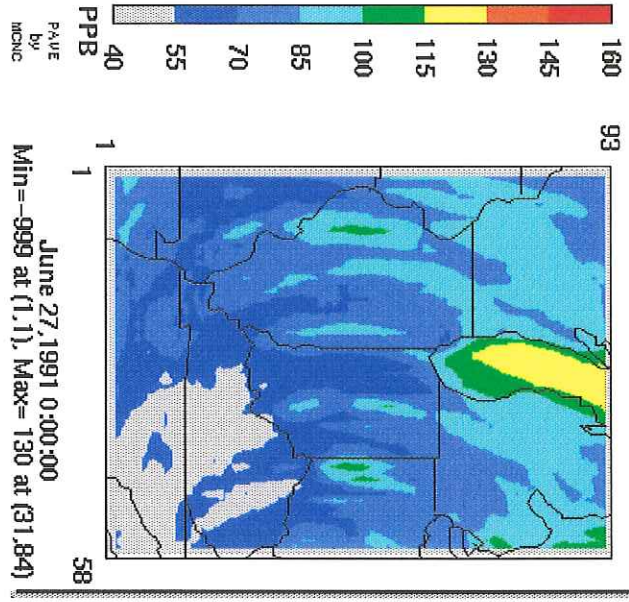
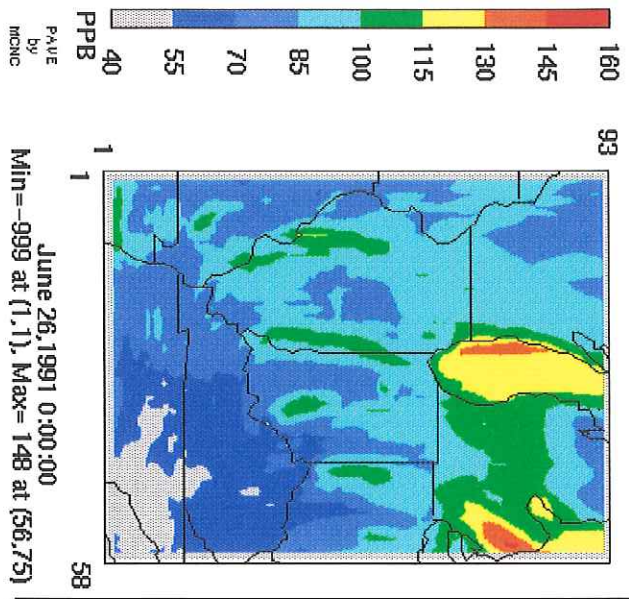
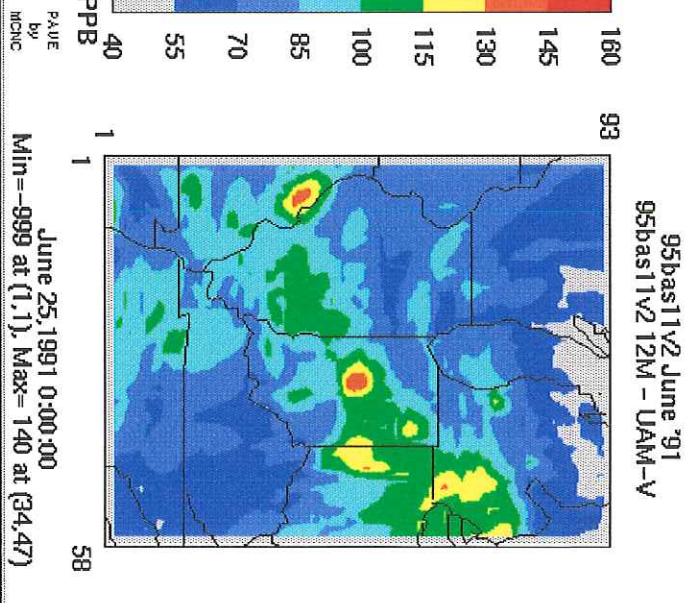
Daily Peak 1-Hour Ozone



Daily Peak 1-Hour Ozone

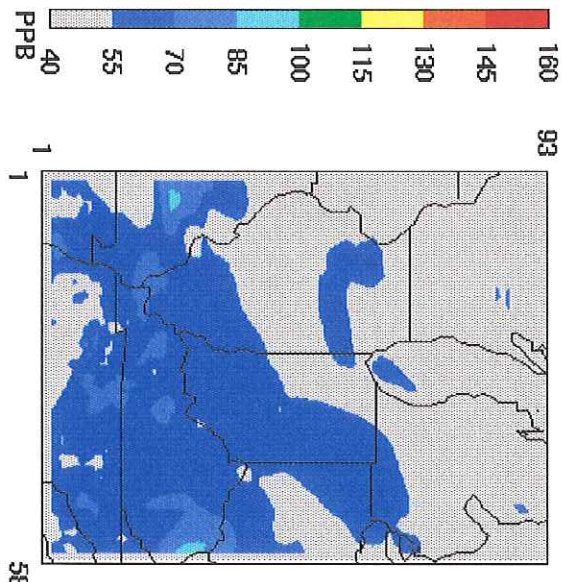


Daily Peak 1-Hour Ozone



Daily Peak 1-Hour Ozone

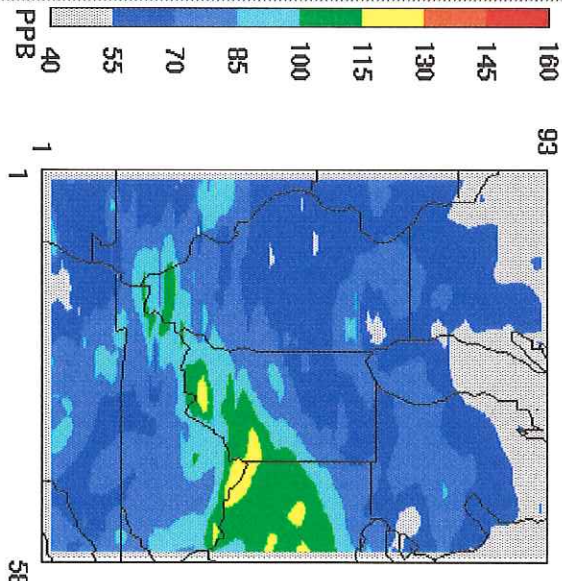
95bas11v2 June '91
95bas11v2 12M -- CAMx v2.01



June 23, 1991 0:00:00
Min=-999 at (1,1), Max= 90 at (57,27)

Daily Peak 1-Hour Ozone

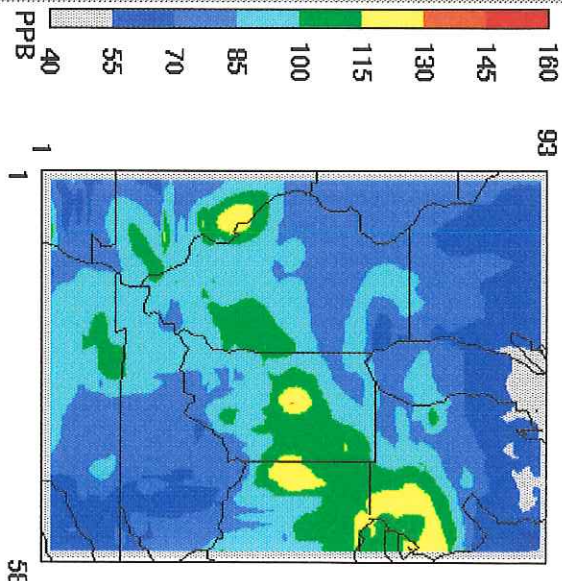
95bas11v2 June '91
95bas11v2 12M -- CAMx v2.01



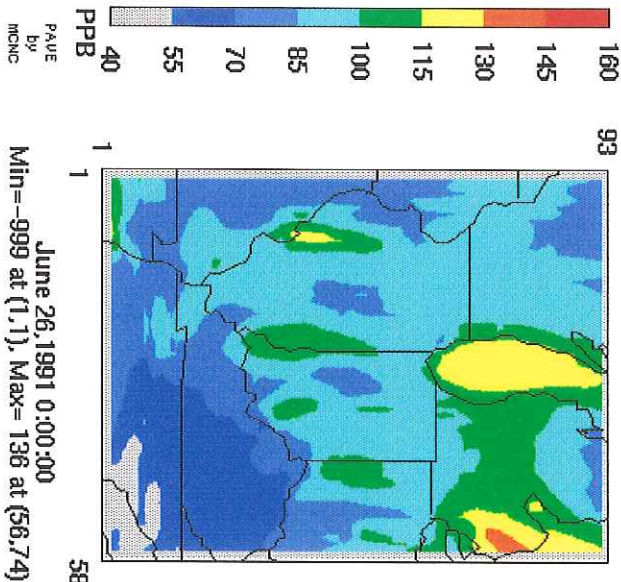
June 24, 1991 0:00:00
Min=-999 at (1,1), Max= 128 at (46,36)

Daily Peak 1-Hour Ozone

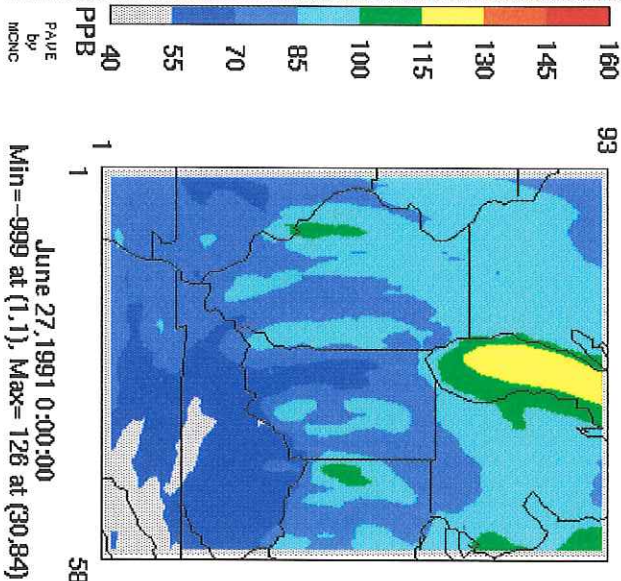
95bas11v2 June '91
95bas11v2 12M -- CAMx v2.01



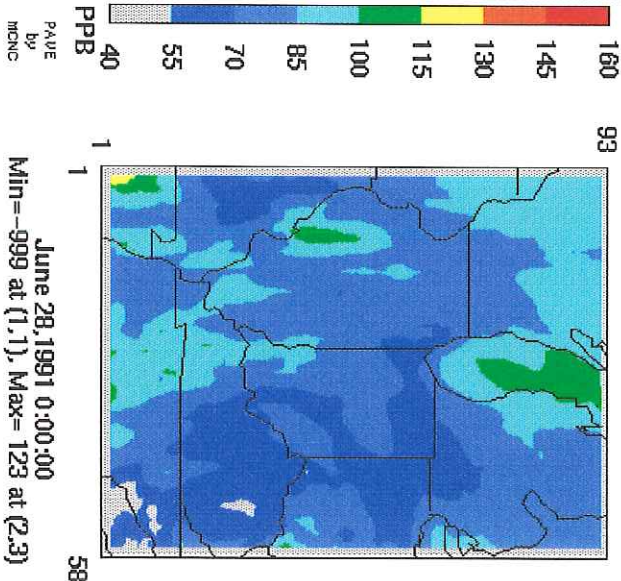
June 25, 1991 0:00:00
Min=-999 at (1,1), Max= 130 at (35,46)



June 26, 1991 0:00:00
Min=-999 at (1,1), Max= 136 at (56,74)



June 27, 1991 0:00:00
Min=-999 at (1,1), Max= 126 at (30,84)

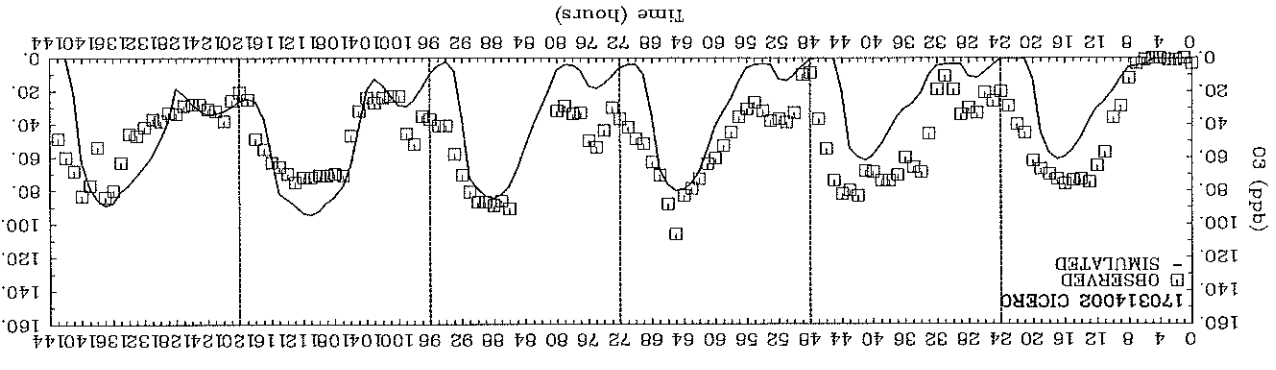
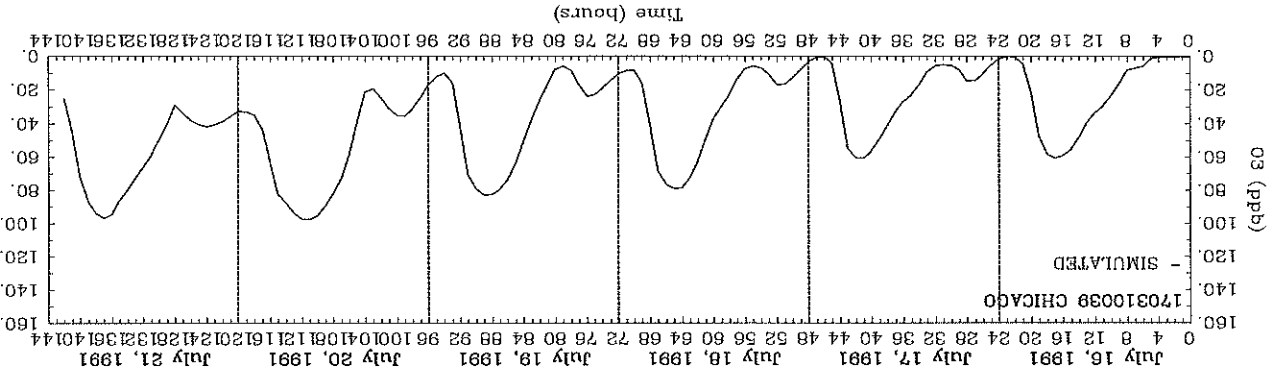
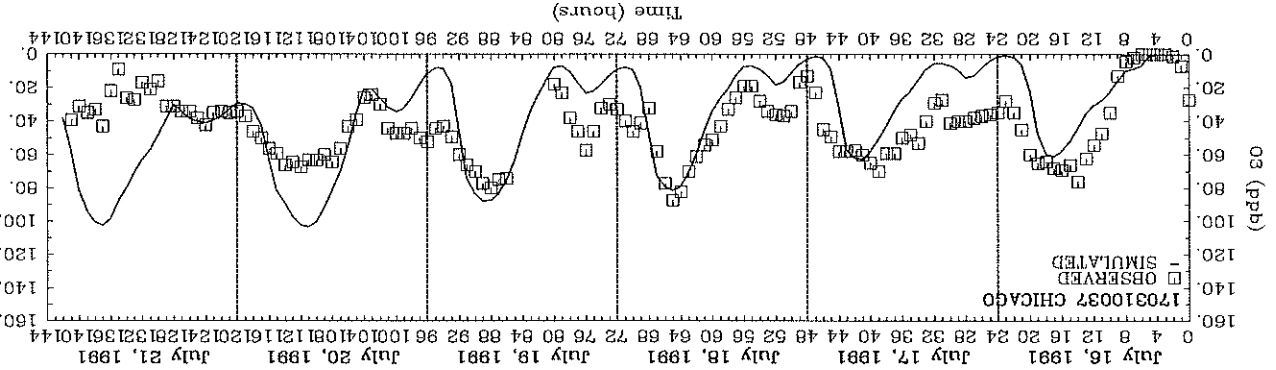
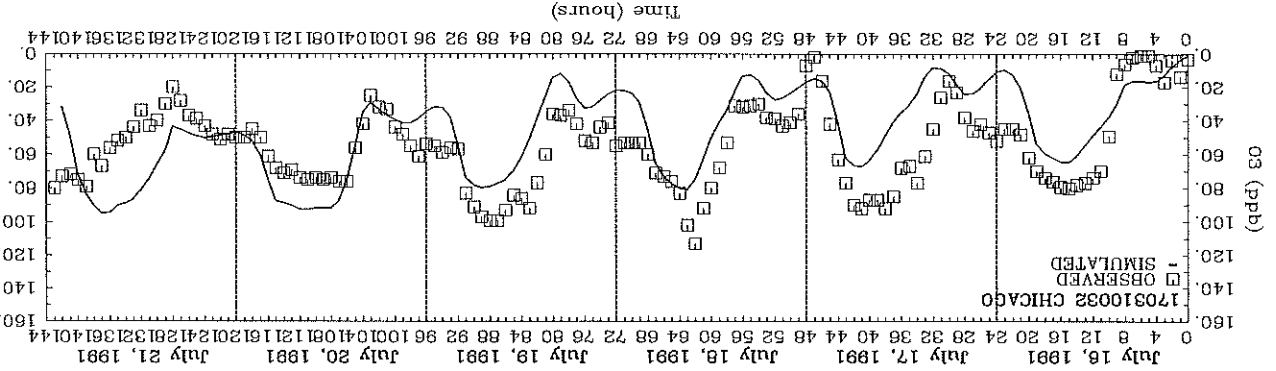


June 28, 1991 0:00:00
Min=-999 at (1,1), Max= 123 at (2,3)

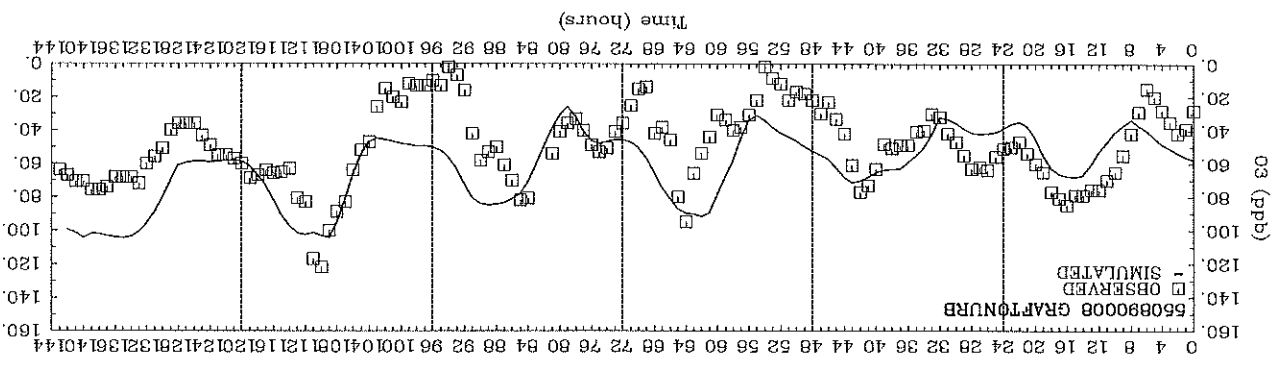
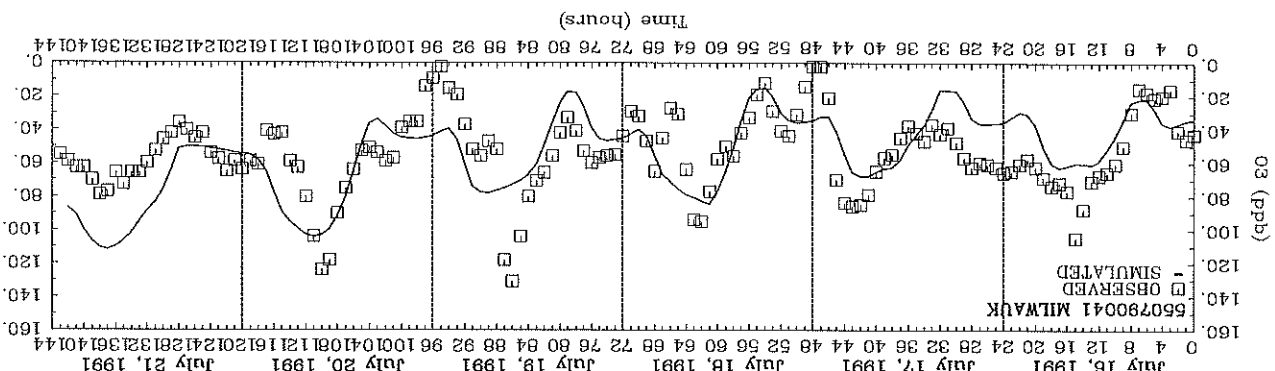
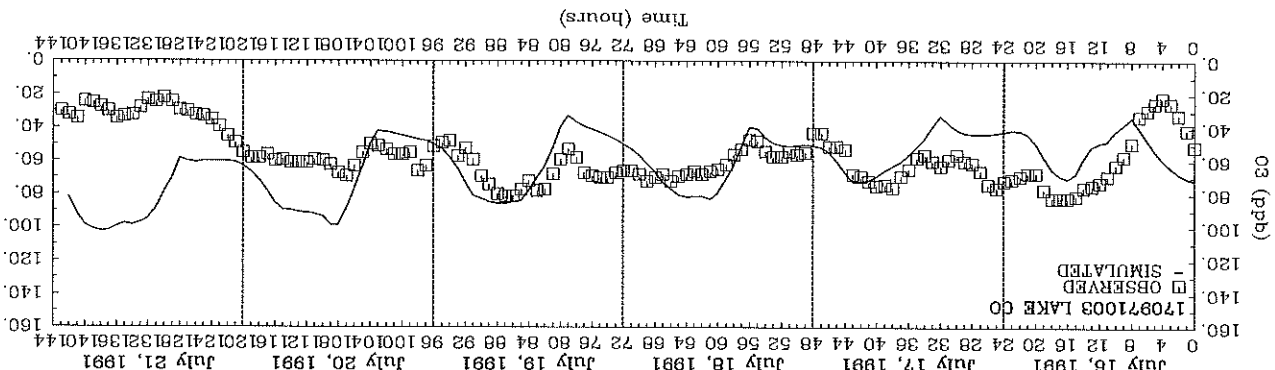
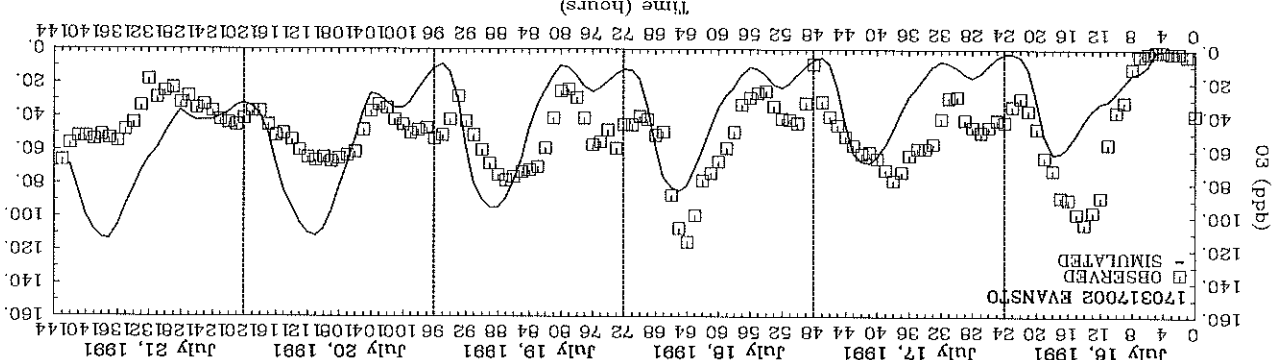
RESULTS

JULY 1991

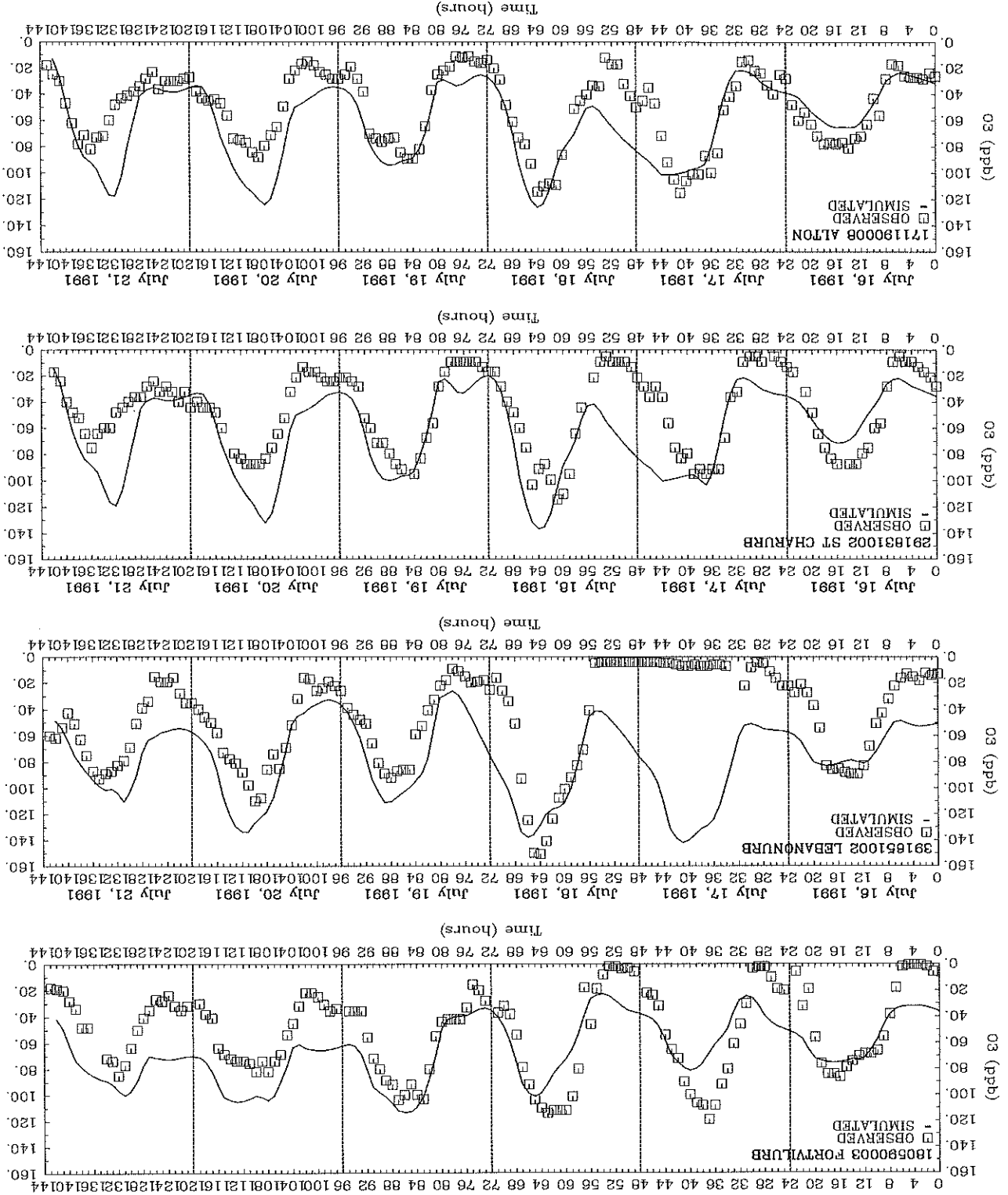
TIME SERIES of Simulated vs. Observed Ozone
Lake Michigan Monitoring Sites
July 1991 Episode - 1995 Base Year Scenario



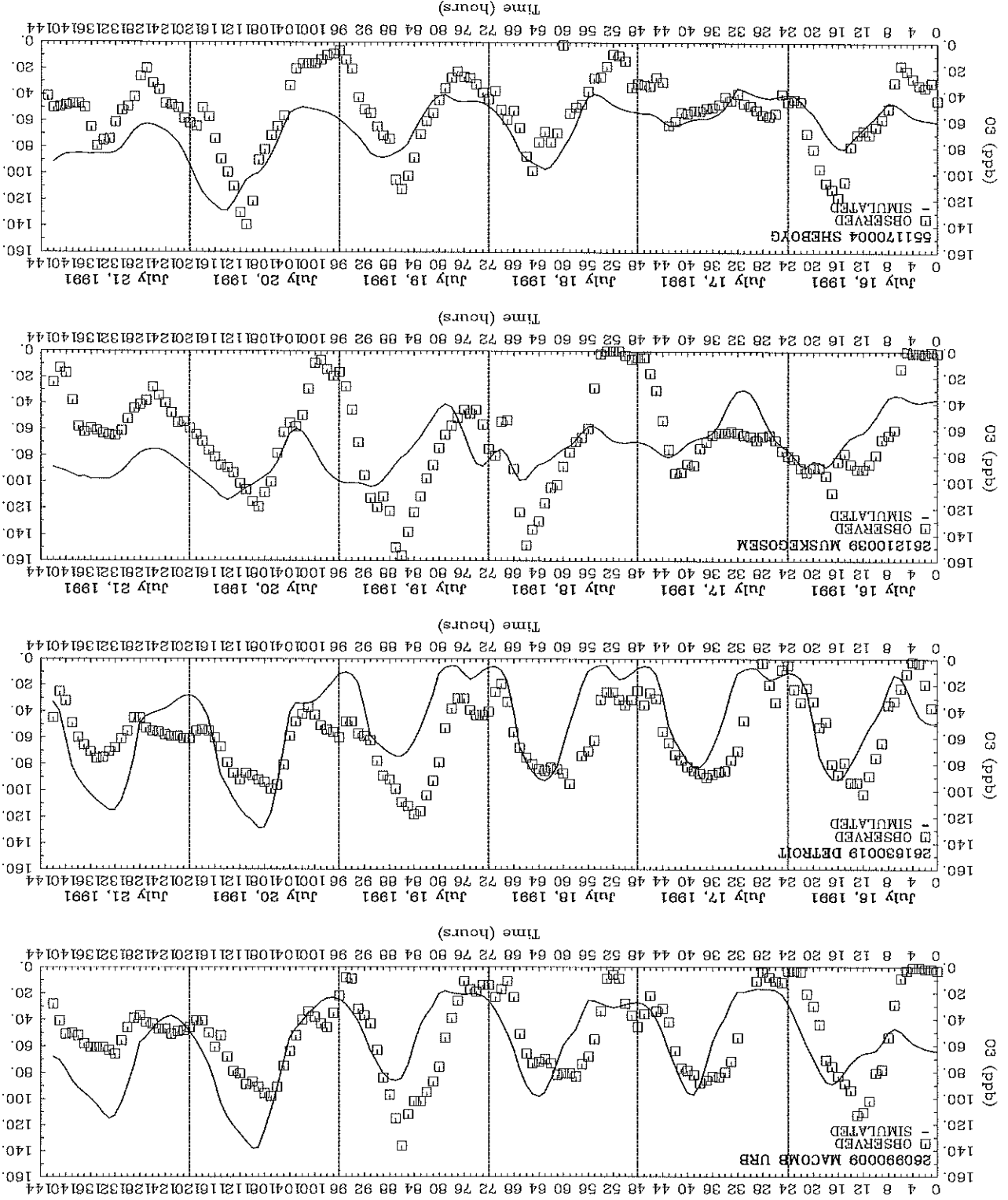
TIME SERIES of Simulated vs. Observed Ozone Lake Michigan Monitoring Sites July 1991 Episode - 1995 Base Year Scenario



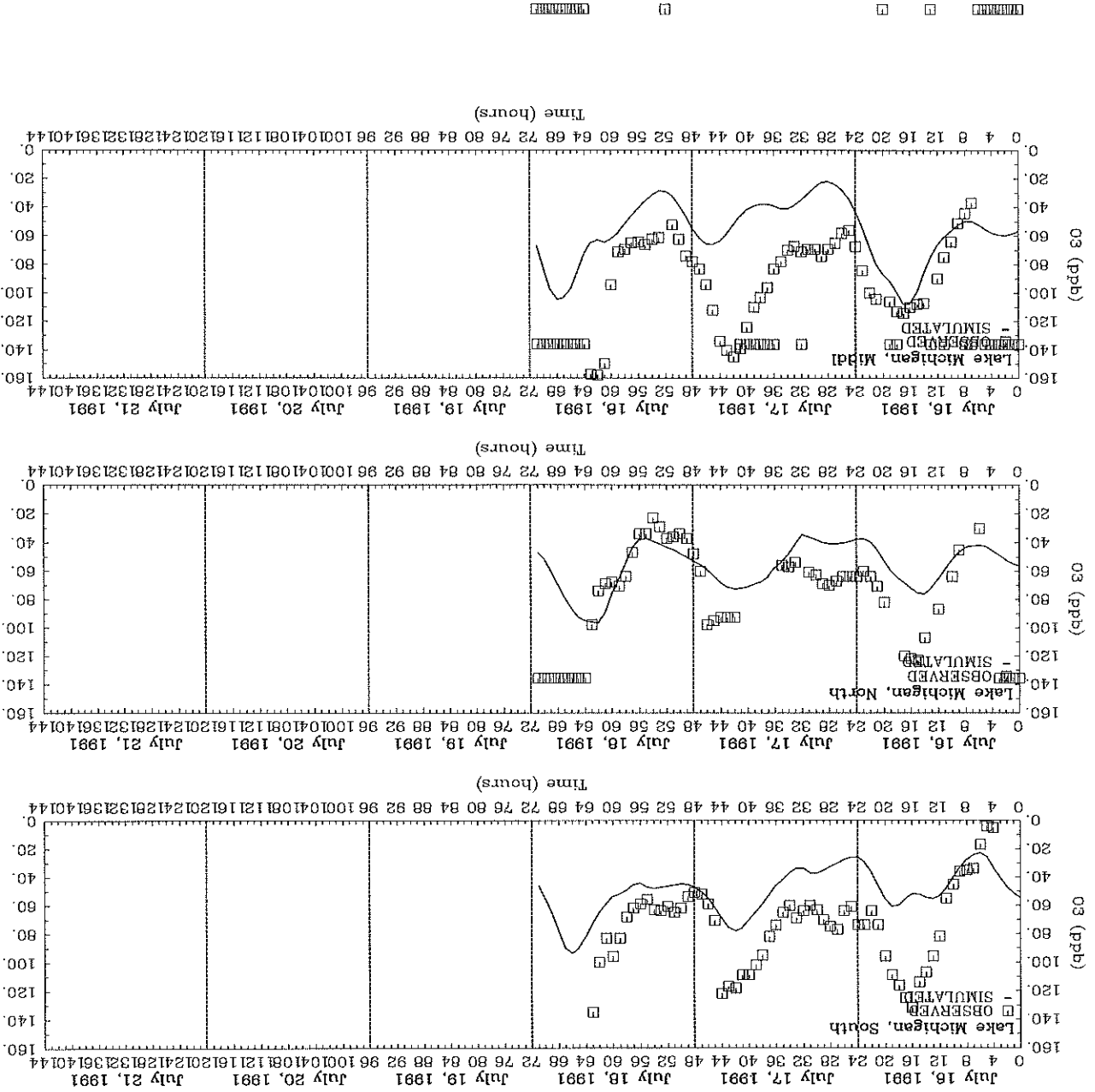
TIME SERIES of Simulated vs. Observed Ozone
Lake Michigan Monitoring Sites
July 1991 Episode - 1995 Base Year Scenario

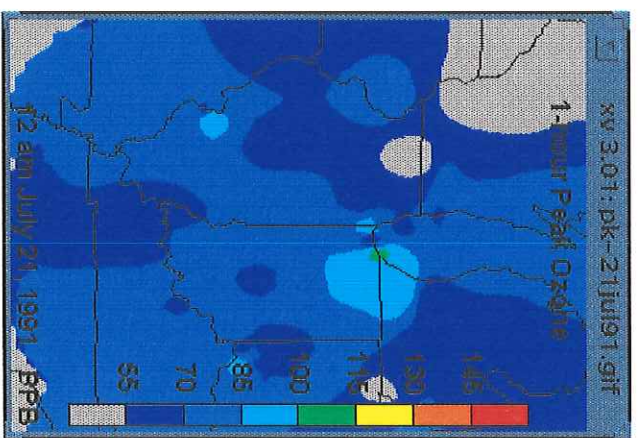
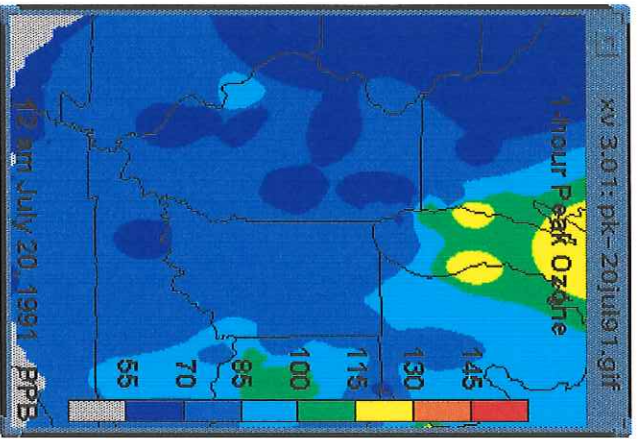
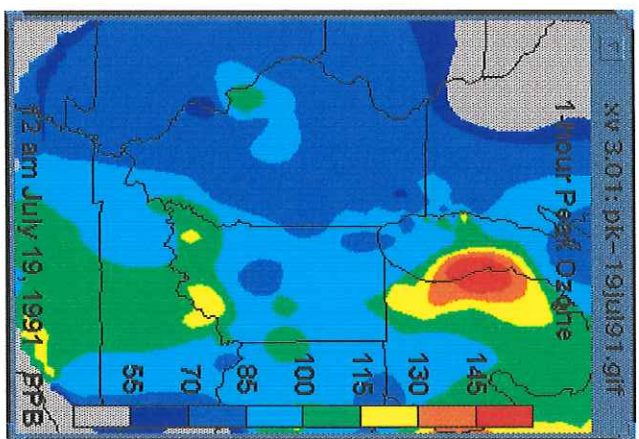
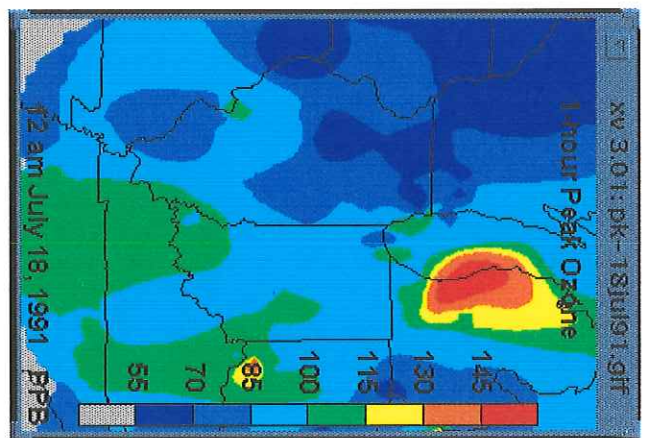
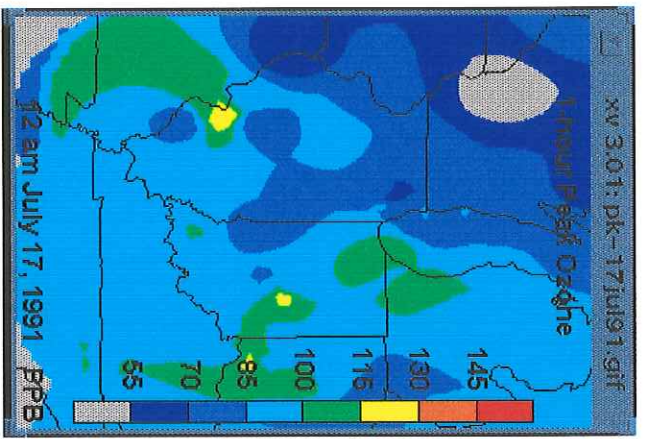
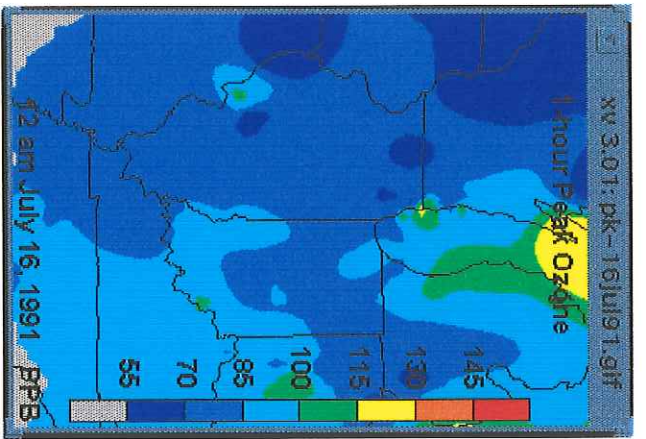


TIME SERIES OF SIMULATED VS. OBSERVED OZONE
Lake Michigan Monitoring Sites
July 1991 Episode - 1995 Base Year Scenario



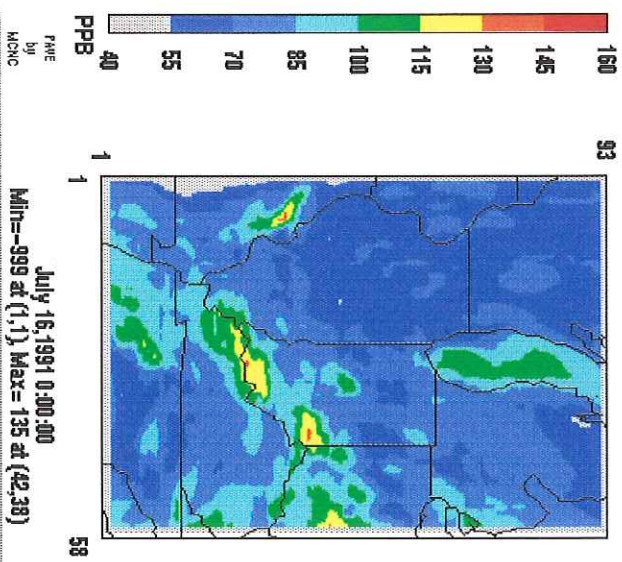
TIME SERIES of Simulated vs. Observed Ozone
Lake Michigan Monitoring Sites
July 1991 Episode - 1995 Base Year Scenario





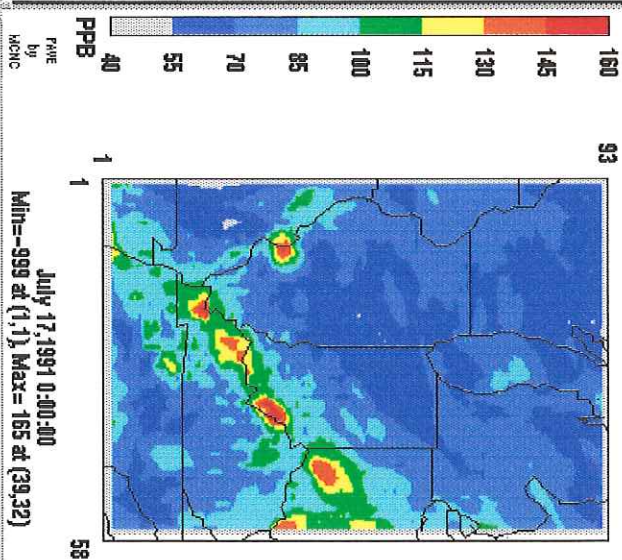
Daily Peak 1-Hour Ozone

1995 base case emissions w/UAMV
95bas1v2 (12 km); GridM--(B11)



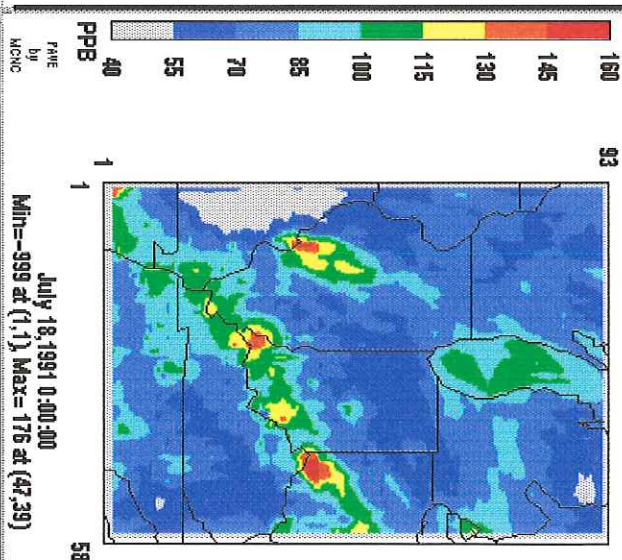
Daily Peak 1-Hour Ozone

1995 base case emissions w/UAMV
95bas1v2 (12 km); GridM--(B11)



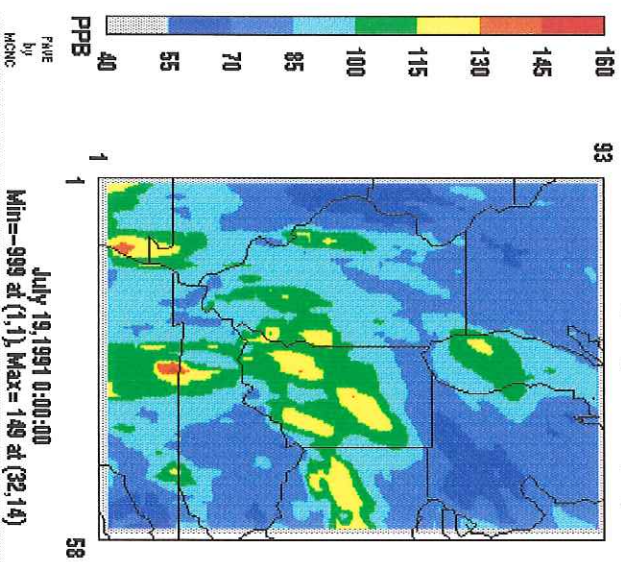
Daily Peak 1-Hour Ozone

1995 base case emissions w/UAMV
95bas1v2 (12 km); GridM--(B11)



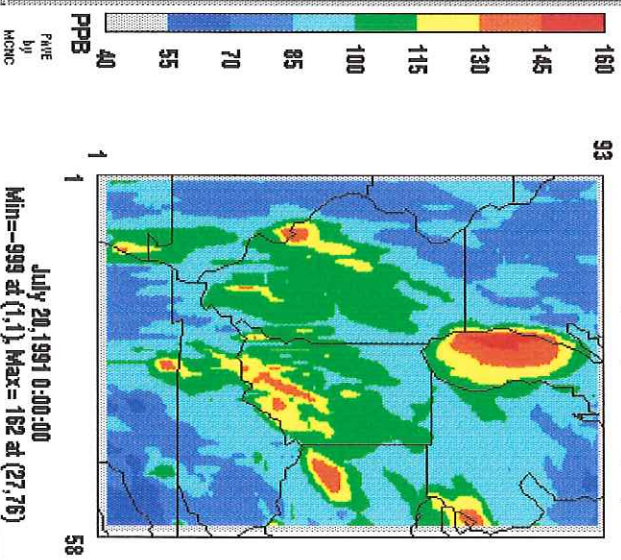
Daily Peak 1-Hour Ozone

1995 base case emissions w/UAMV
95bas1v2 (12 km); GridM--(B11)



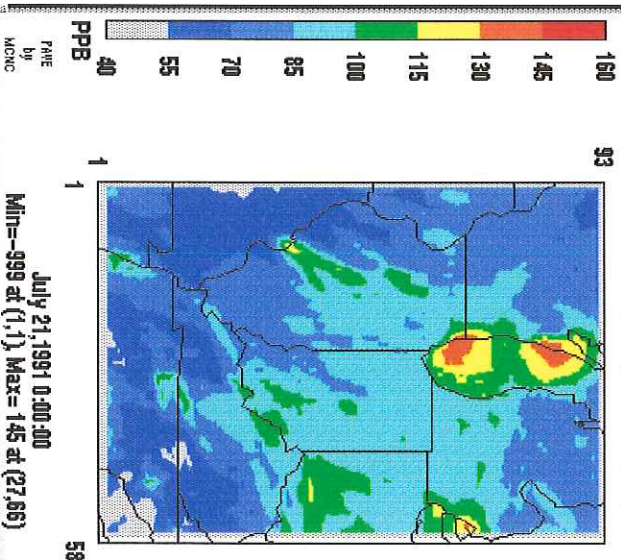
Daily Peak 1-Hour Ozone

1995 base case emissions w/UAMV
95bas1v2 (12 km); GridM--(B11)



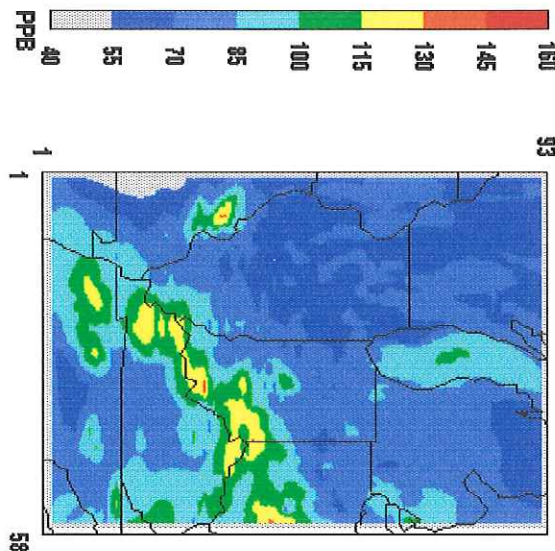
Daily Peak 1-Hour Ozone

1995 base case emissions w/UAMV
95bas1v2 (12 km); GridM--(B11)



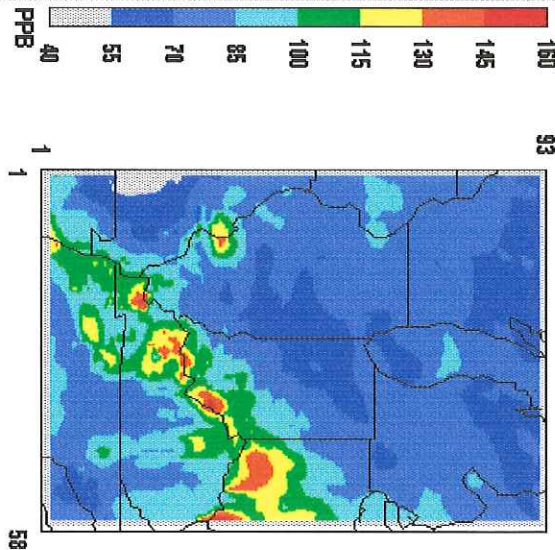
Daily Peak 1-Hour Ozone

1995 base case emissions w/CAMx
95bas11v2 (12 km): GridM--(B11)



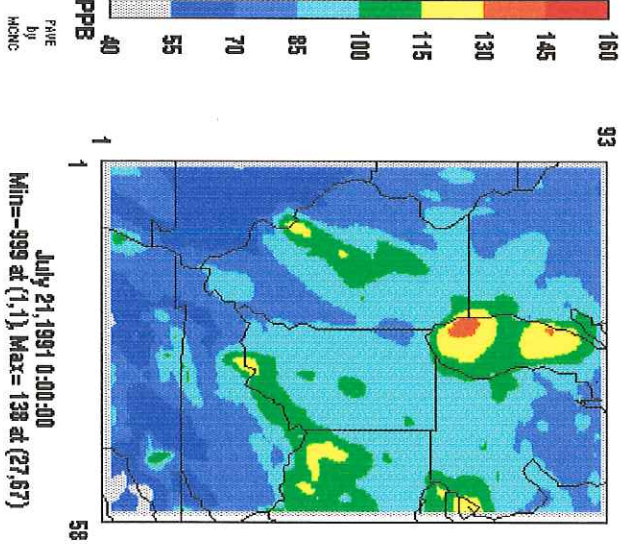
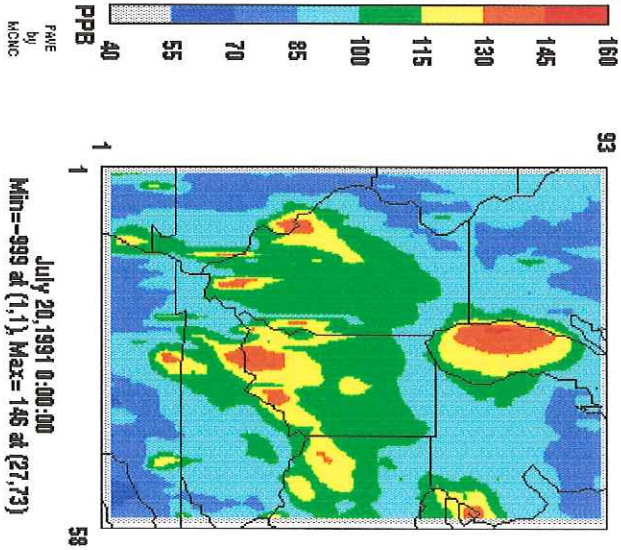
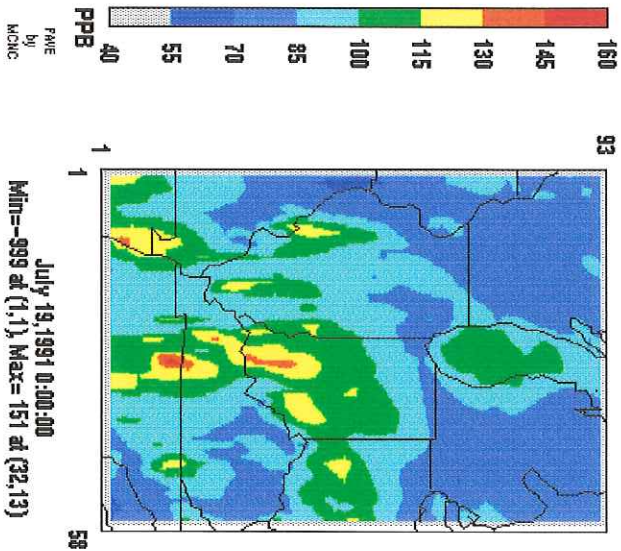
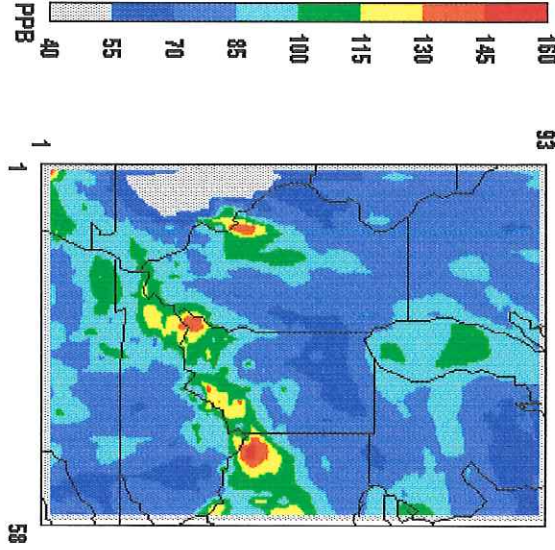
Daily Peak 1-Hour Ozone

1995 base case emissions w/CAMx
95bas11v2 (12 km): GridM--(B11)

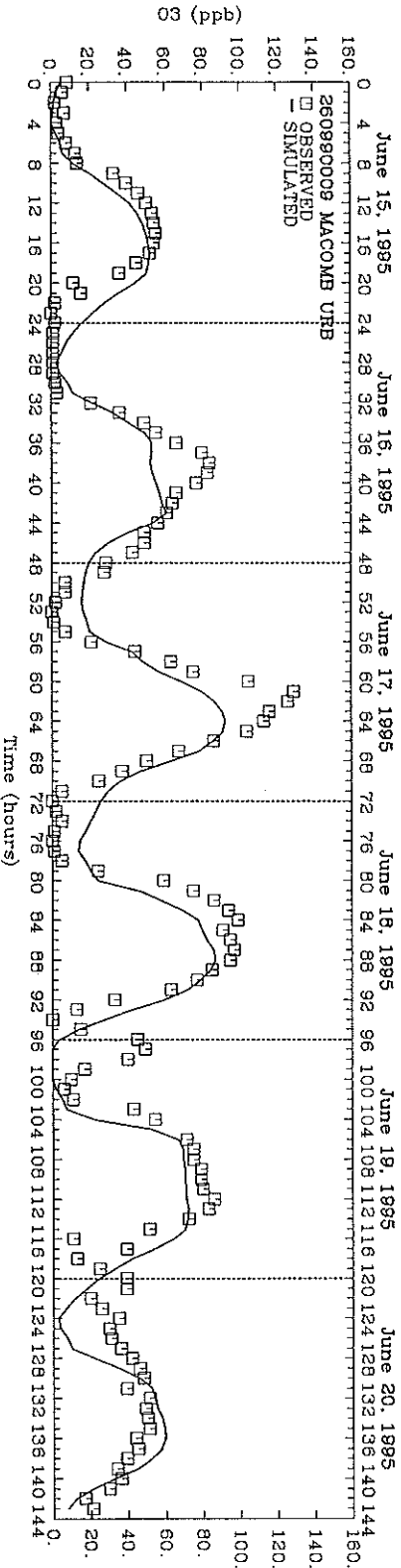
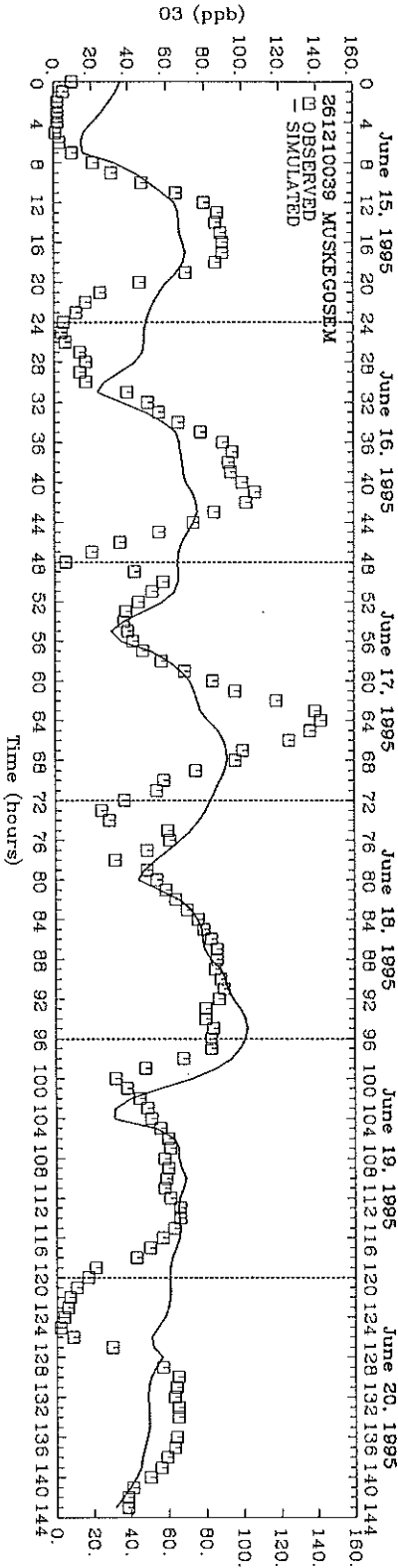
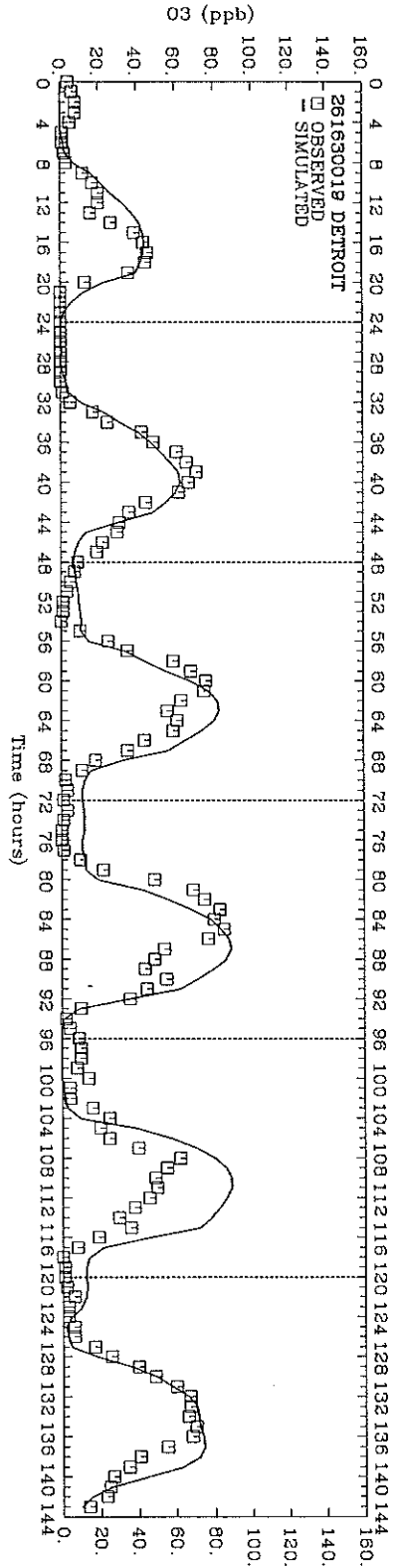


Daily Peak 1-Hour Ozone

1995 base case emissions w/CAMx
95bas11v2 (12 km): GridM--(B11)



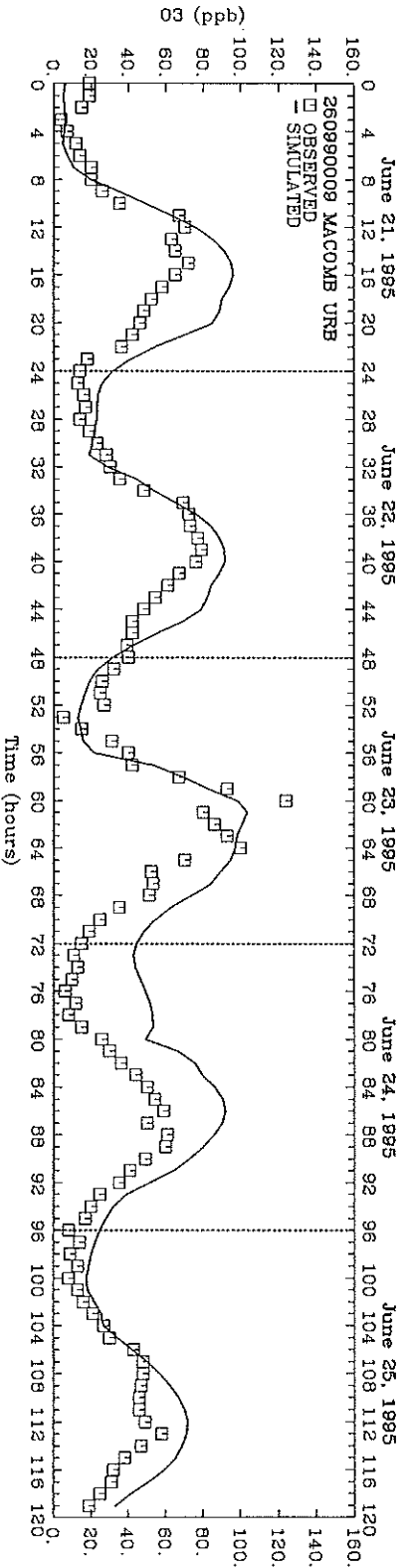
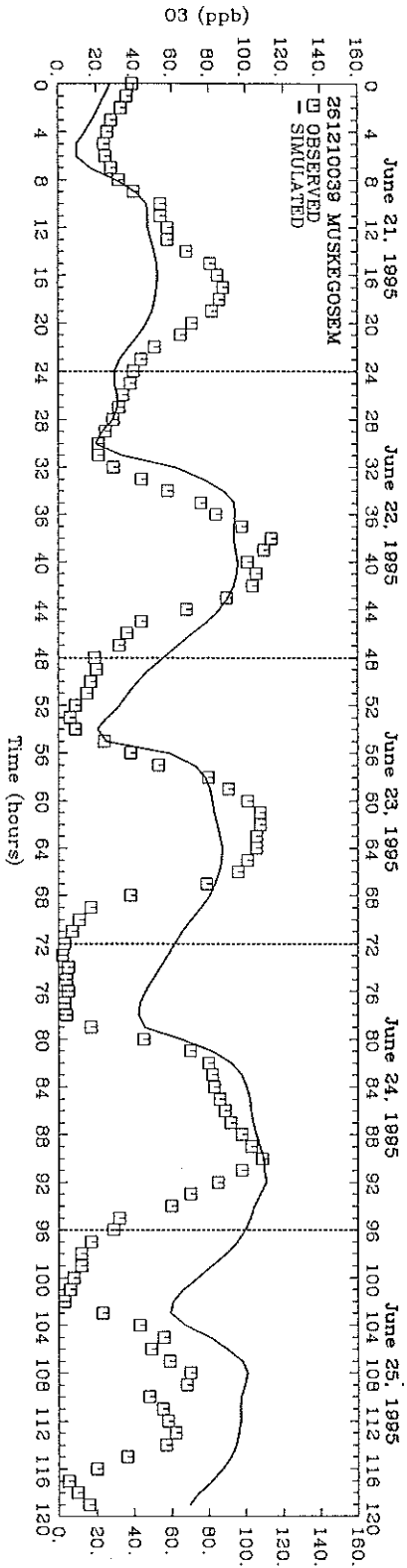
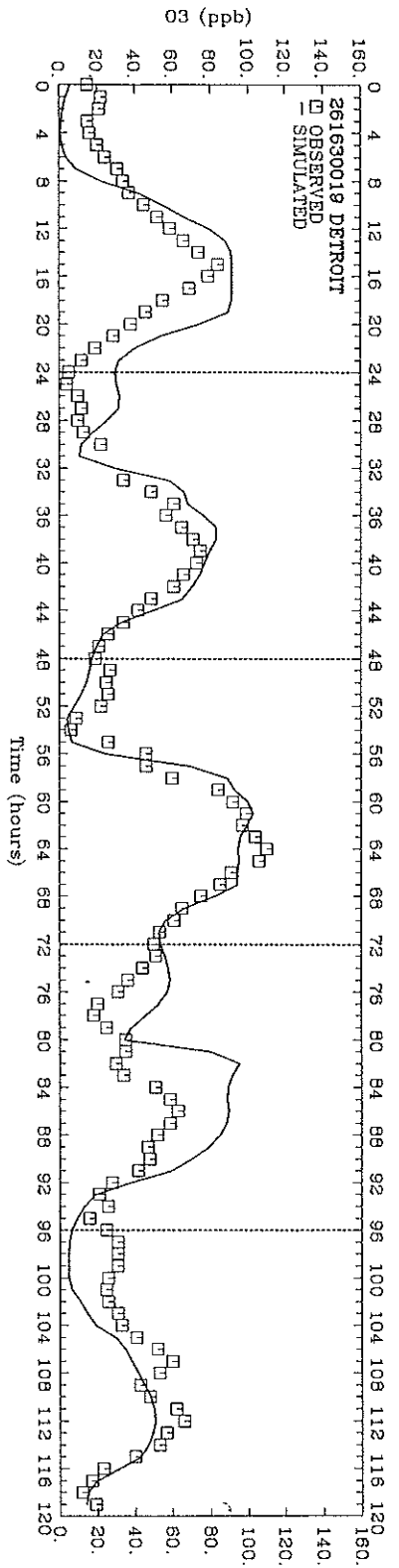
JUNE 1995
RESULTS



Grid M UAMV Model Ozone Predictions vs. Ambient Observations

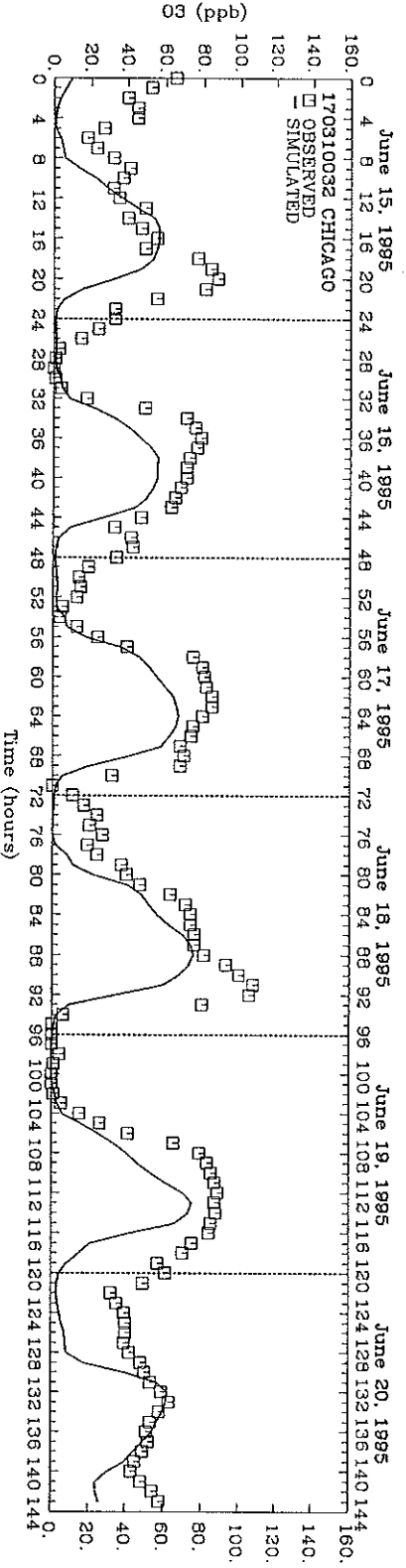
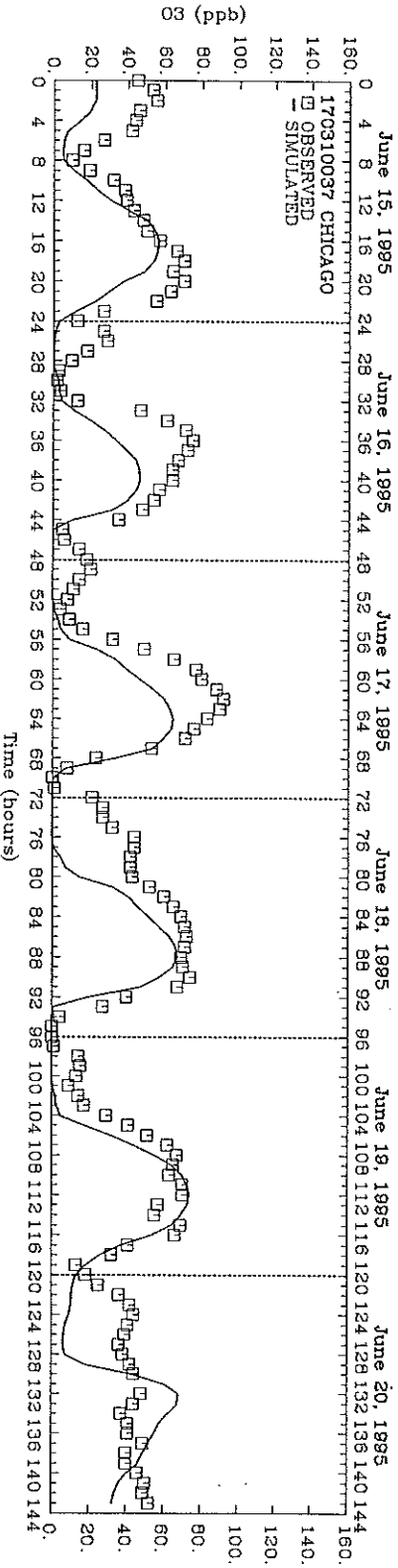
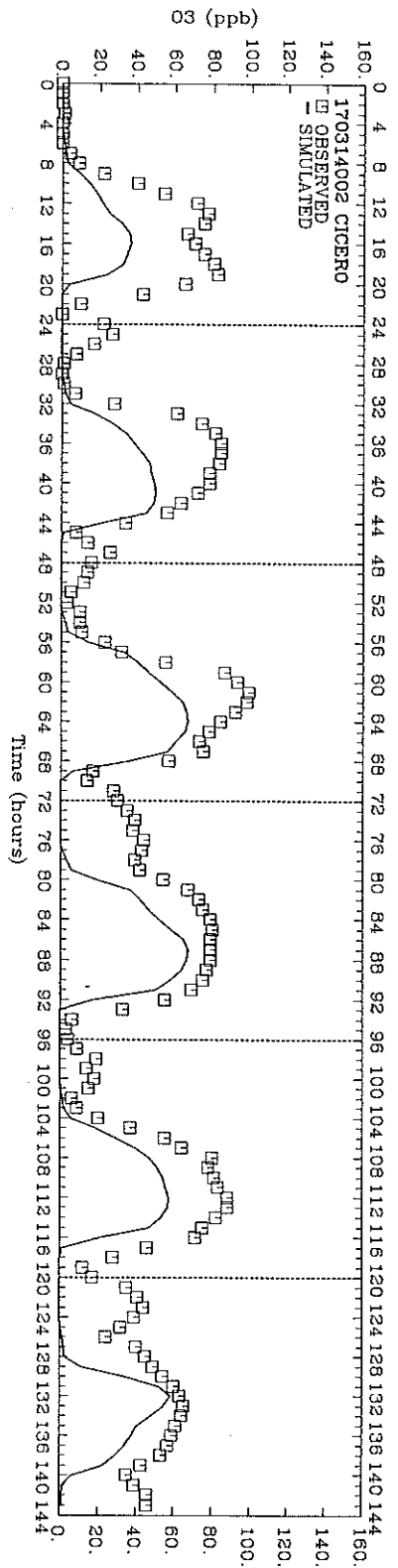
-- June 15-20, 1995 --

95bas11v2 @ 12 km (Stress = 0)



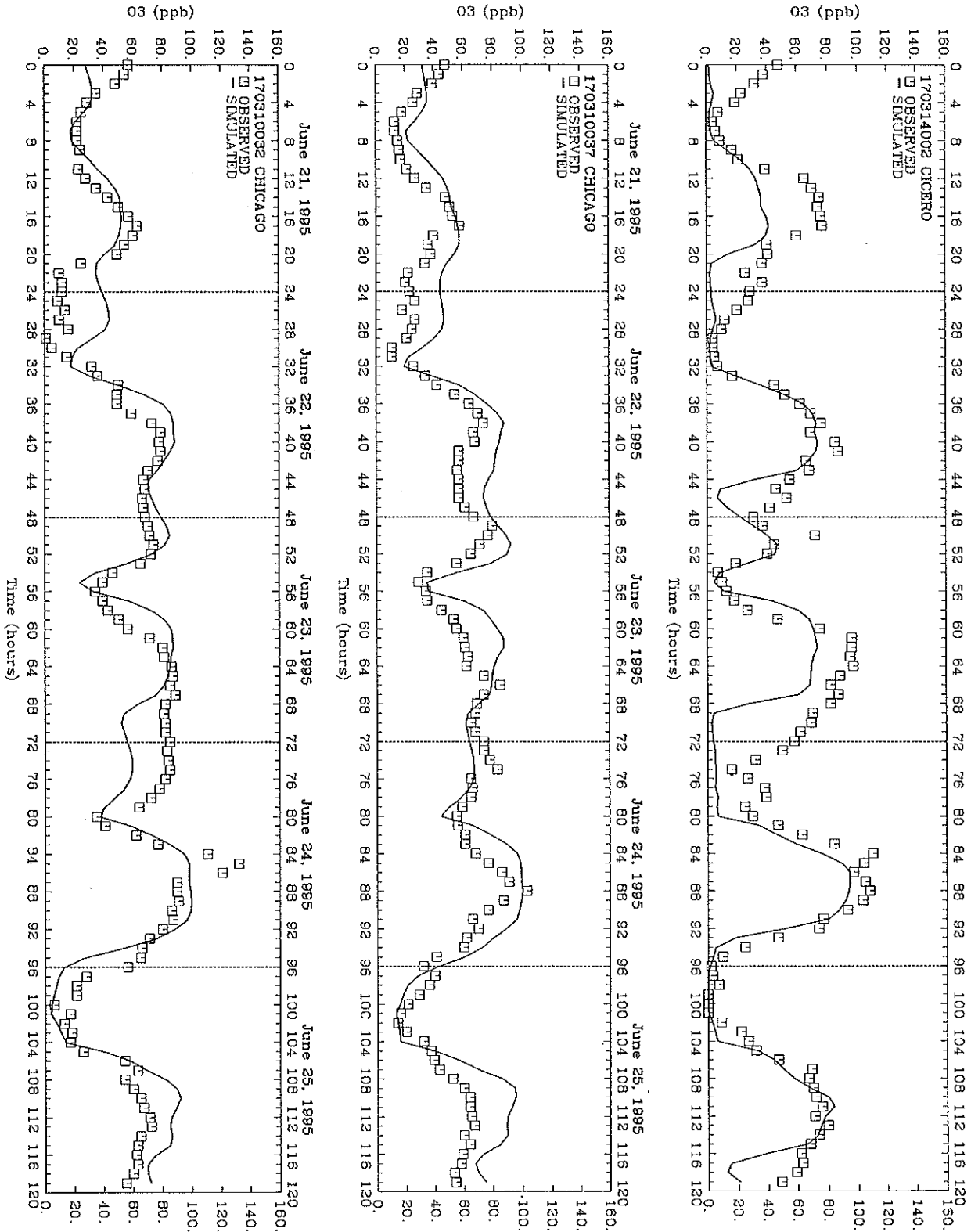
Grid M UAMV Model Ozone Predictions vs. Ambient Observations
-- June 15-20, 1995 --

95bas11v2 @ 12 km (Stress = 0)



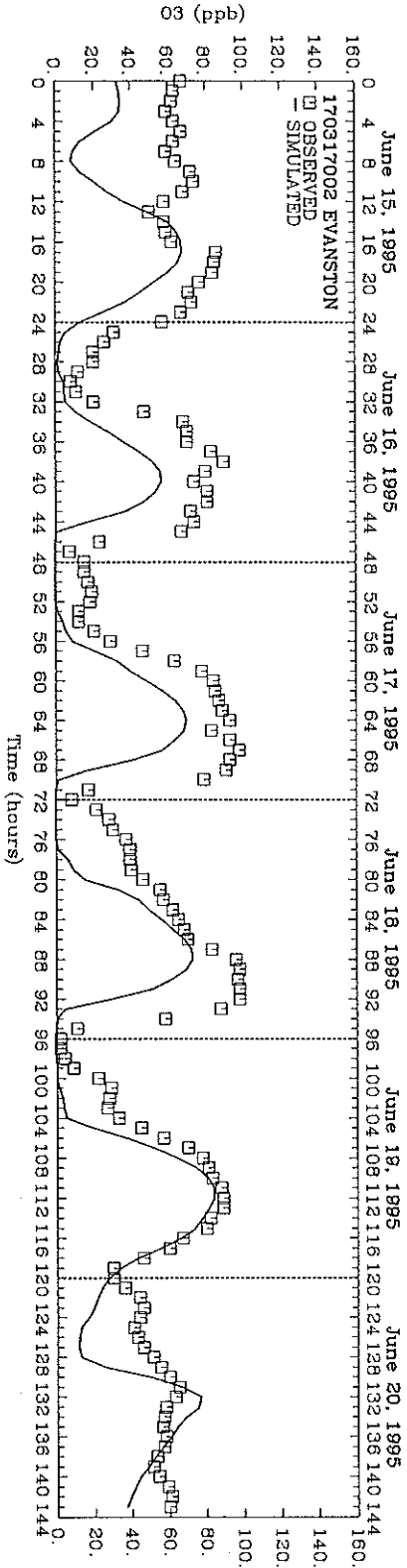
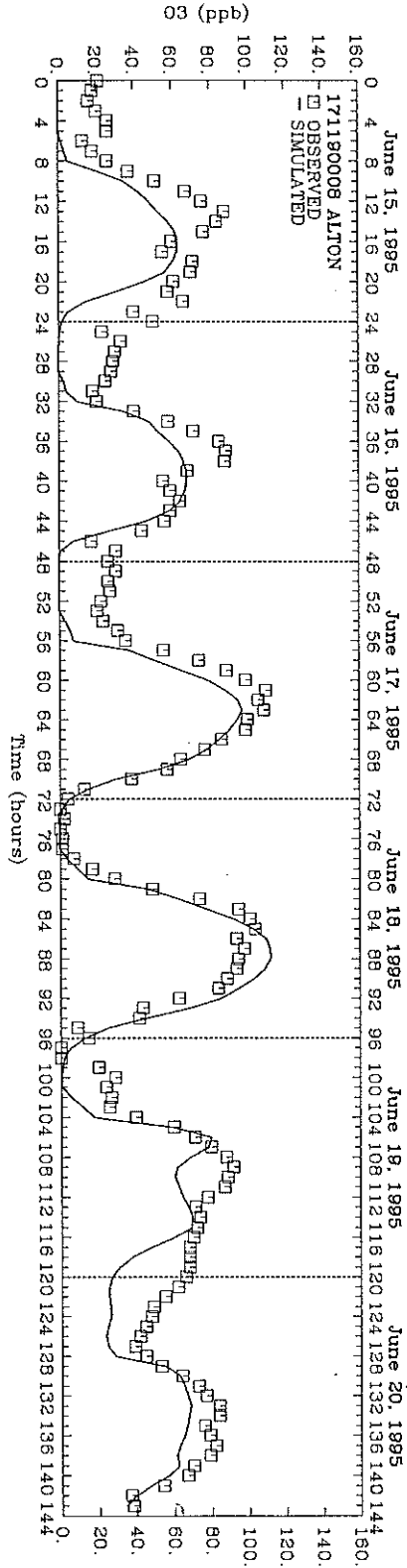
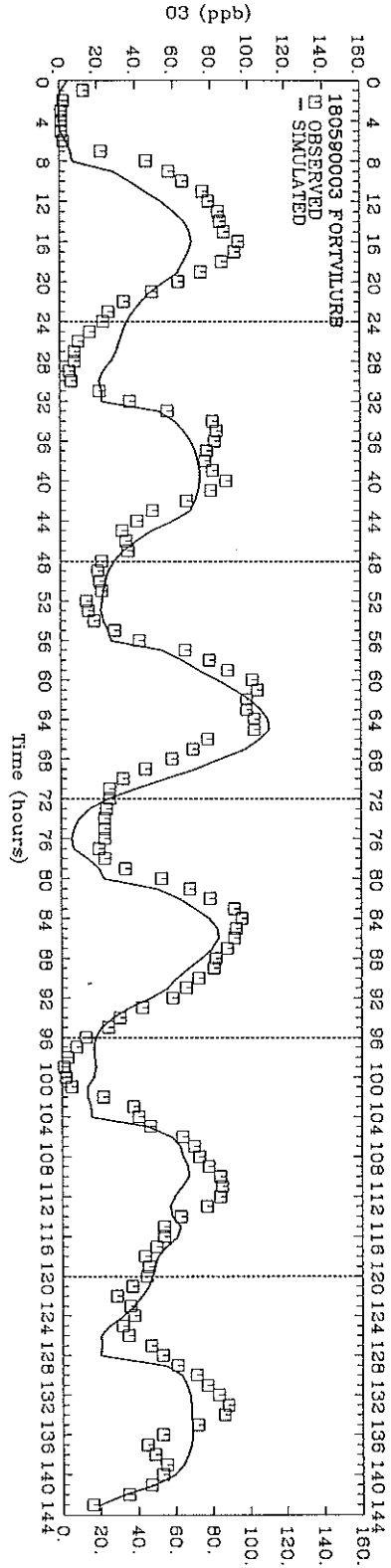
Grid M UAMV Model Ozone Predictions vs. Ambient Observations
-- June 15-20, 1995 --

95bas11v2 @ 12 km (Stress = 0)



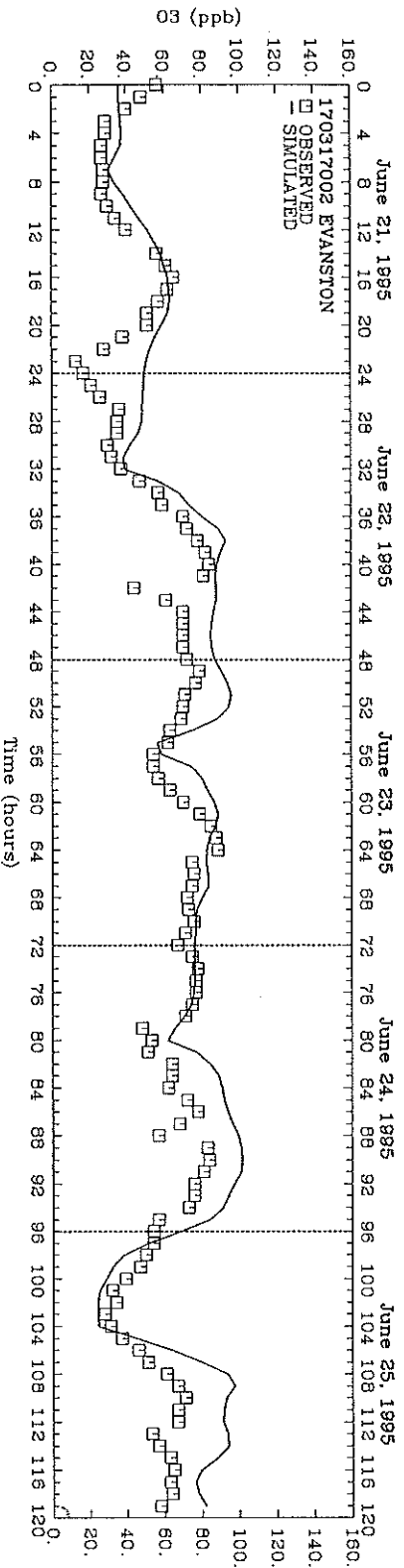
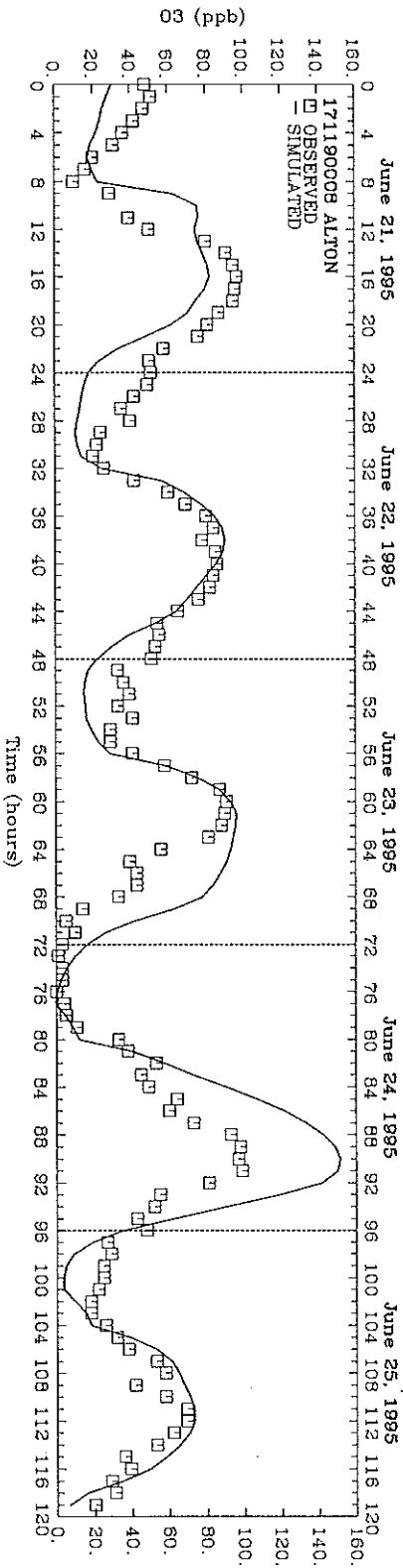
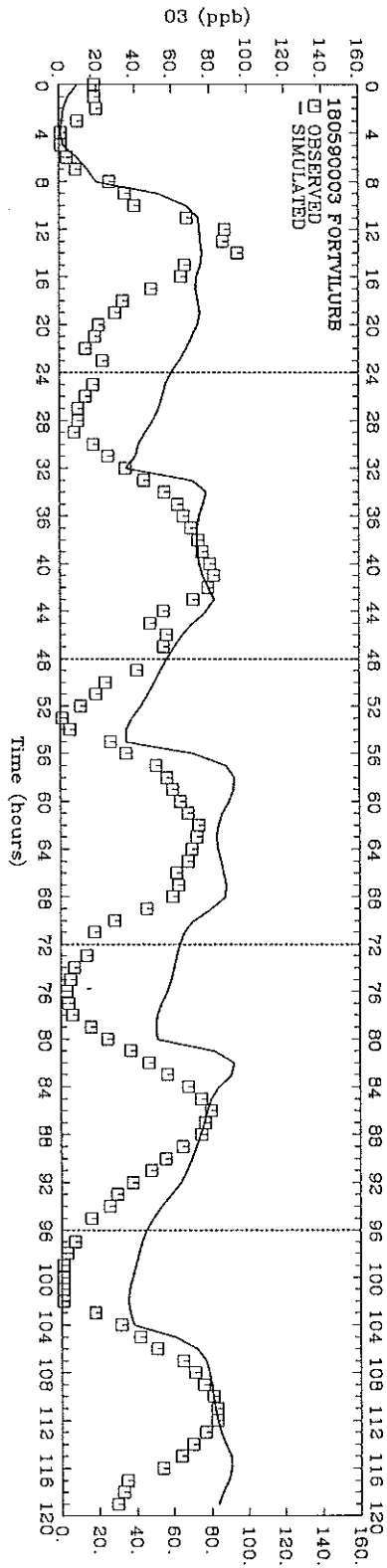
Grid M UAMV Model Ozone Predictions vs. Ambient Observations
-- June 15-20, 1995 --

95bas11v2 @ 12 km (Stress = 0)



Grid M UAMV Model Ozone Predictions vs. Ambient Observations
-- June 15--20, 1995 --

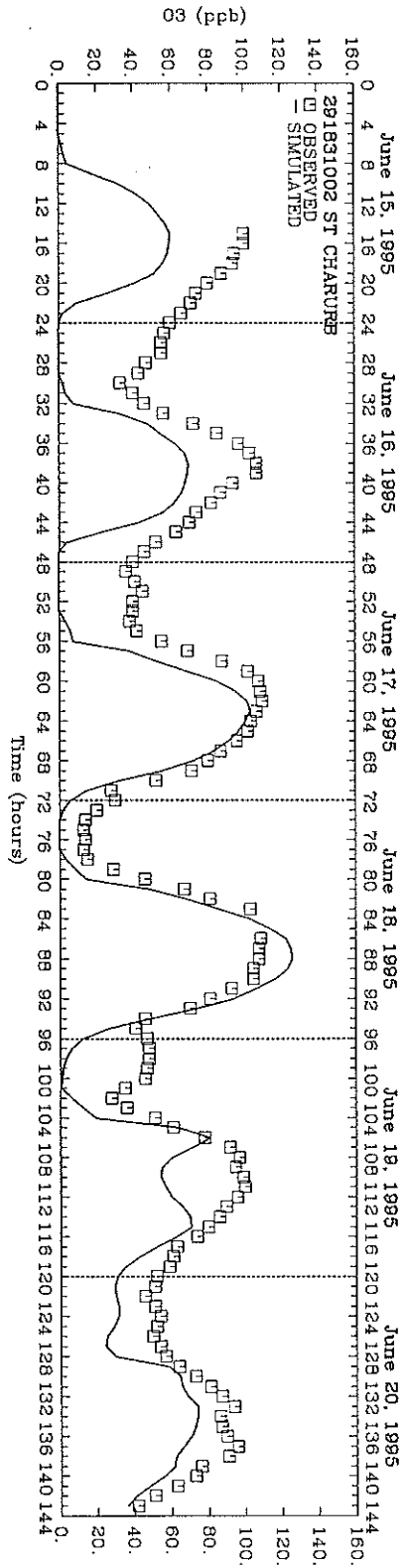
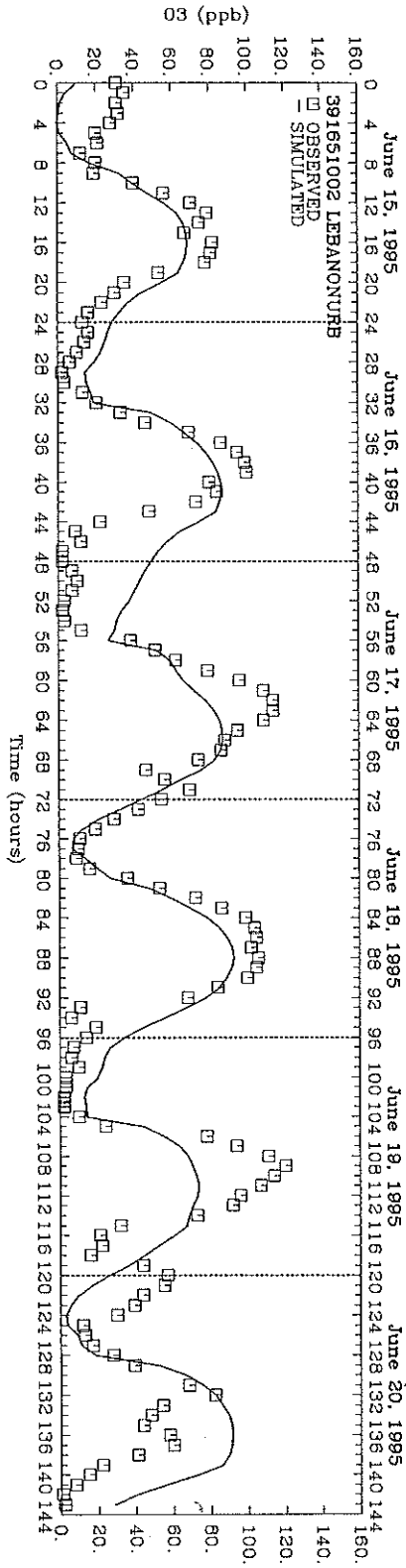
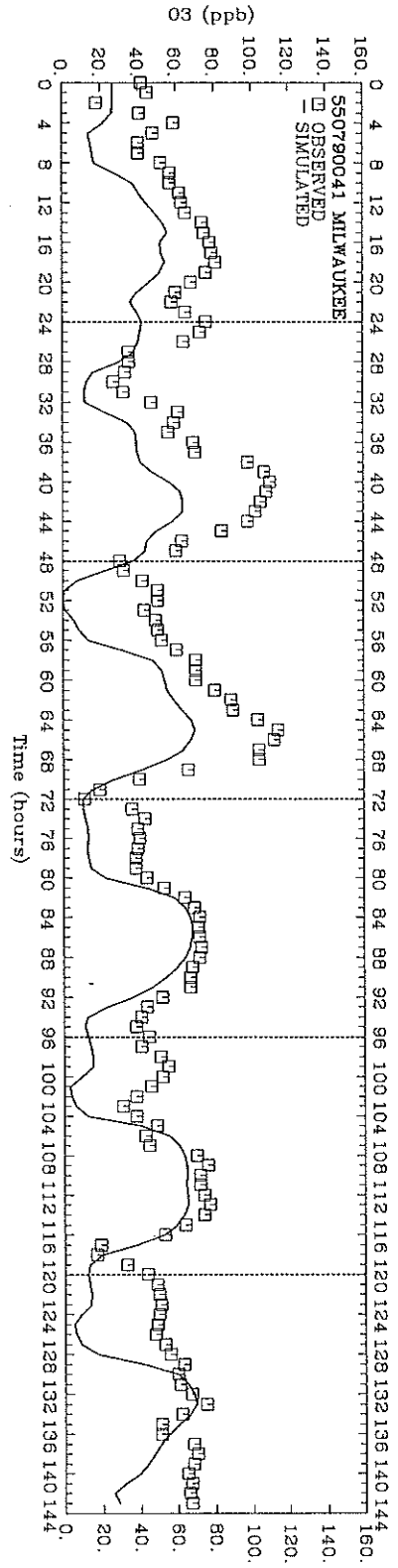
95bas11v2 @ 12 km (Stress = 0)



Grid M UAMV Model Ozone Predictions vs. Ambient Observations

-- June 15-20, 1995 --

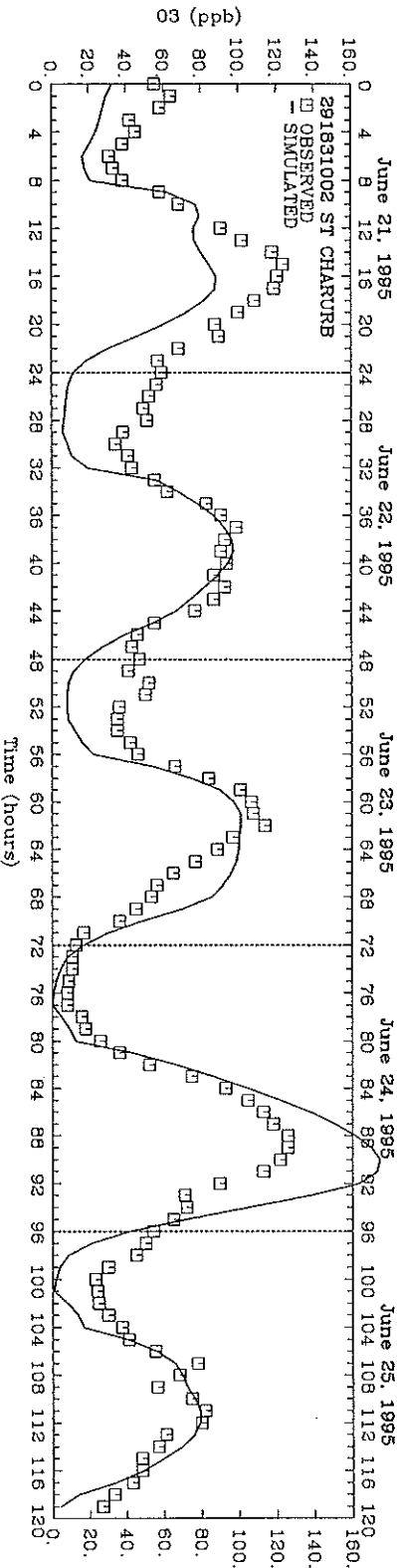
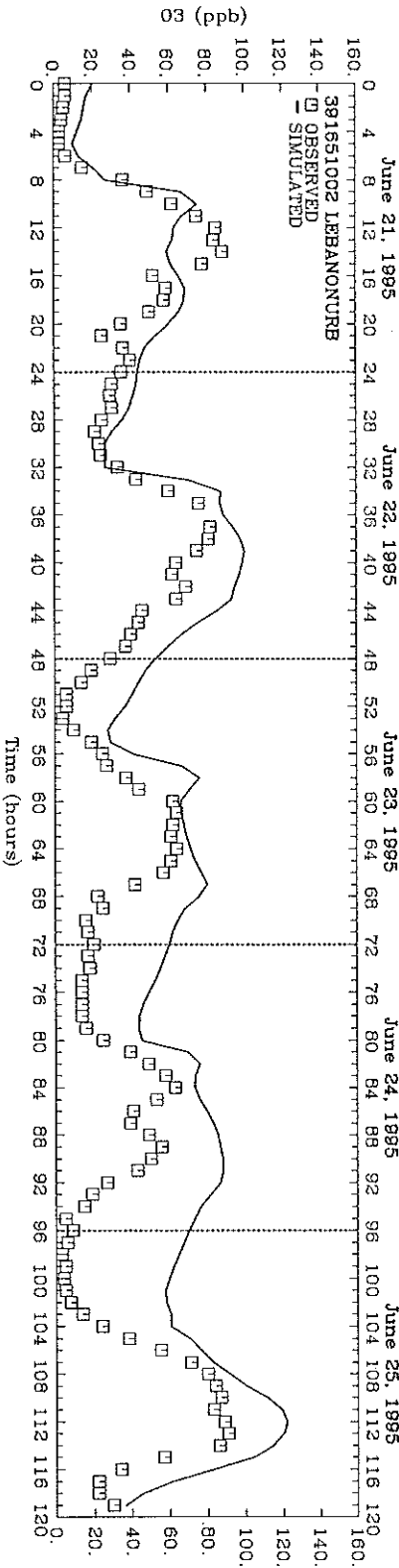
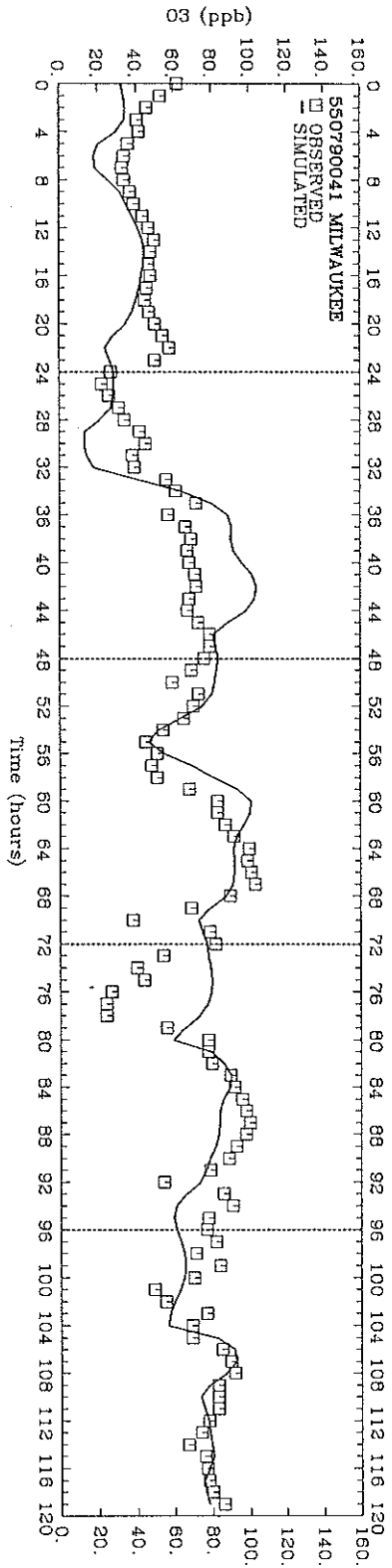
95bas11v2 @ 12 km (Stress = 0)



Grid M UAMV Model Ozone Predictions vs. Ambient Observations

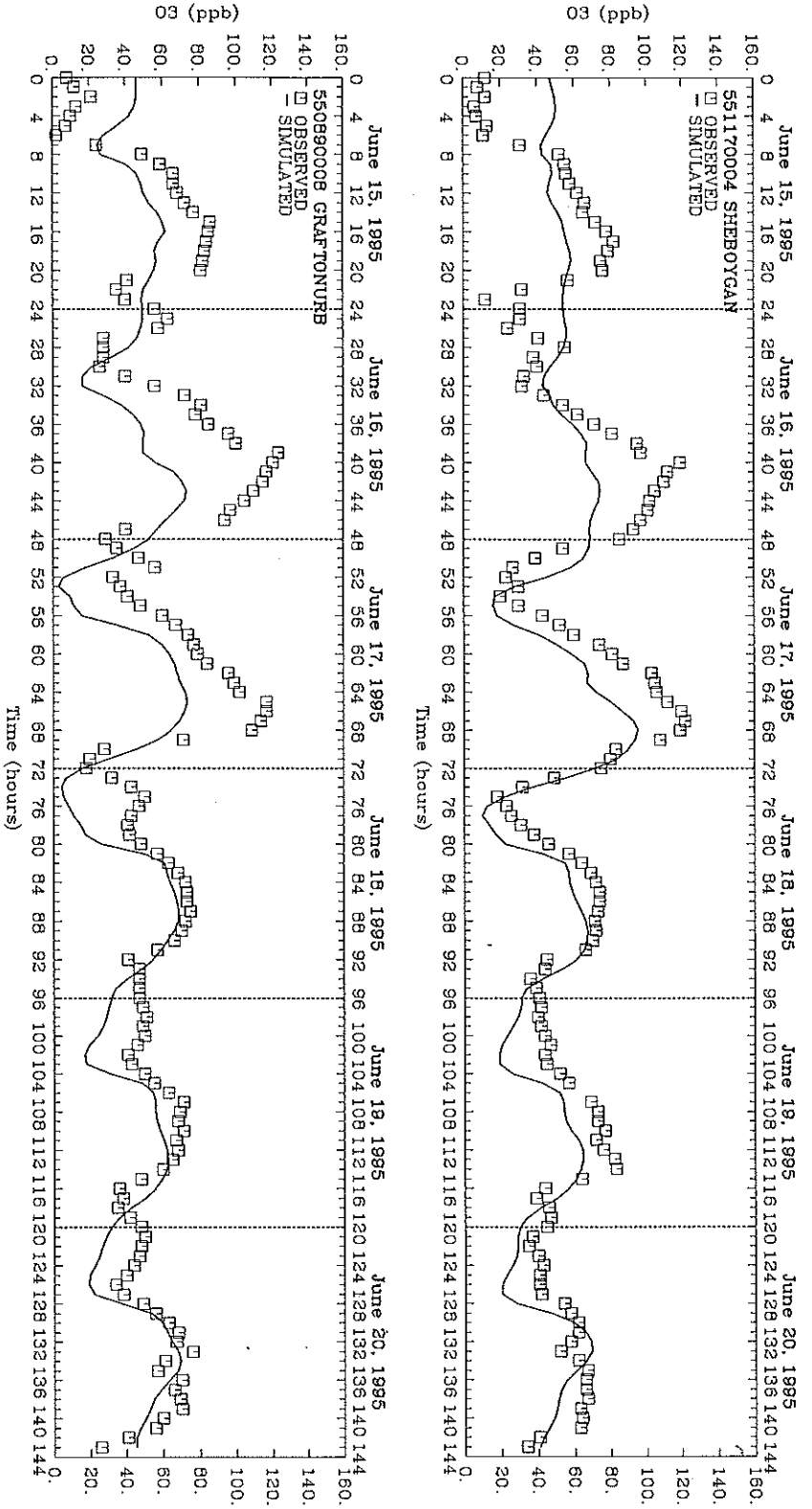
-- June 15-20, 1995 --

95bas11v2 @ 12 km (Stress = 0)



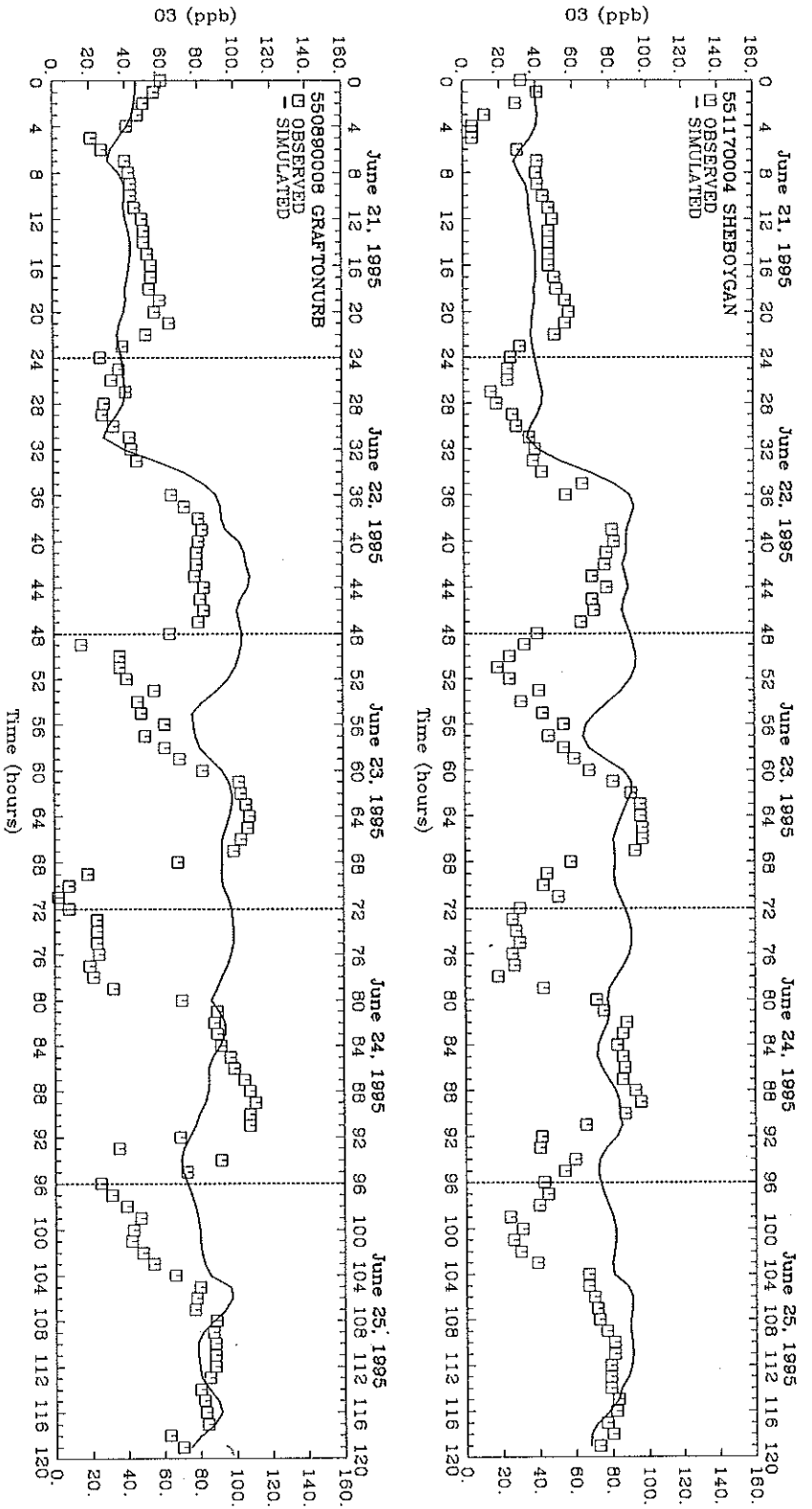
Grid M UAMV Model Ozone Predictions vs. Ambient Observations
-- June 15-20, 1995 --

95bas11v2 @ 12 km (Stress = 0)



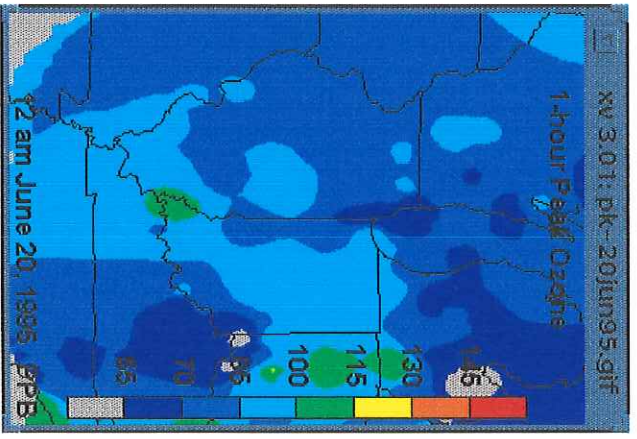
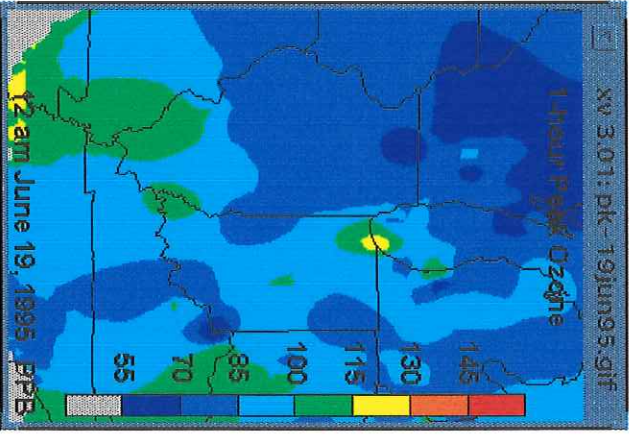
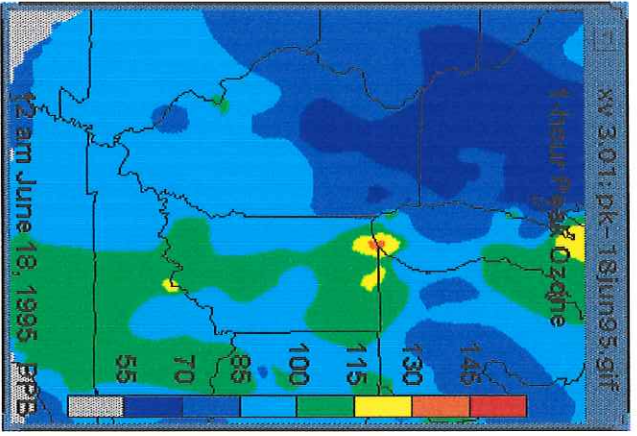
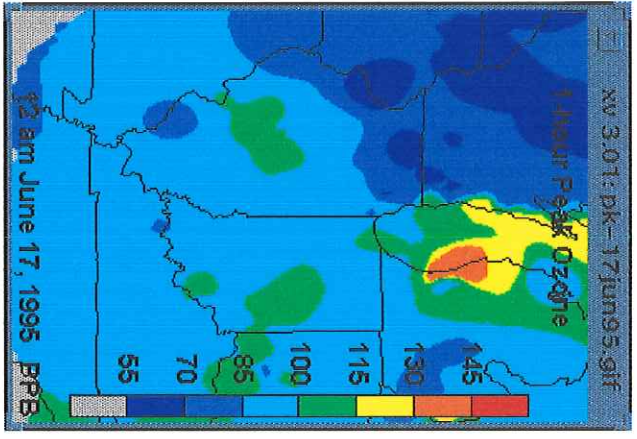
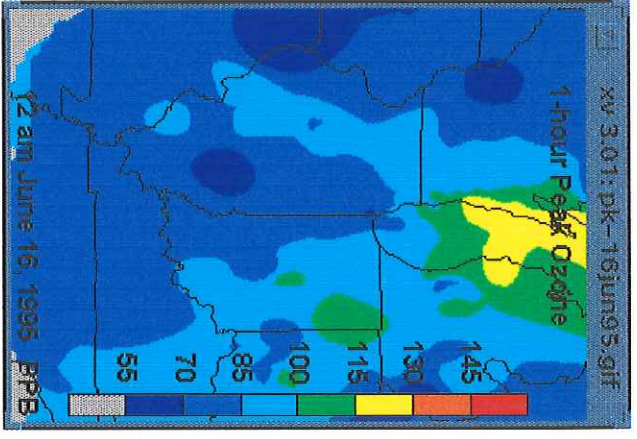
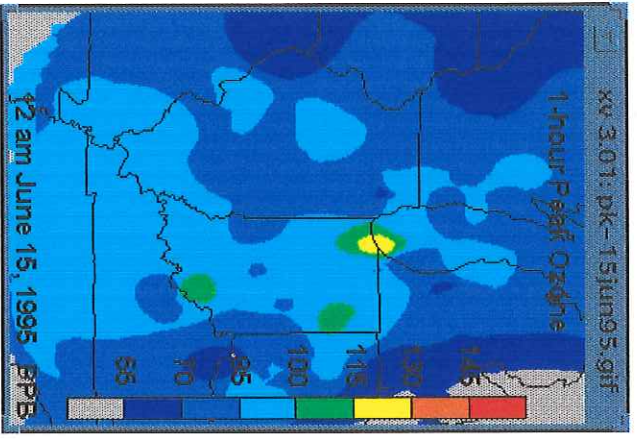
Grid M UAMV Model Ozone Predictions vs. Ambient Observations
--- June 15-20, 1995 ---

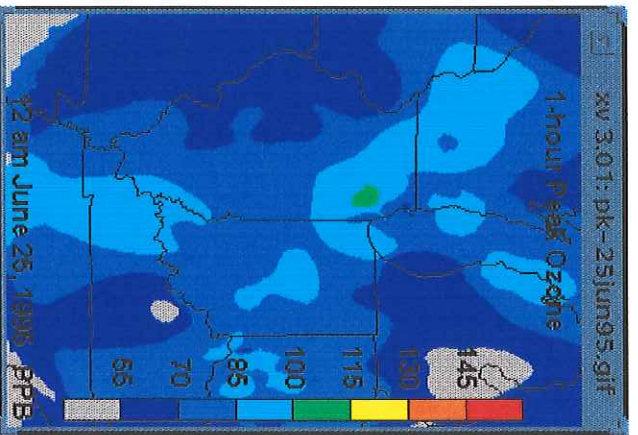
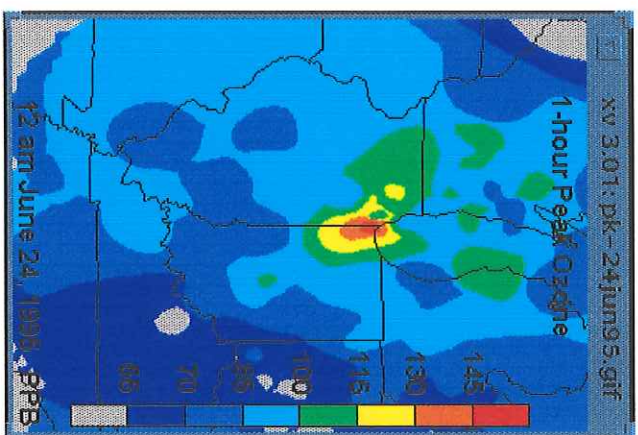
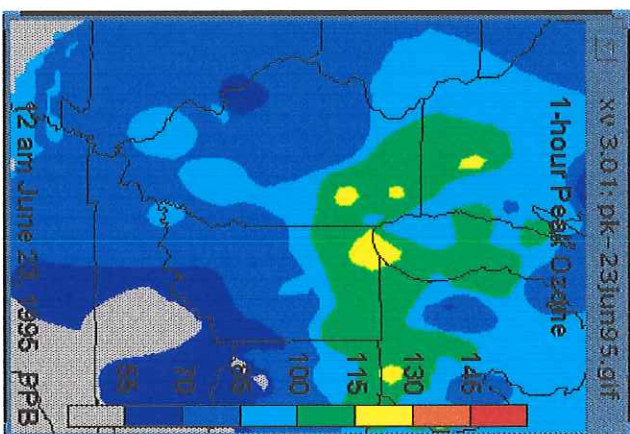
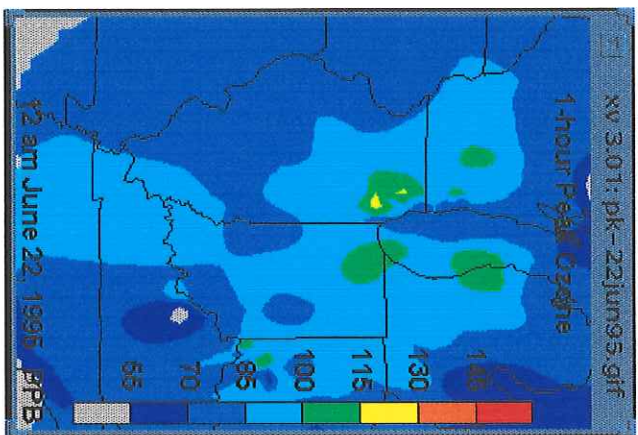
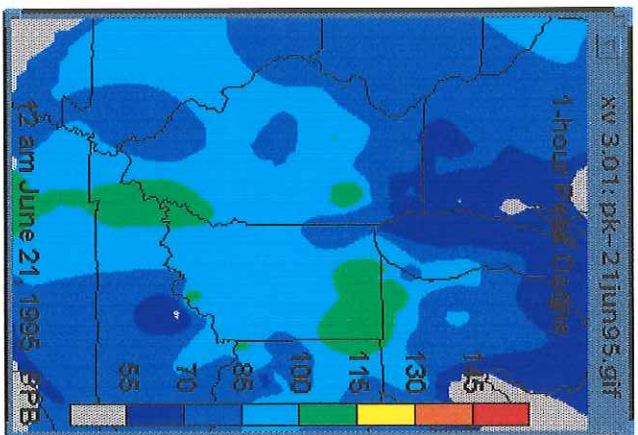
95bas11v2 @ 12 km (Stress = 0)



Grid M UAMV Model Ozone Predictions vs. Ambient Observations
-- June 15-20, 1995 --

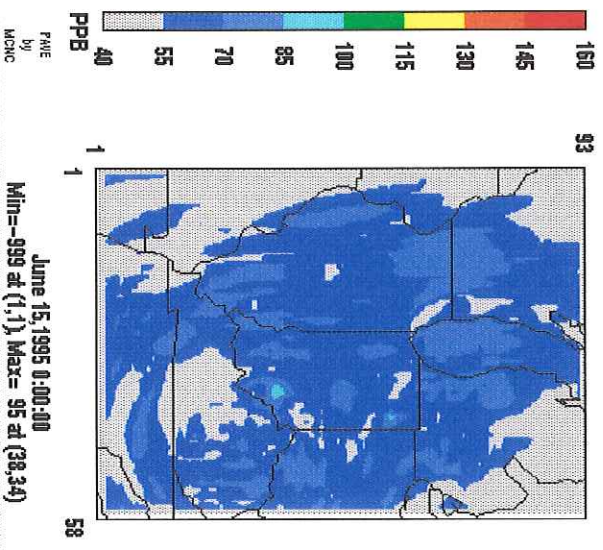
95bas11v2 @ 12 km (Stress = 0)





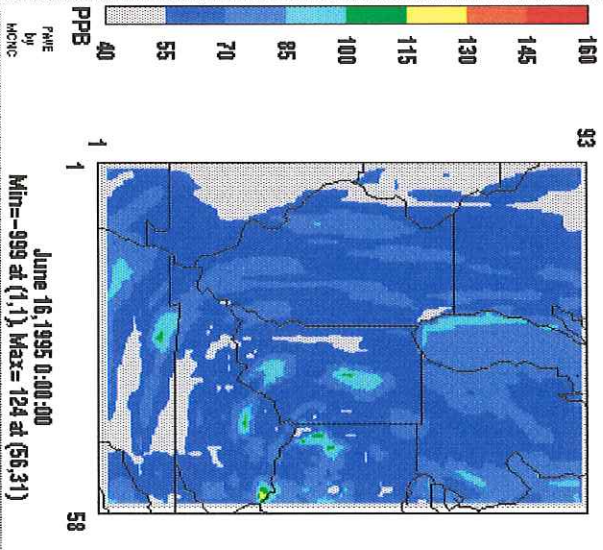
Daily Peak 1-Hour Ozone

UAMV 95bas11v2 Grid-M 12km
Jun95-Base Case Result



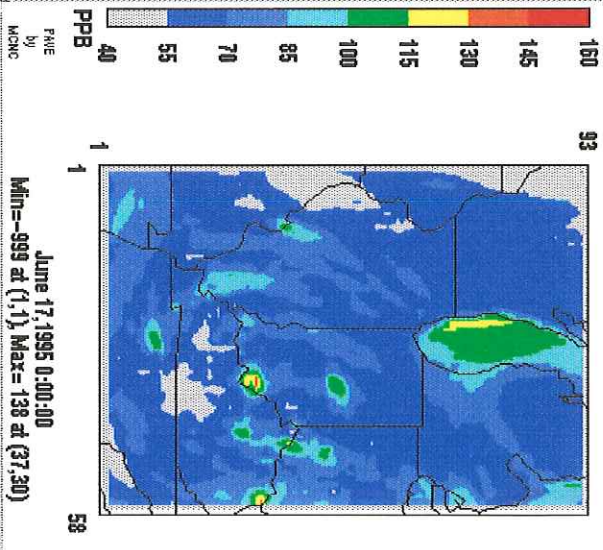
Daily Peak 1-Hour Ozone

UAMV 95bas11v2 Grid-M 12km
Jun95-Base Case Result



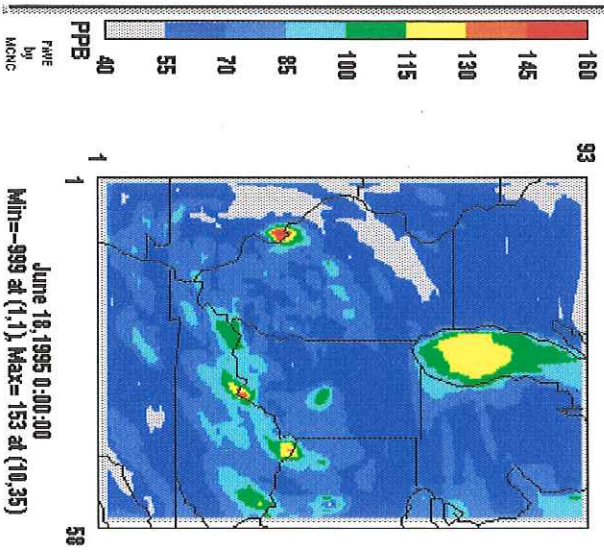
Daily Peak 1-Hour Ozone

UAMV 95bas11v2 Grid-M 12km
Jun95-Base Case Result



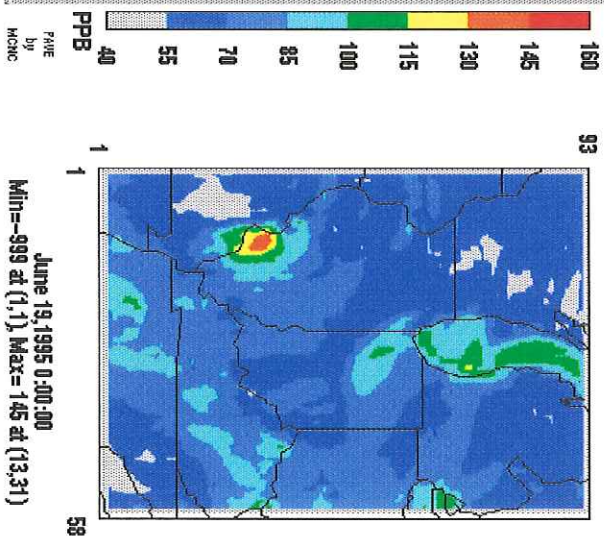
Daily Peak 1-Hour Ozone

UAMV 95bas11v2 Grid-M 12km
Jun95-Base Case Result



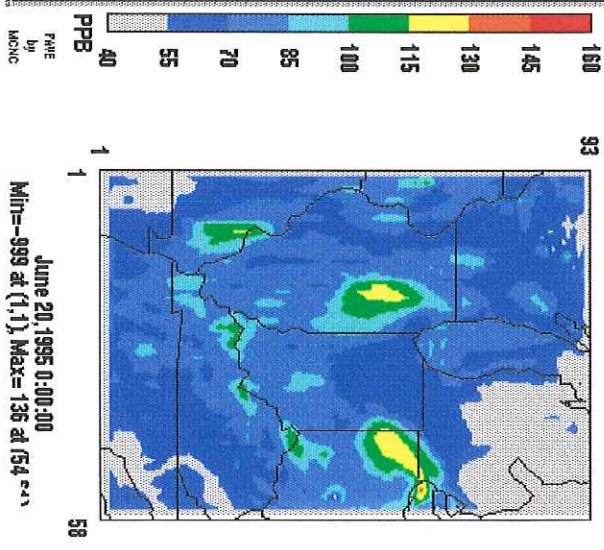
Daily Peak 1-Hour Ozone

UAMV 95bas11v2 Grid-M 12km
Jun95-Base Case Result



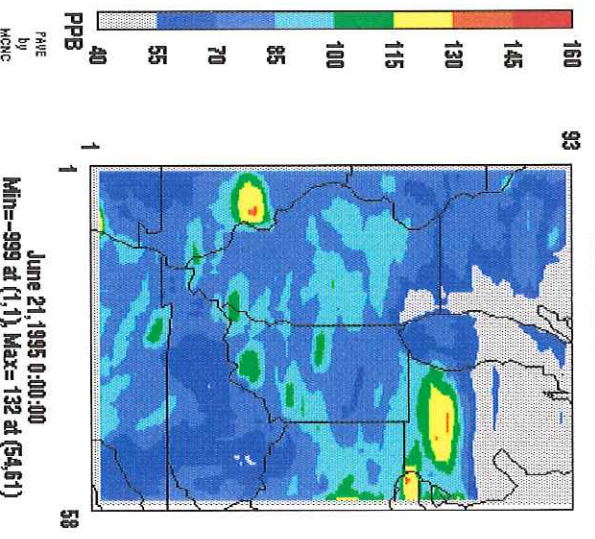
Daily Peak 1-Hour Ozone

UAMV 95bas11v2 Grid-M 12km
Jun95-Base Case Result



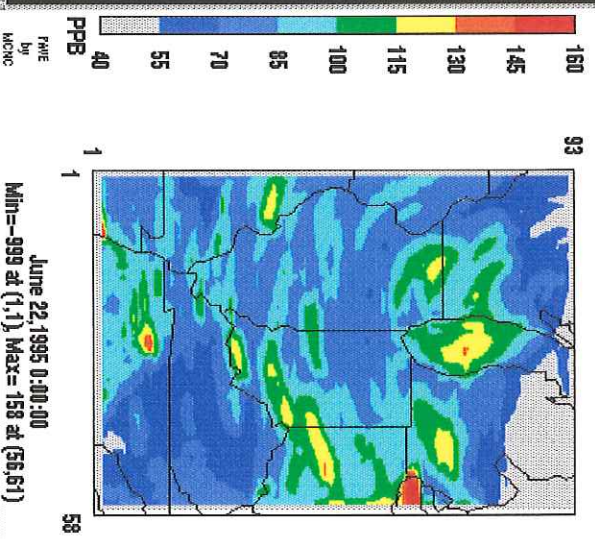
Daily Peak 1-Hour Ozone

UAMV 95ba5t1v2 Grid-M 12km
Jun95-Base Case Result



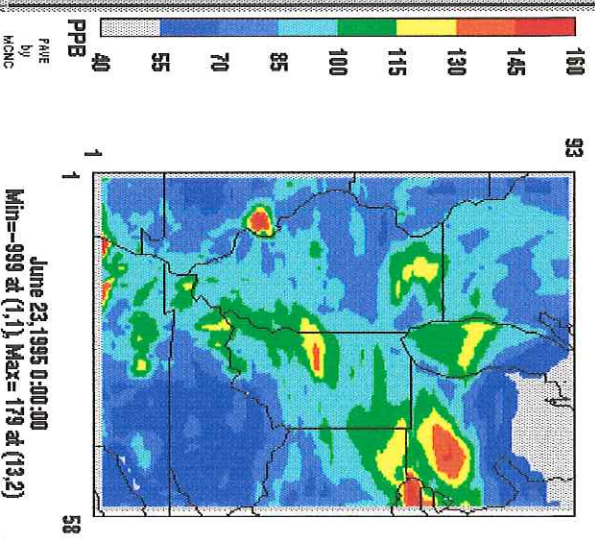
Daily Peak 1-Hour Ozone

UAMV 95ba5t1v2 Grid-M 12km
Jun95-Base Case Result



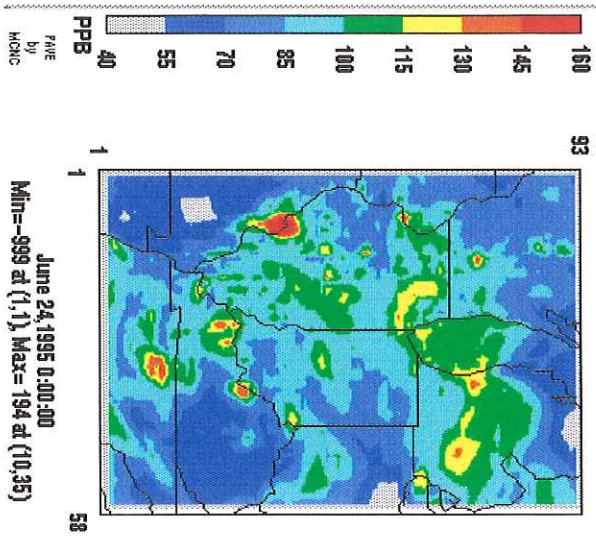
Daily Peak 1-Hour Ozone

UAMV 95ba5t1v2 Grid-M 12km
Jun95-Base Case Result



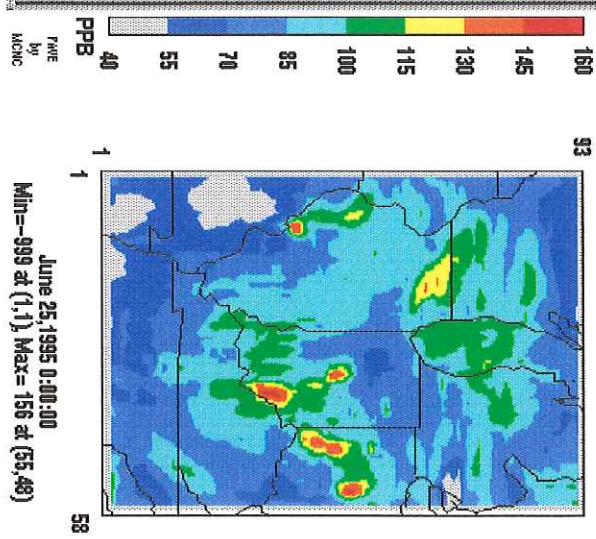
Daily Peak 1-Hour Ozone

UAMV 95ba5t1v2 Grid-M 12km
Jun95-Base Case Result



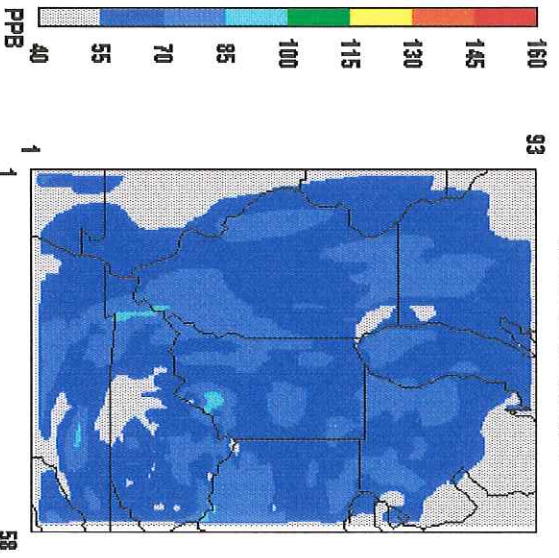
Daily Peak 1-Hour Ozone

UAMV 95ba5t1v2 Grid-M 12km
Jun95-Base Case Result



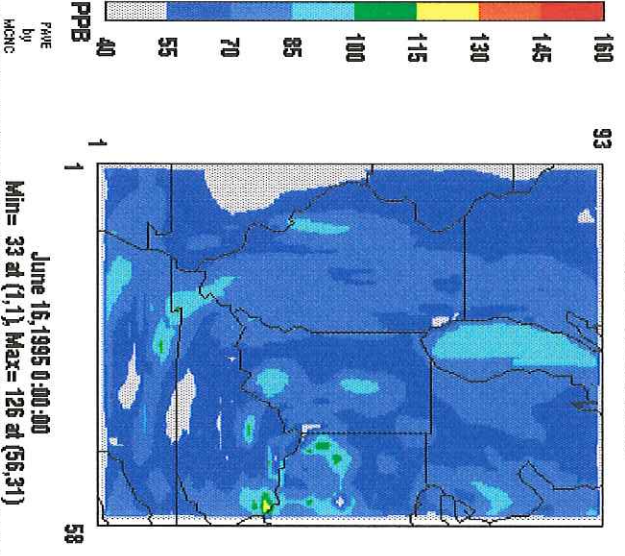
Daily Peak 1-Hour Ozone

CAMx 95Seast1v2 Grid-M 12km
Jun95-Base Case Result



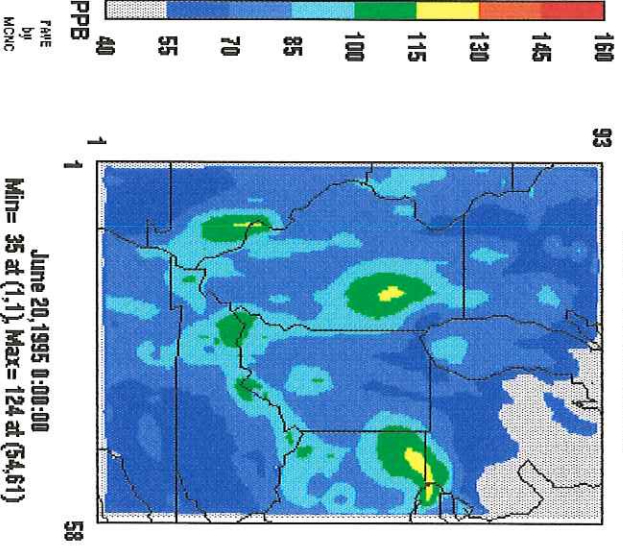
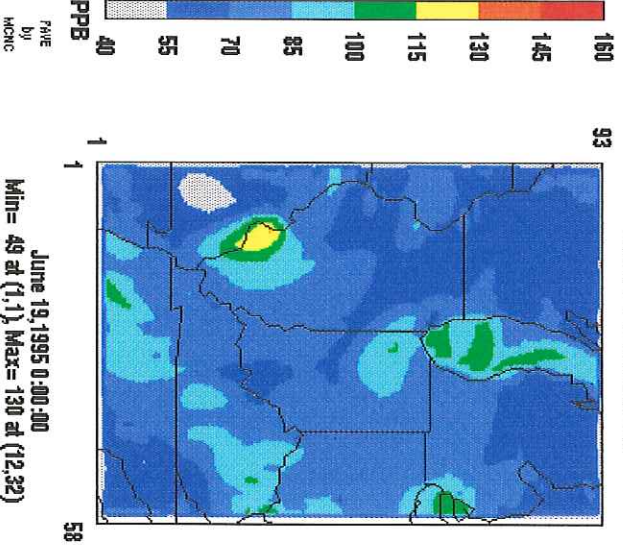
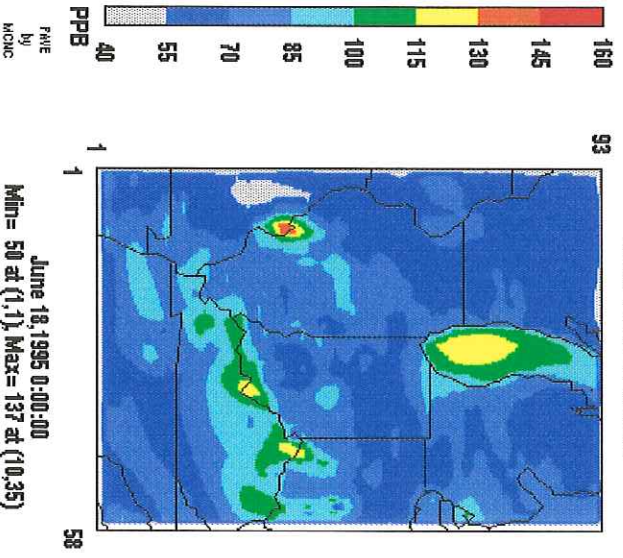
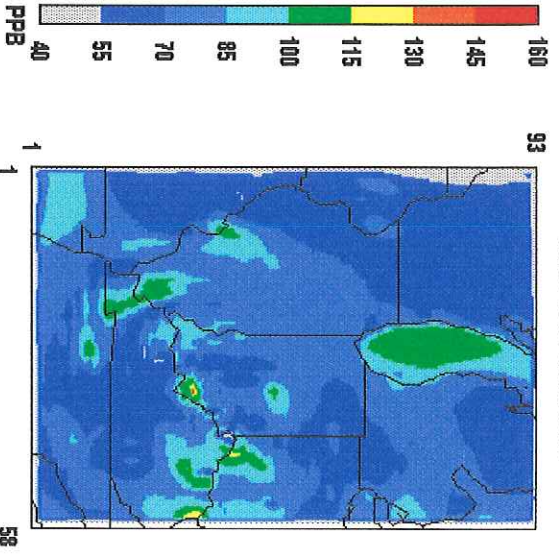
Daily Peak 1-Hour Ozone

CAMx 95Seast1v2 Grid-M 12km
Jun95-Base Case Result



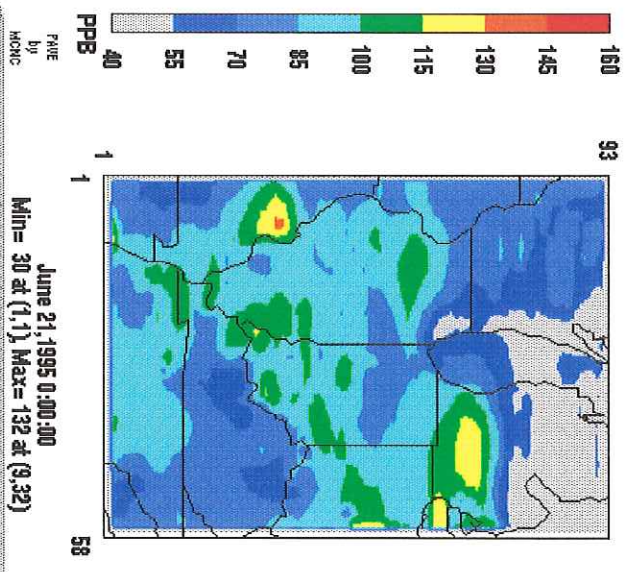
Daily Peak 1-Hour Ozone

CAMx 95Seast1v2 Grid-M 12km
Jun95-Base Case Result



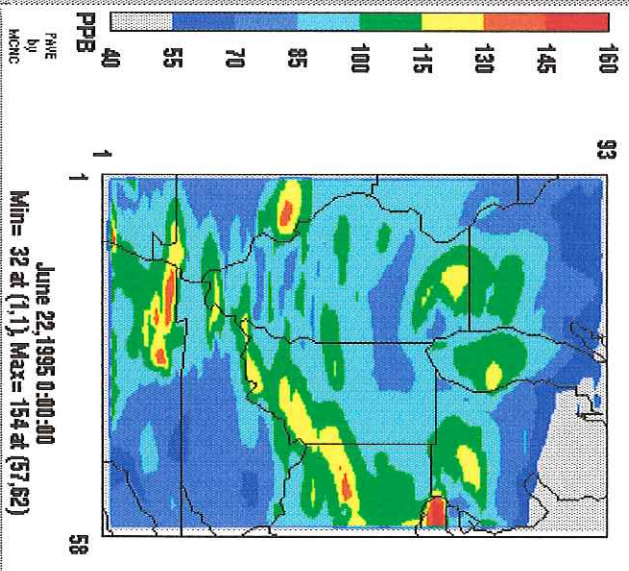
Daily Peak 1-Hour Ozone

CAMx 95bas1v2 Grid-M 12km
Jun95-Base Case Result



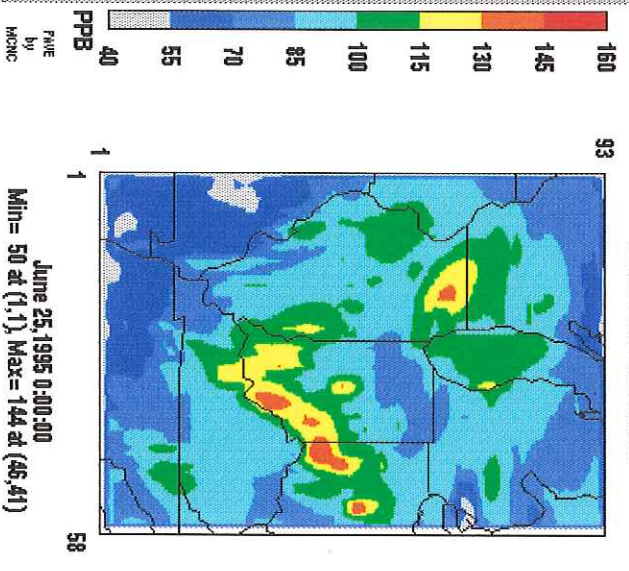
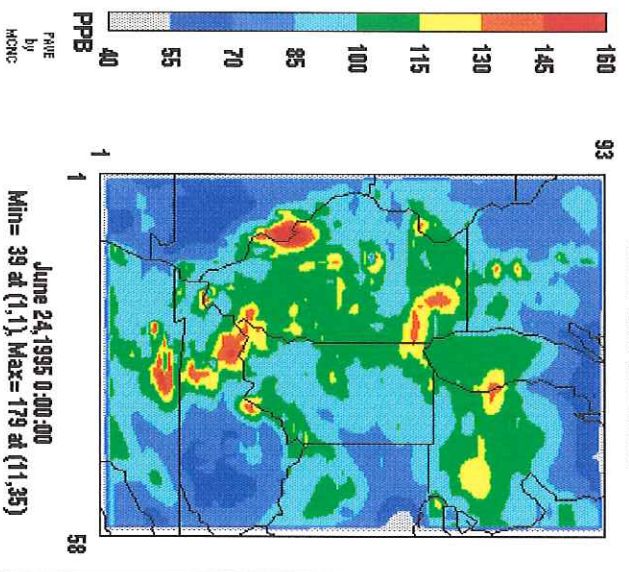
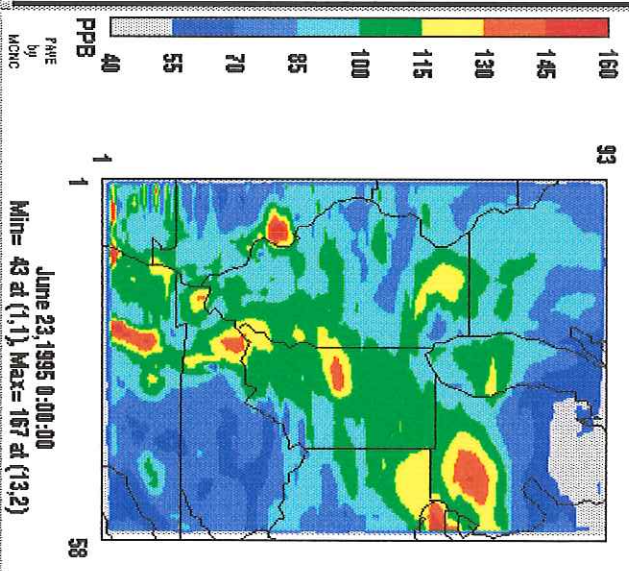
Daily Peak 1-Hour Ozone

CAMx 95bas1v2 Grid-M 12km
Jun95-Base Case Result

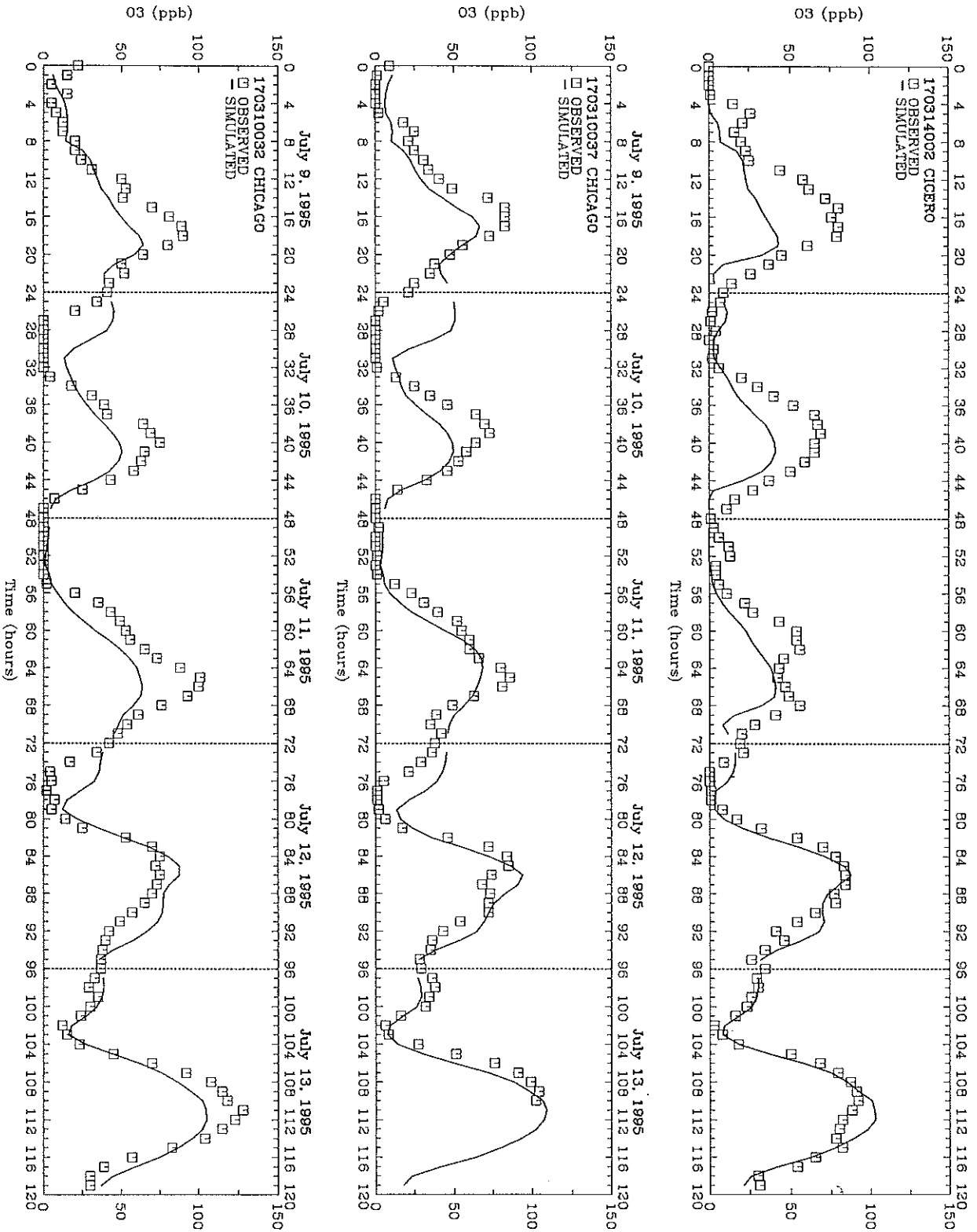


Daily Peak 1-Hour Ozone

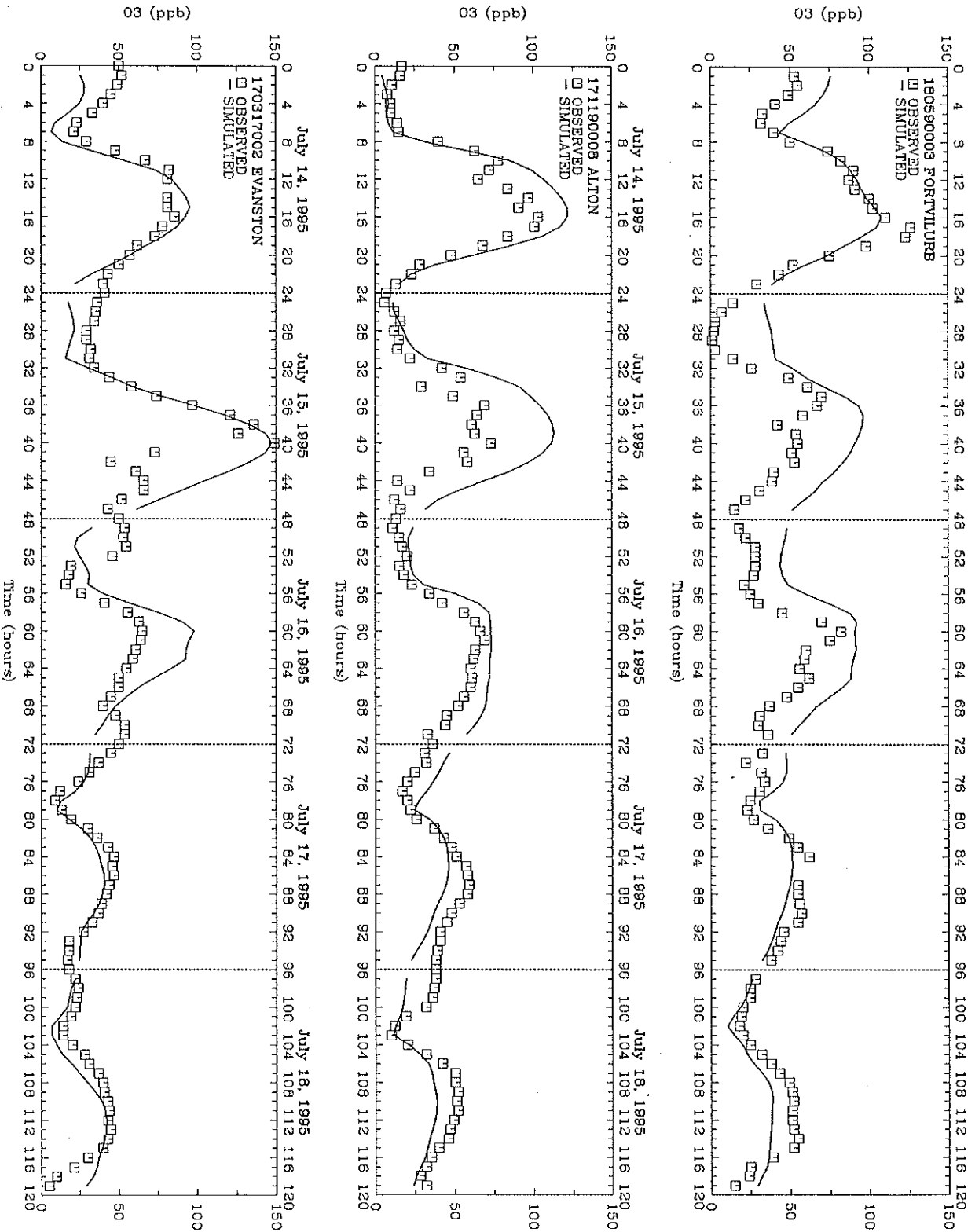
CAMx 95bas1v2 Grid-M 12km
Jun95-Base Case Result



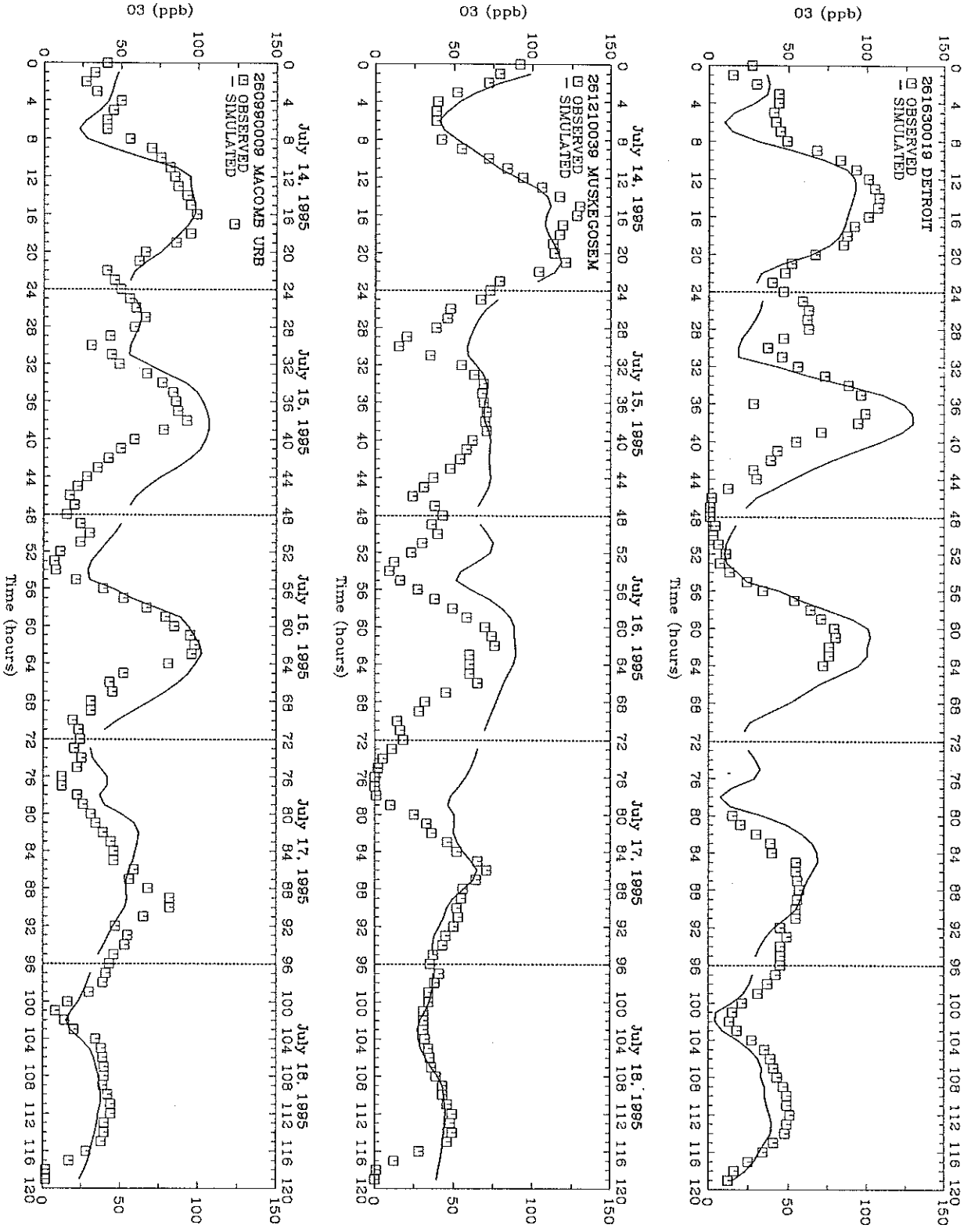
JULY 1995
RESULTS



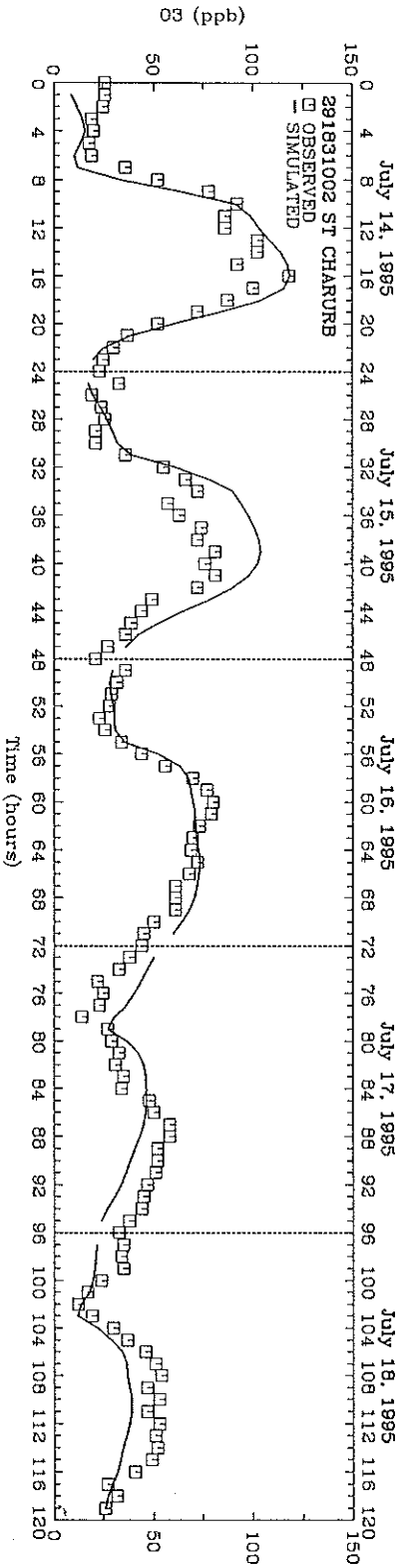
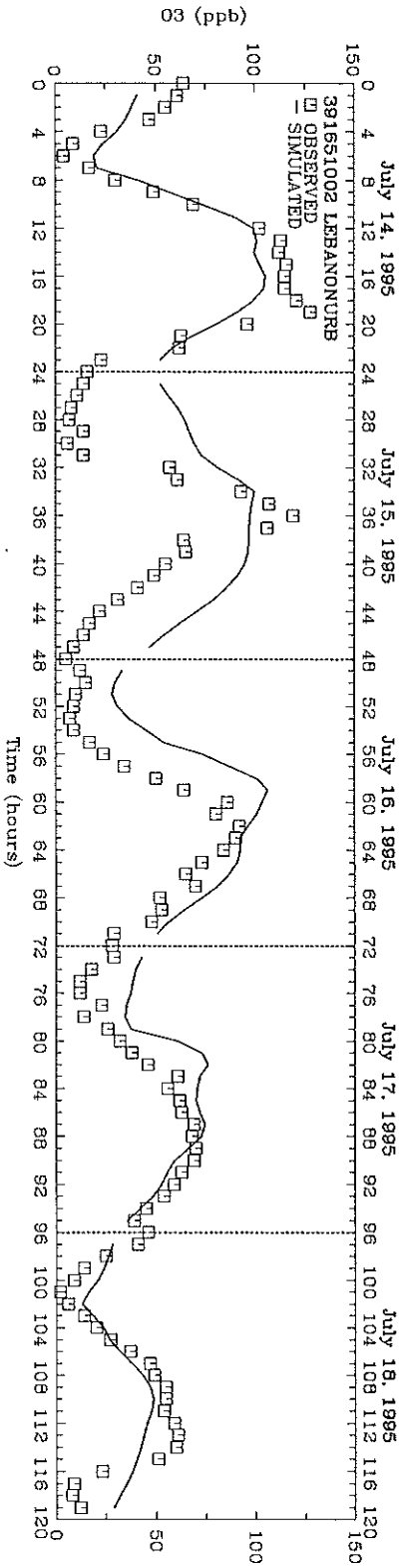
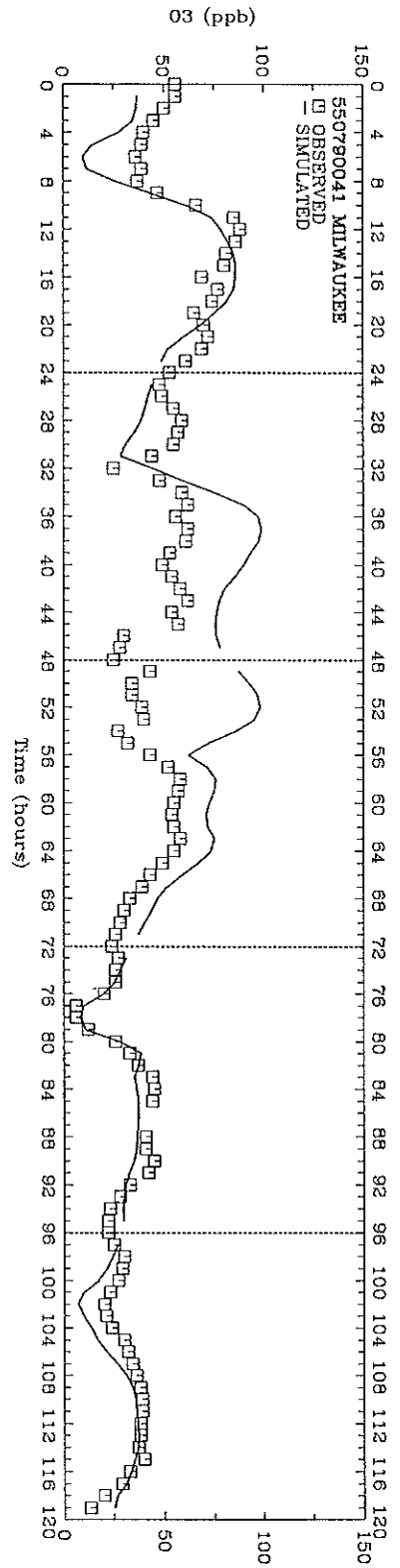
1-hour Time Series for the Lado Domain
July 09-13, 1995 (95bas1lv2 run)
uamv 12M



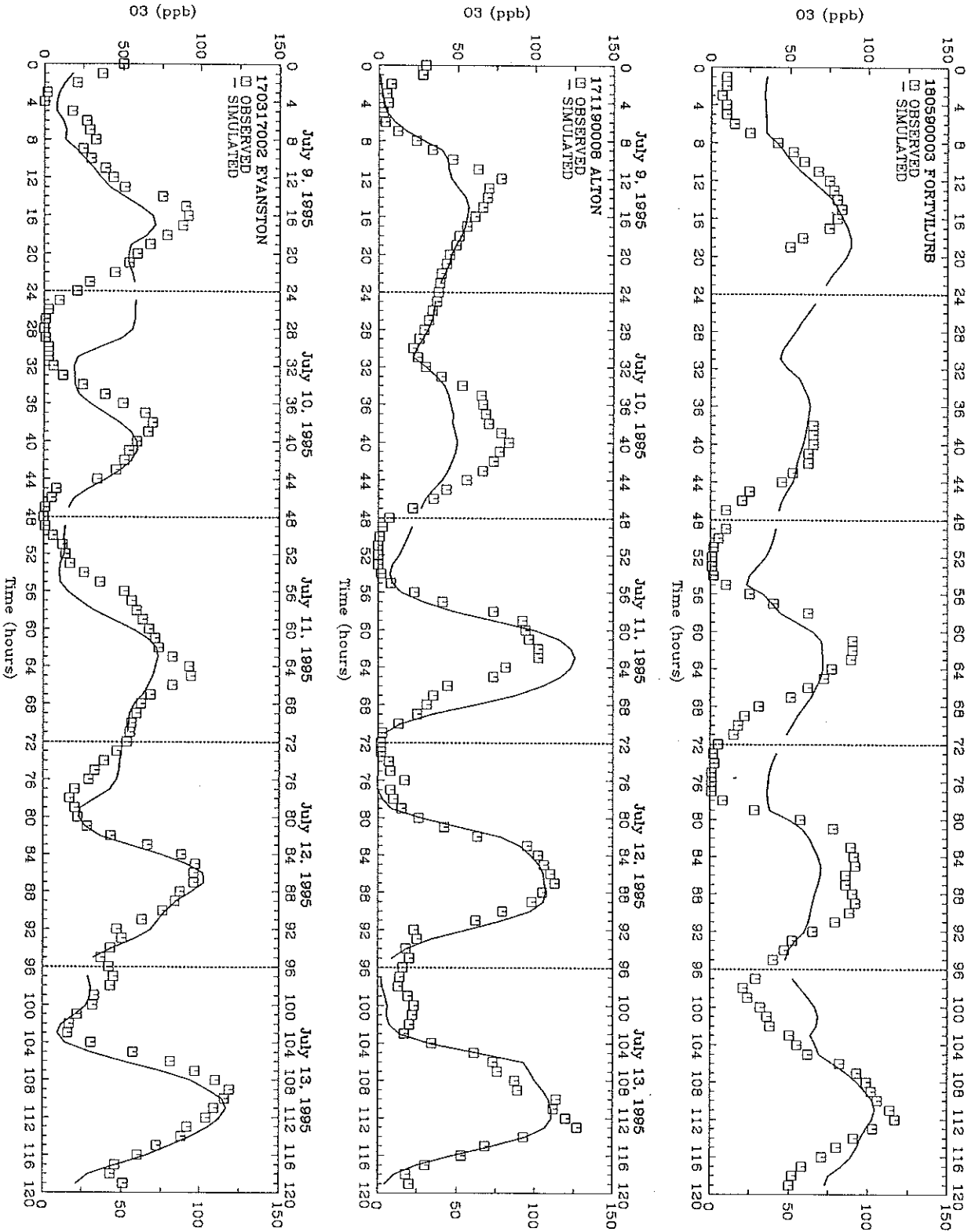
1-hour Time Series for the Ladco Domain
July 14-18, 1995 (95bas1v2 run)
uamv 12M



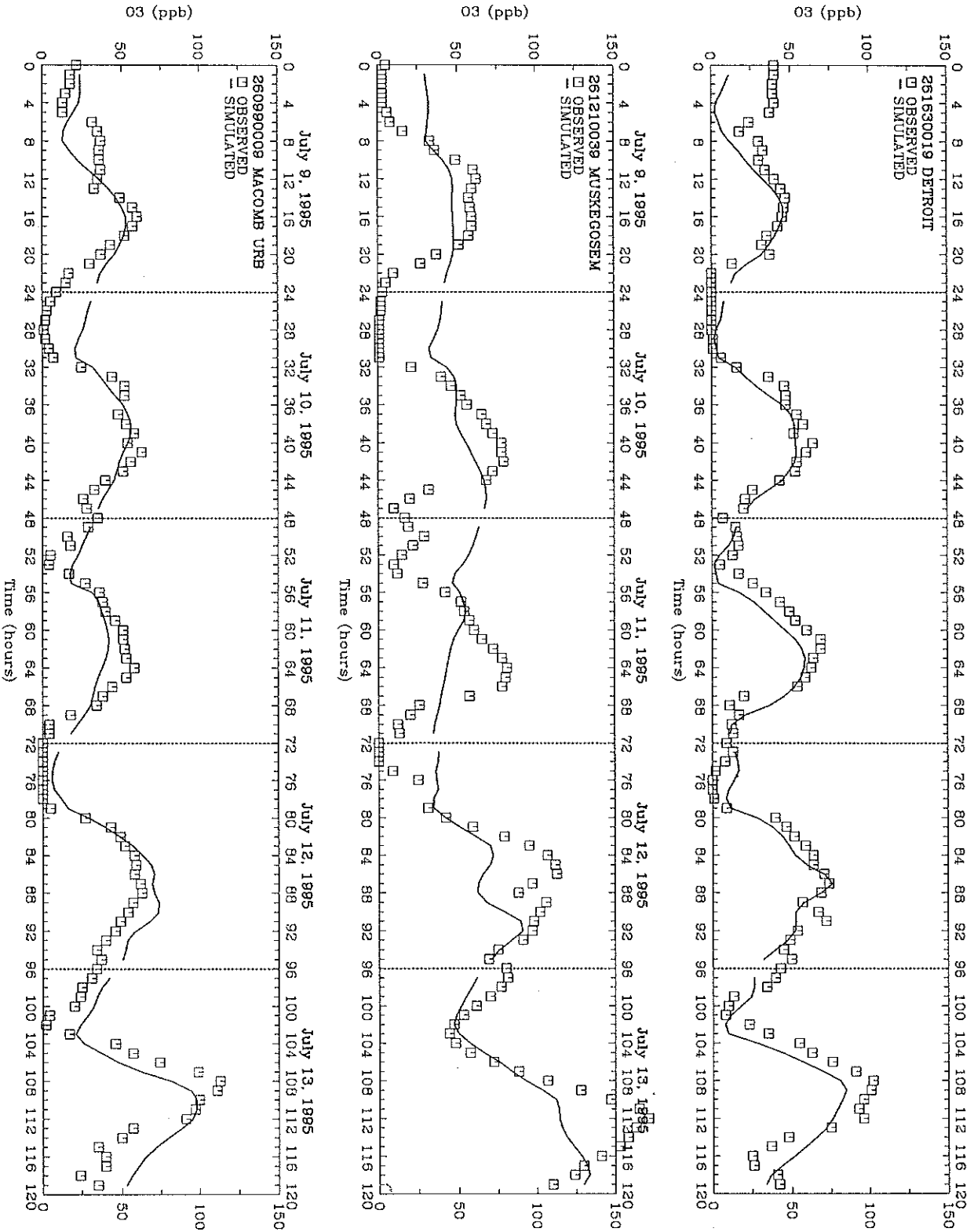
1-hour Time Series for the Lado Domain
July 14-18, 1995 (95bas11v2 run)
uamv 12M



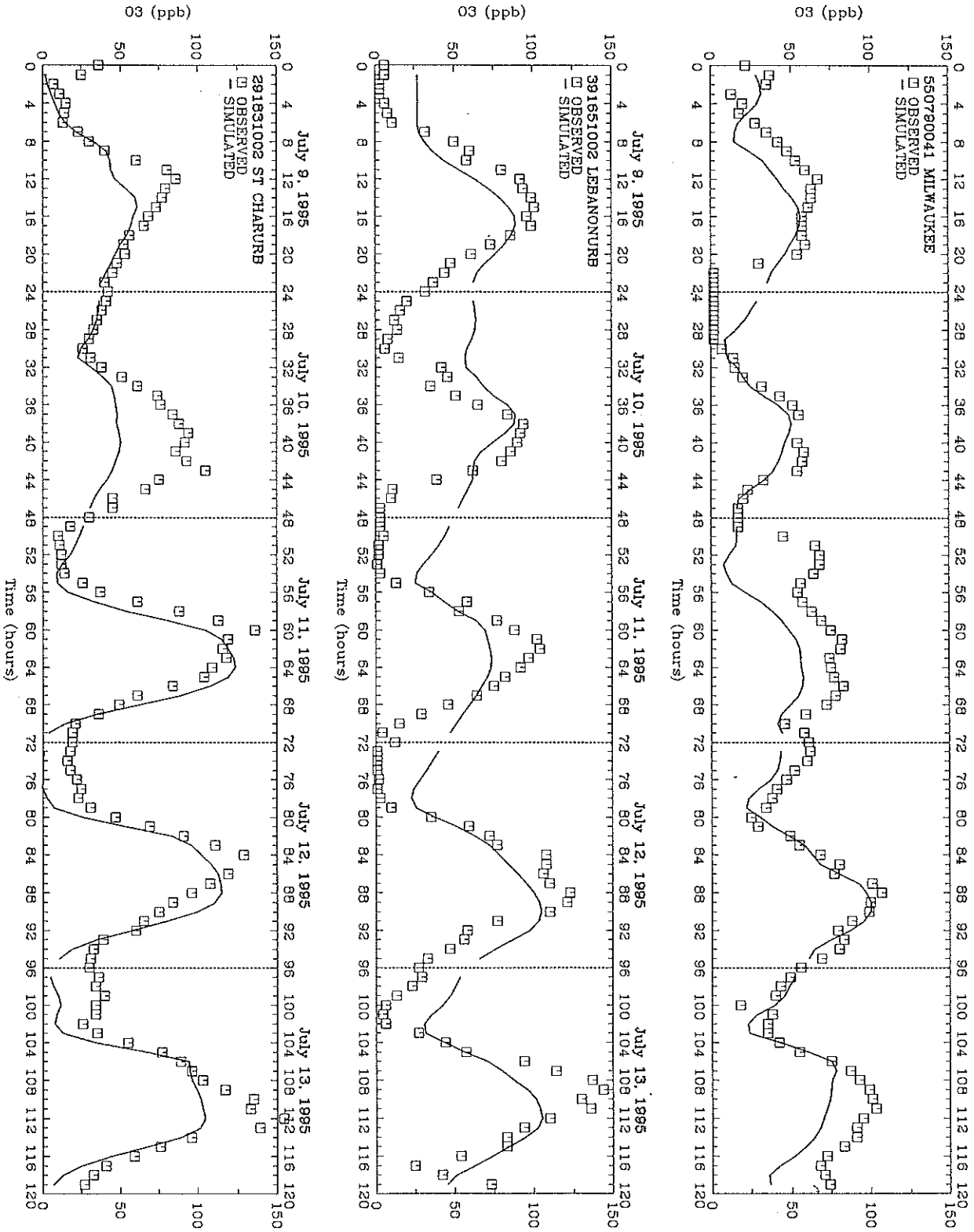
1-hour Time Series for the Ladco Domain
July 14-18, 1995 (95bas11v2 run)
namv 12M



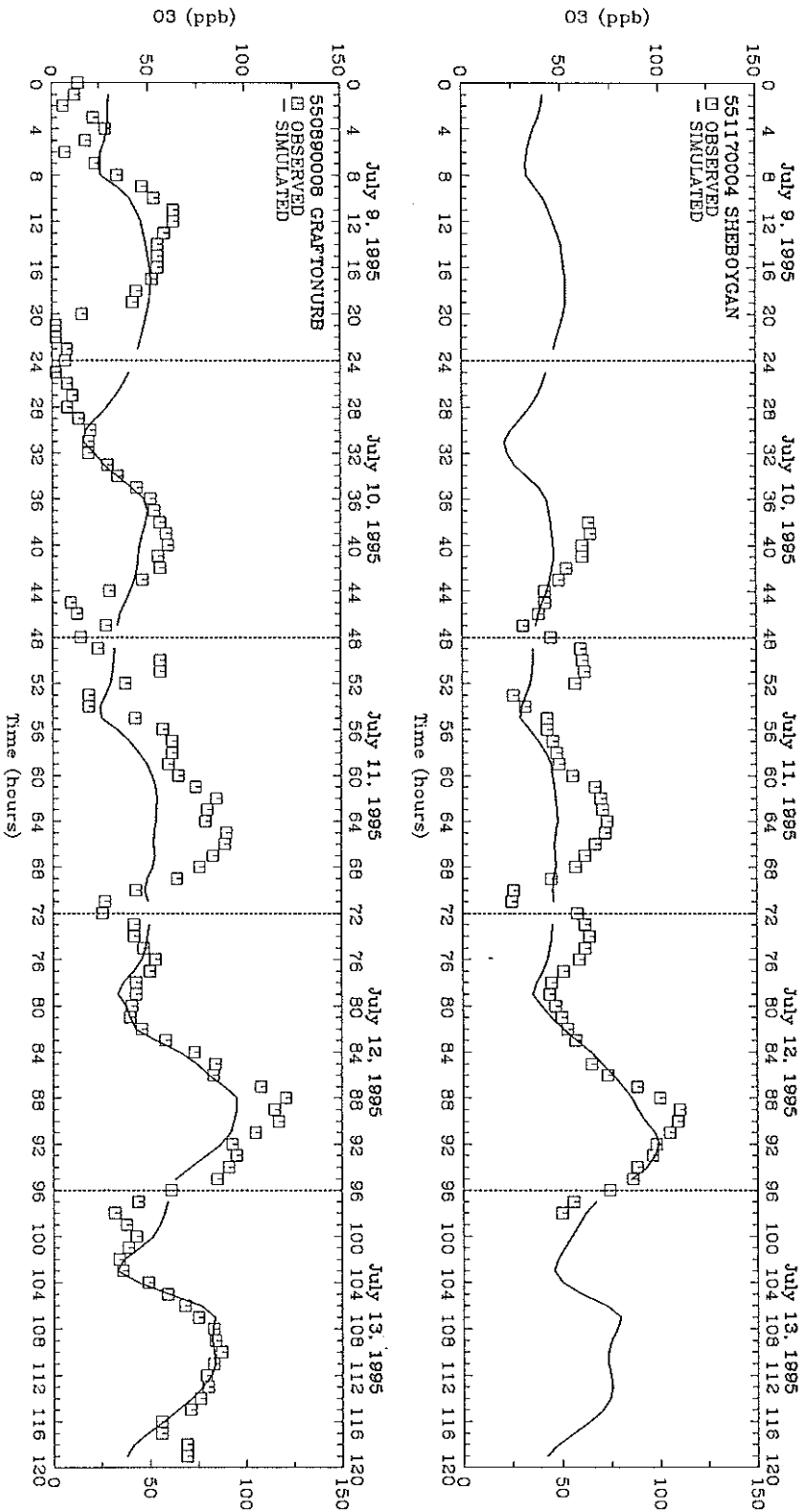
1-hour Time Series for the Ladco Domain
July 09-13, 1995 (95bas11v2 run)
namv 12M



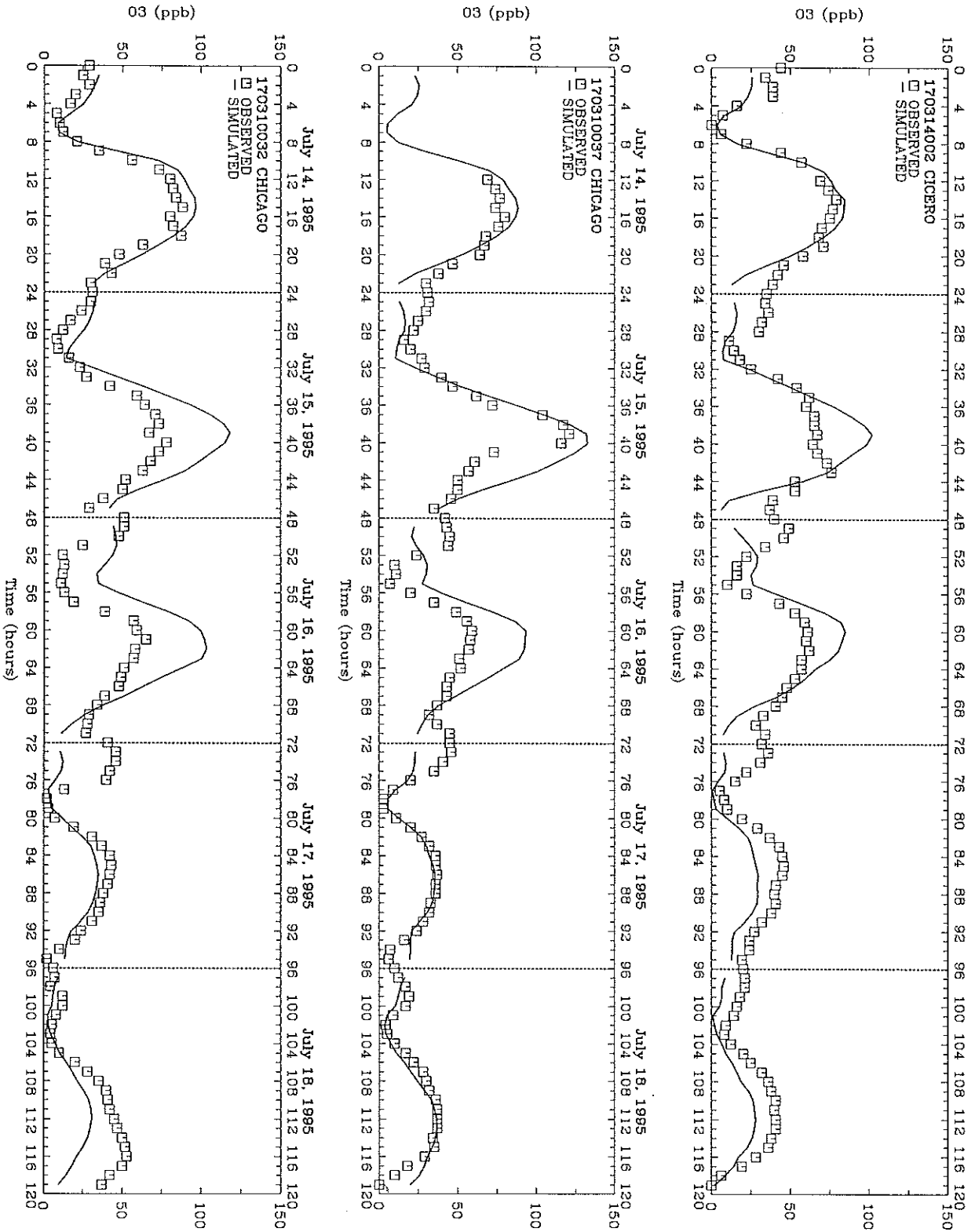
1-hour Time Series for the Lado Domain
July 09-13, 1995 (95bas1v2 run)
uamv 12M



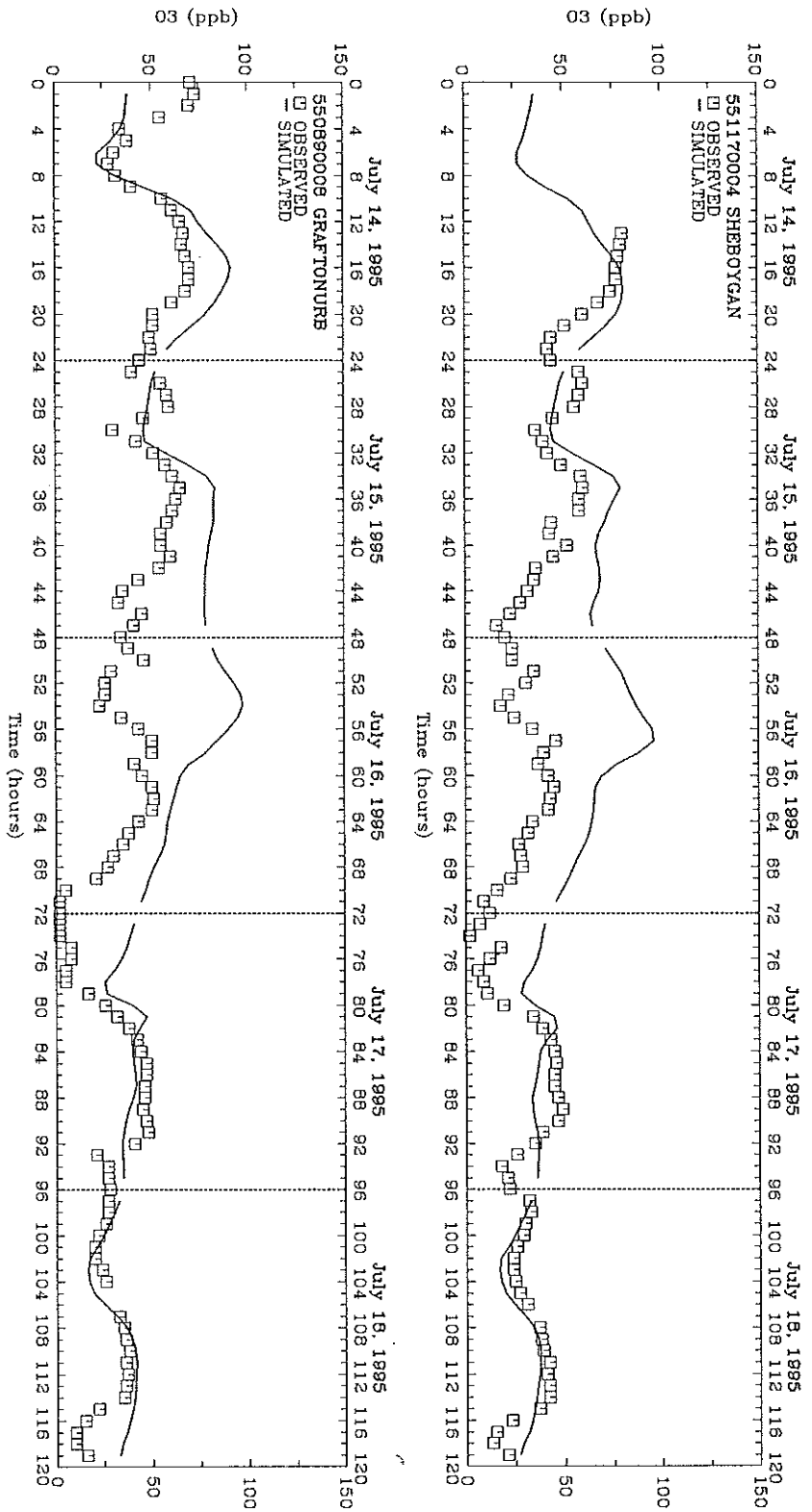
1-hour Time Series for the Ladco Domain
July 09-13, 1995 (95bas1lv2 run)
uamv 12M



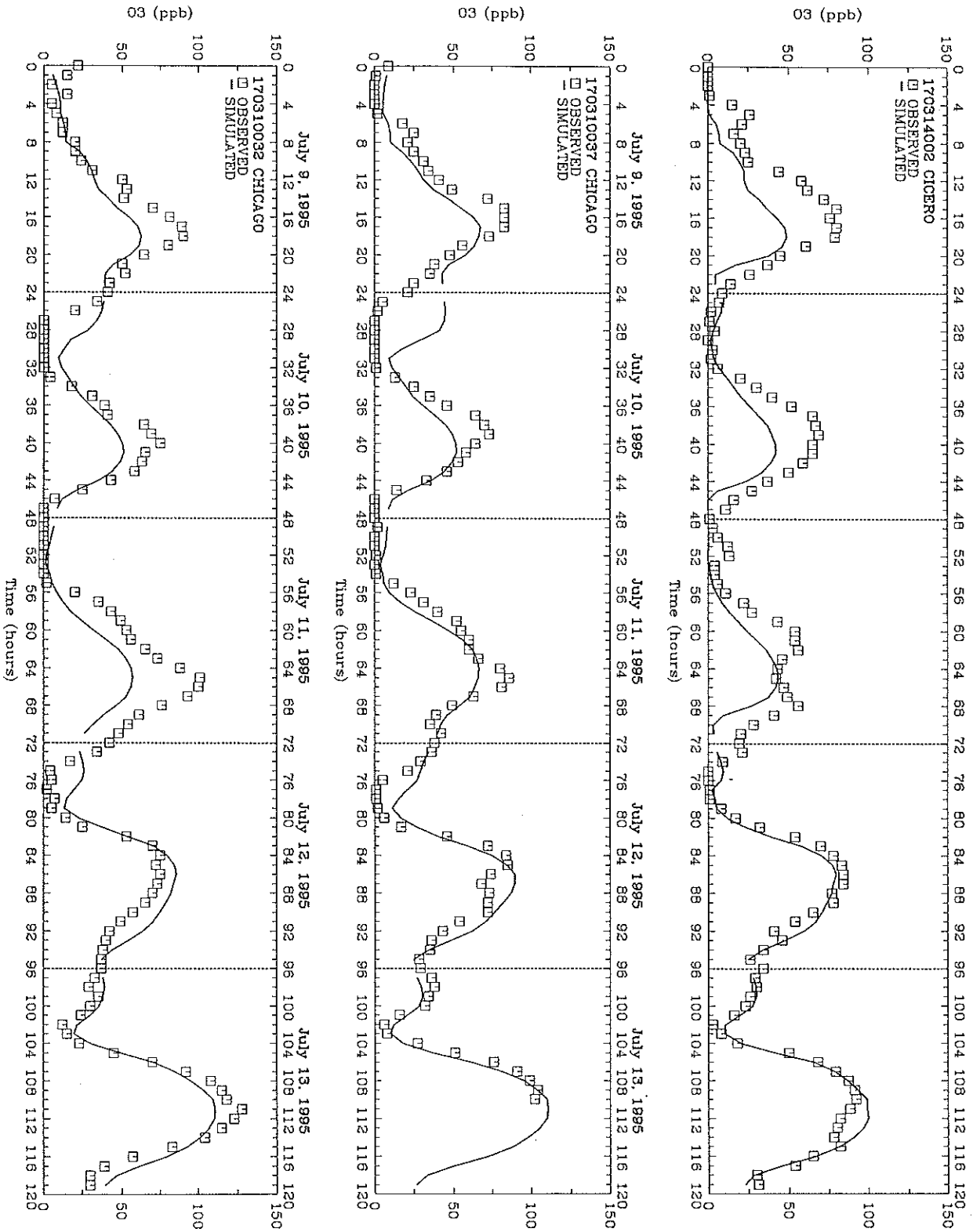
1-hour Time Series for the Ladco Domain
July 09-13, 1995 (95bas11v2 run)
uamv 12M



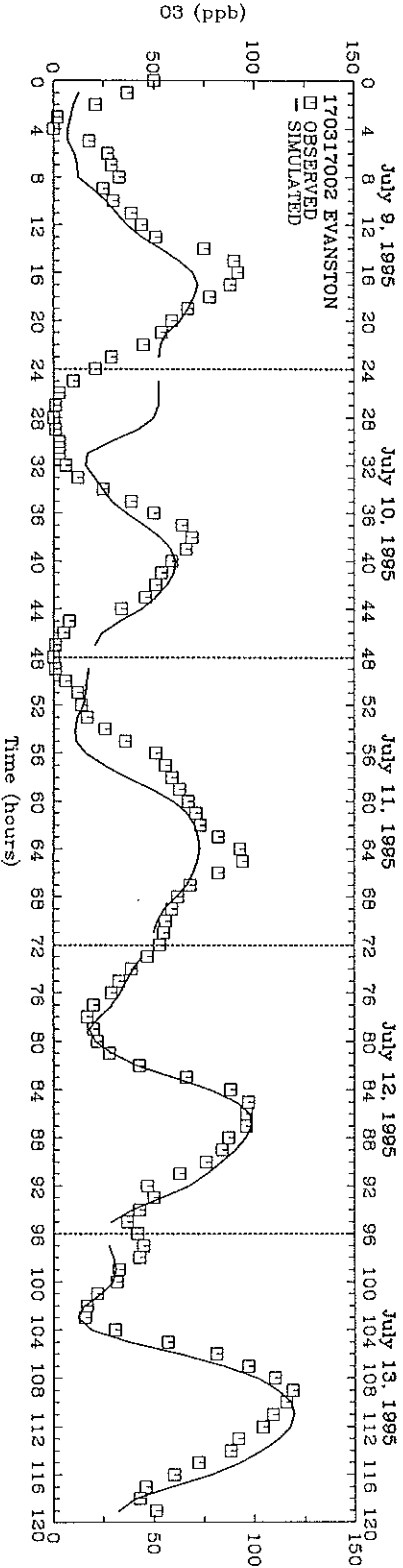
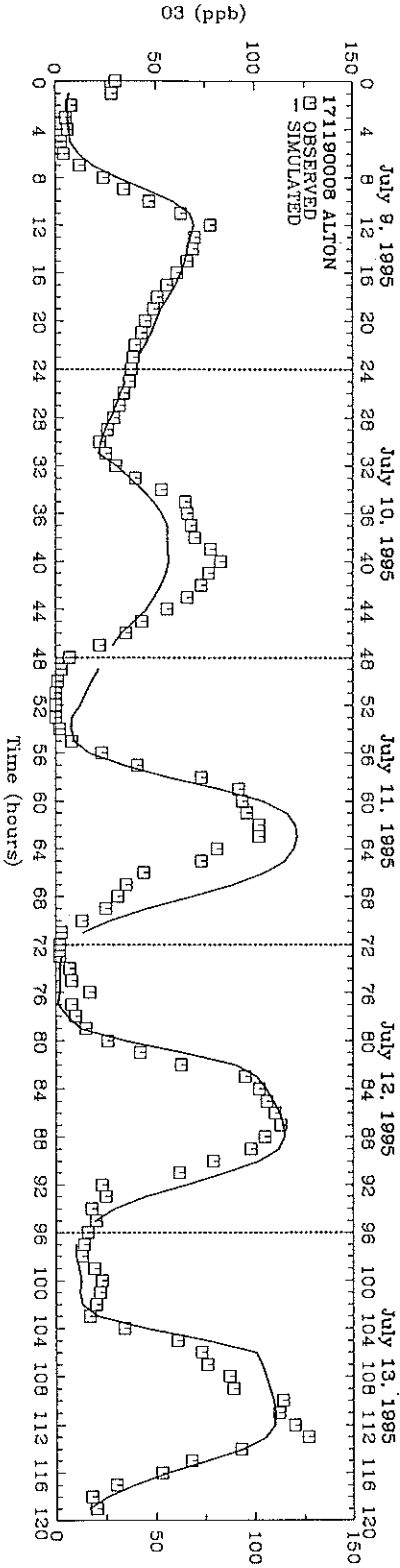
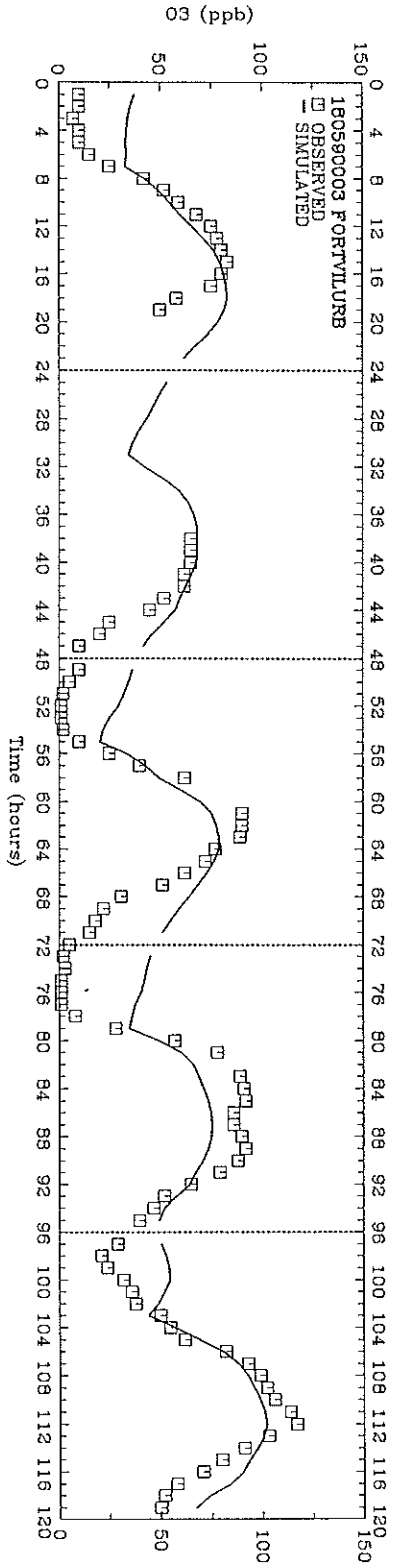
1-hour Time Series for the Ladco Domain
July 14-18, 1995 (95bas11v2 run)
uamv 12M



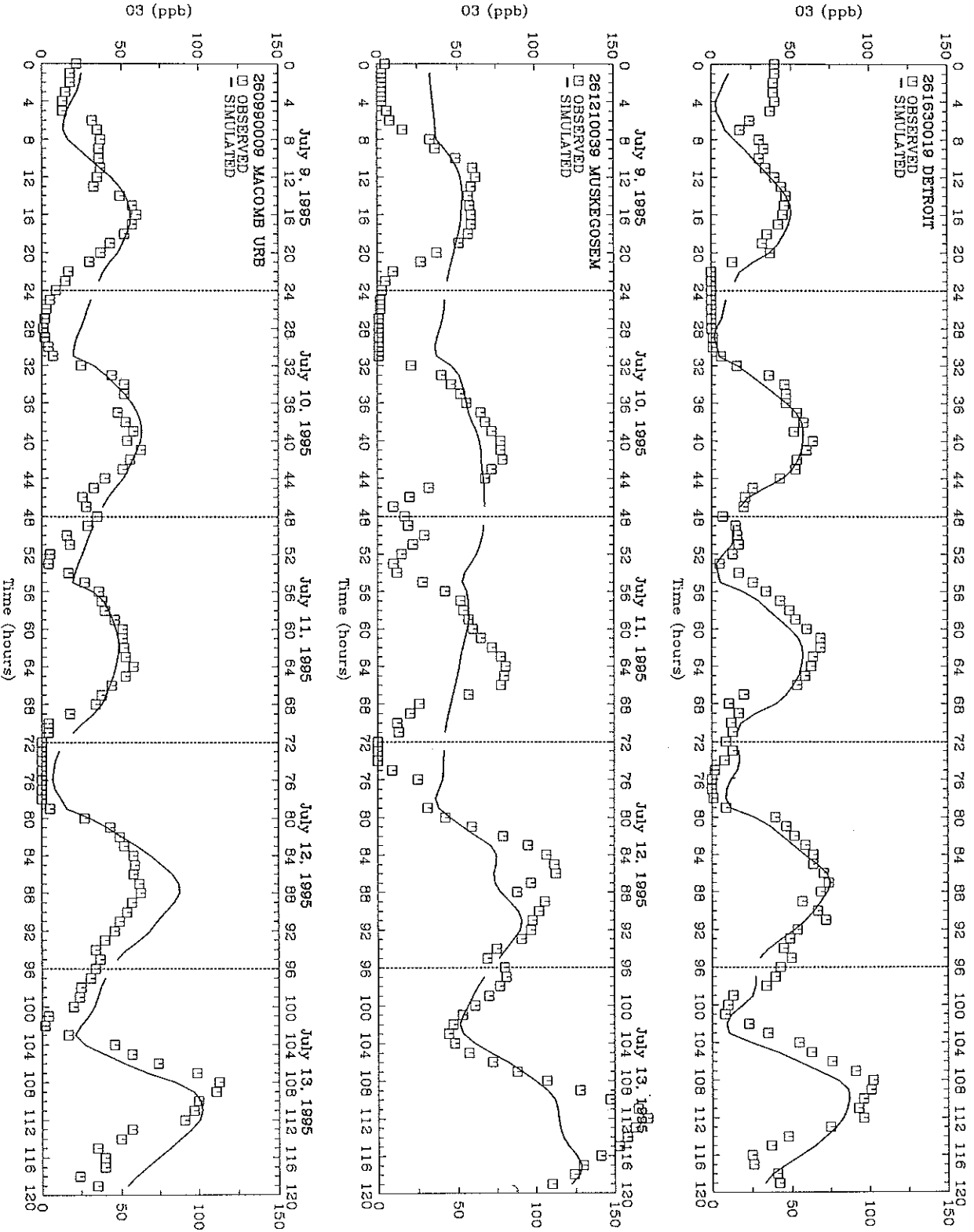
1-hour Time Series for the Ladco Domain
July 14-18, 1995 (95bas1lv2 run)
uamv 12M



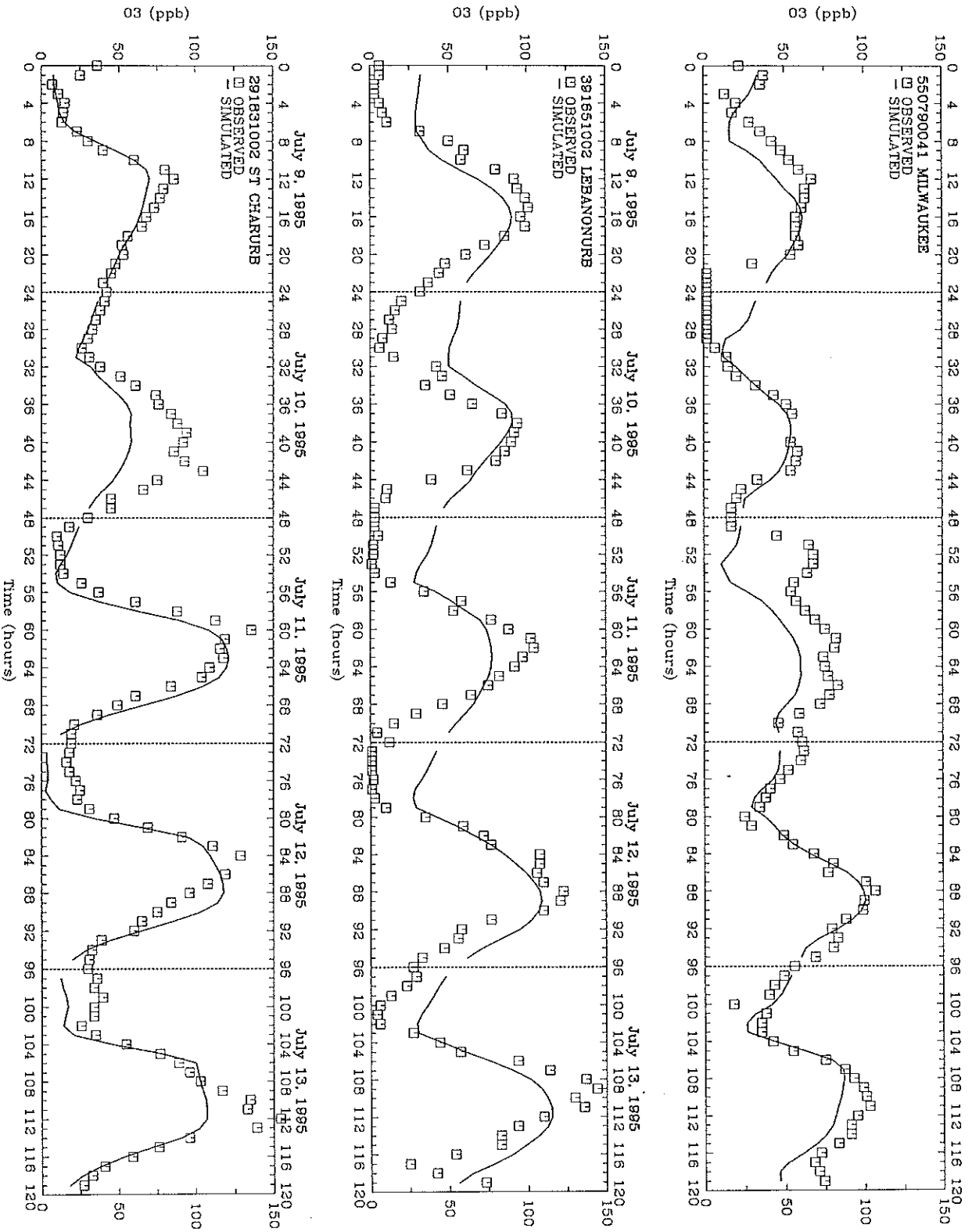
1-hour Time Series for the Ladco Domain
July 09-13, 1995 (95bas11v2 run)
camx 12M



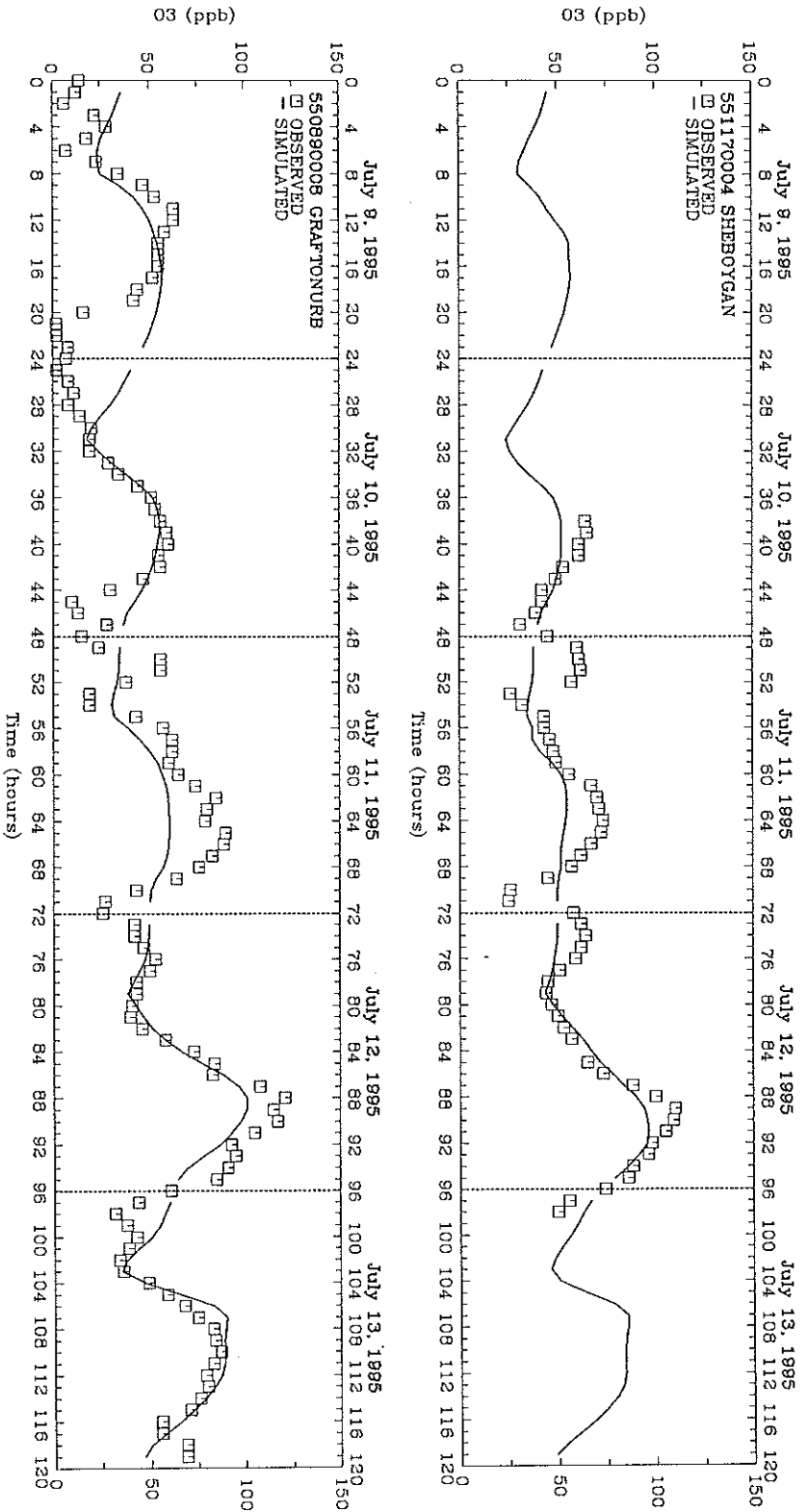
1-hour Time Series for the Ladco Domain
July 09-13, 1995 (95bas11v2 run)
camx 12M



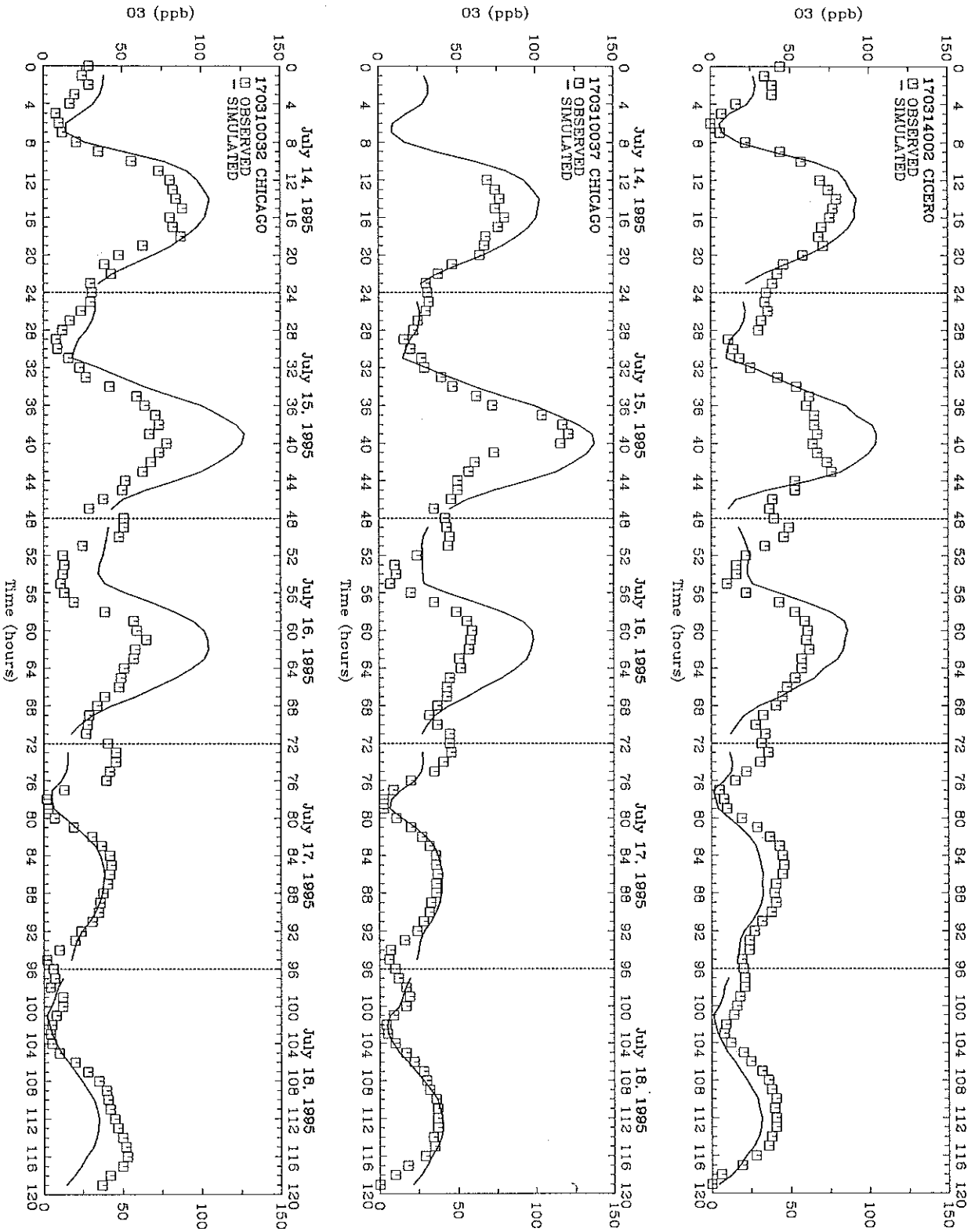
1-hour Time Series for the Ladoo Domain
July 09-13, 1995 (95bas11v2 run)
camx 12M



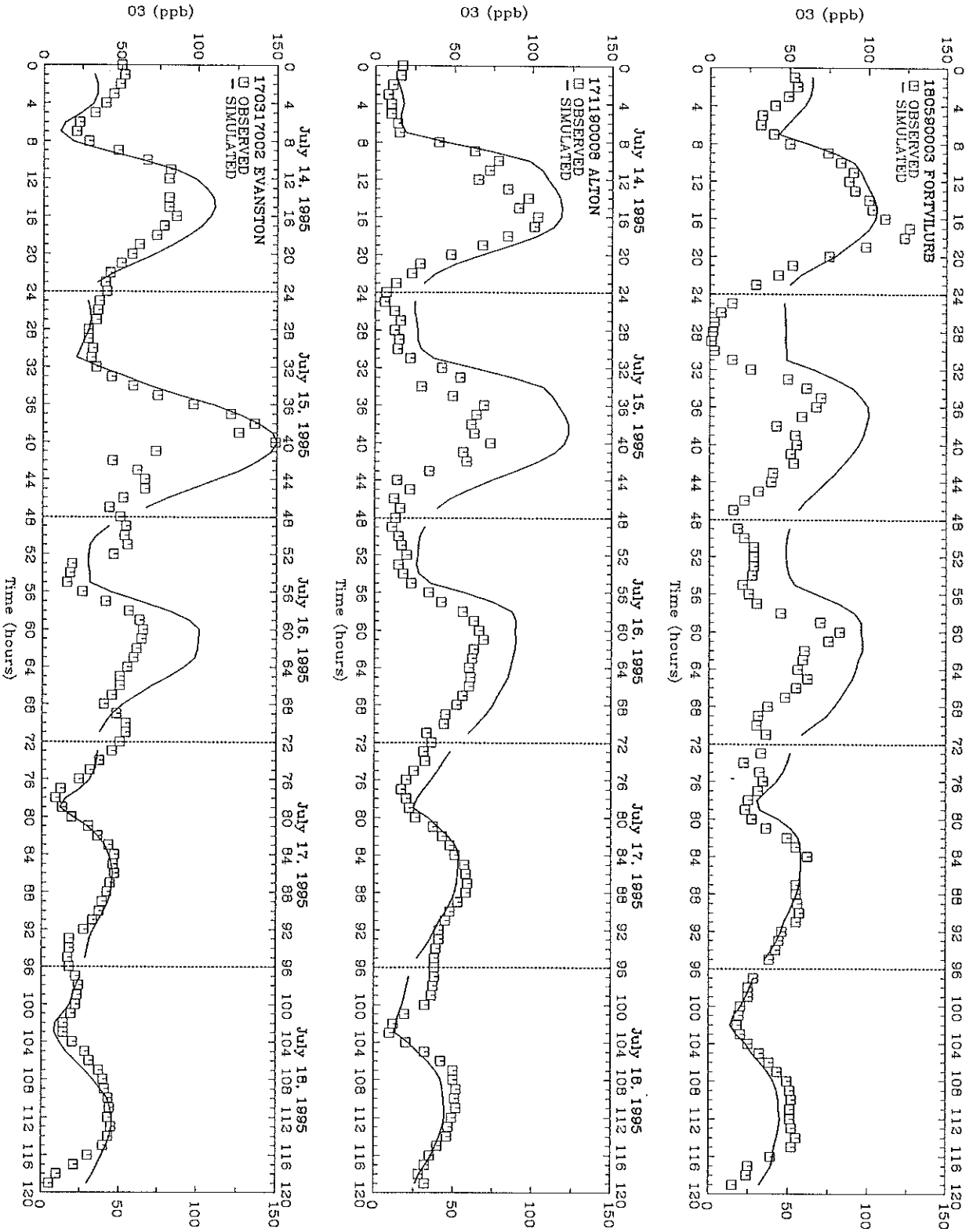
1-hour Time Series for the Ladco Domain
July 09-13, 1995 (95bas11v2 run)
camx 12M



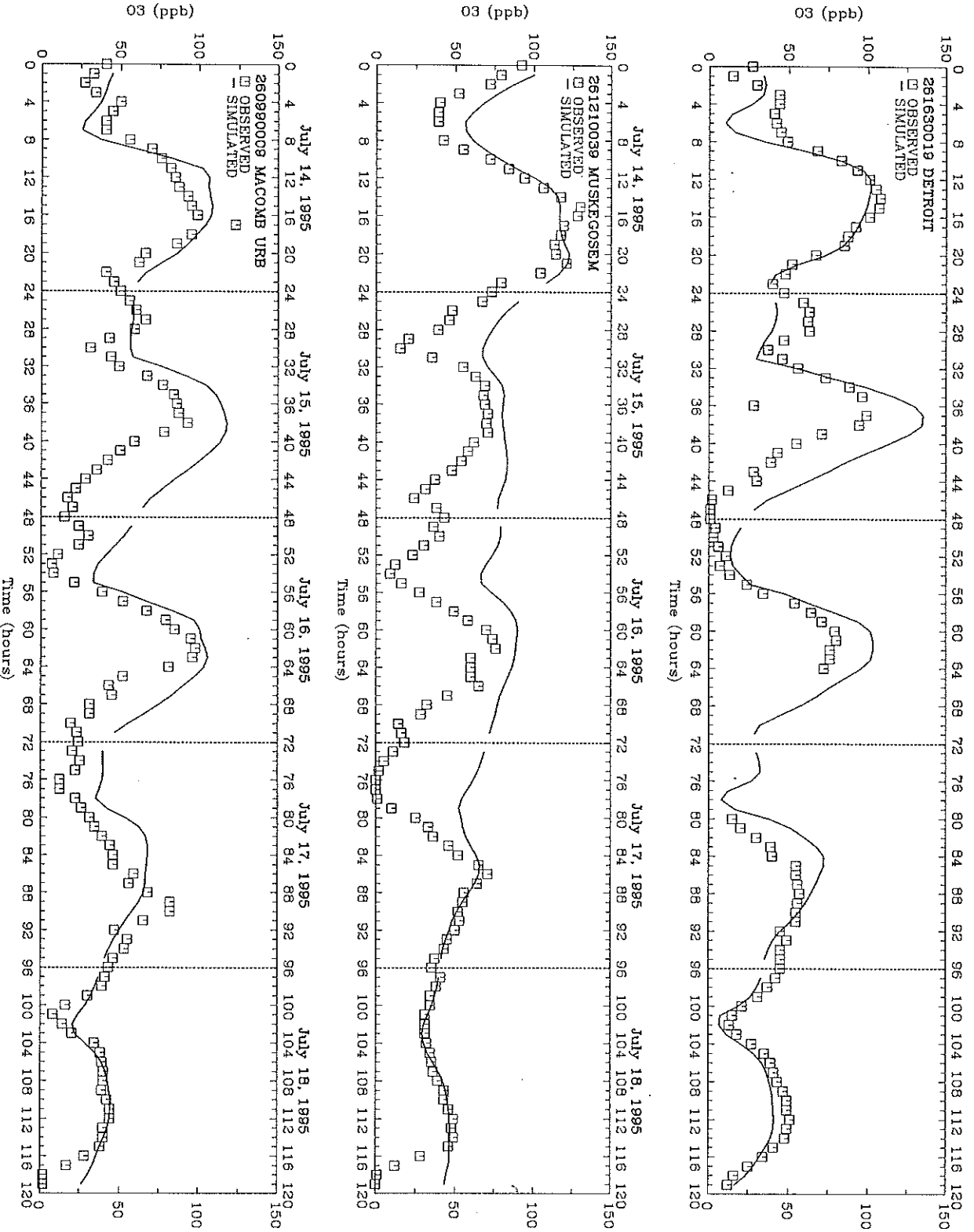
1-hour Time Series for the Ladco Domain
July 09-13, 1995 (95bas11v2 run)
camx 12M



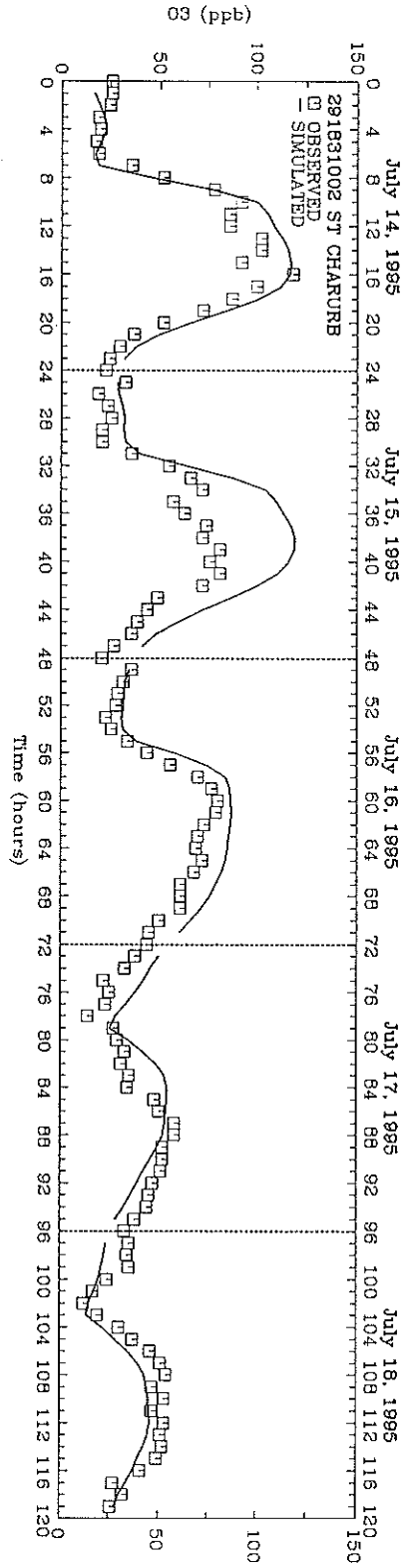
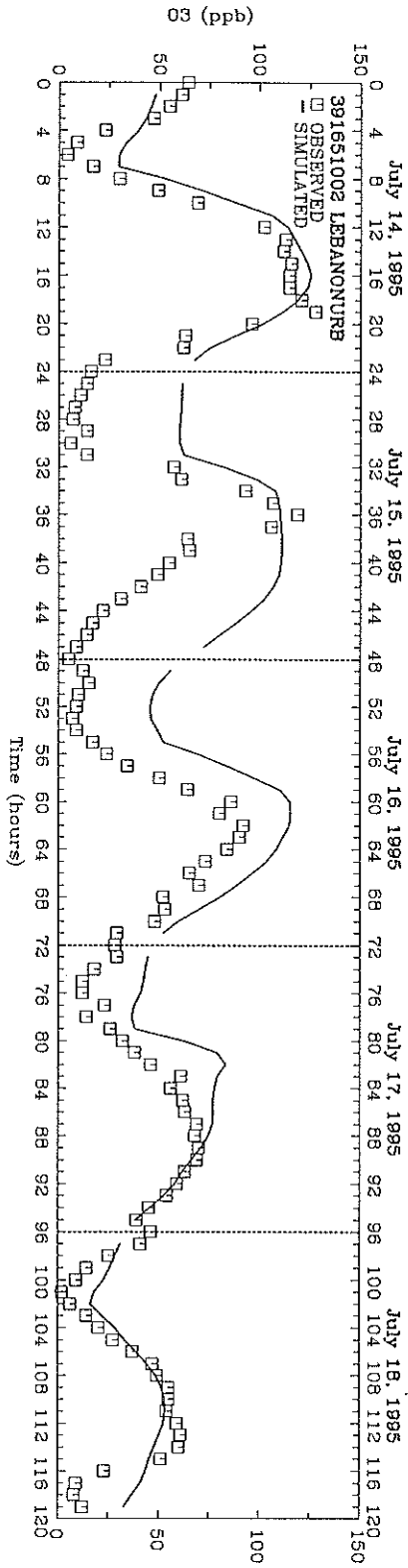
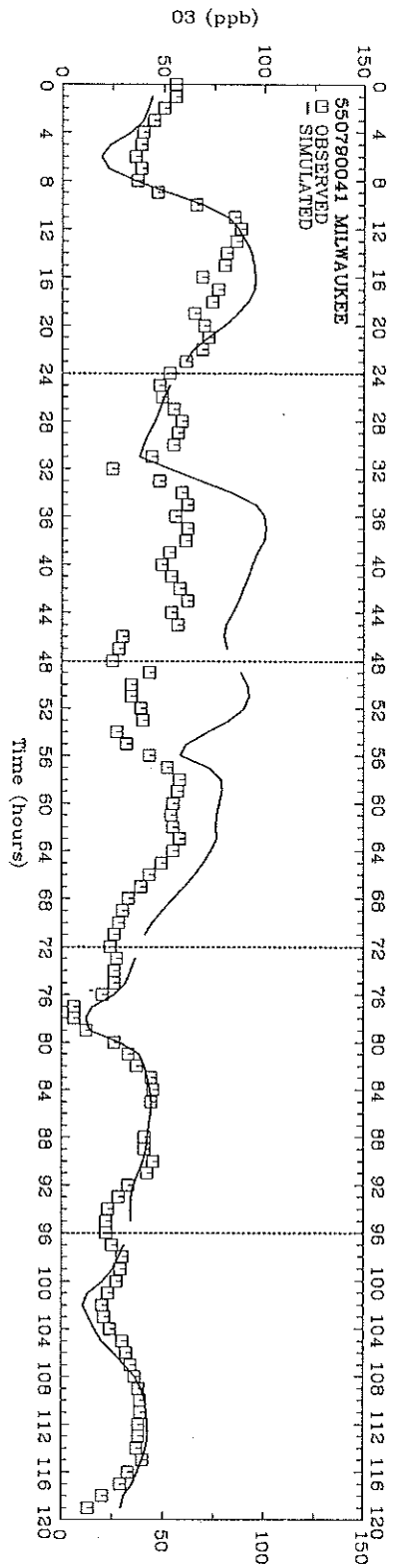
1-hour Time Series for the Lado Domain
July 14-18, 1995 (95bas11v2 run)
camx 12M



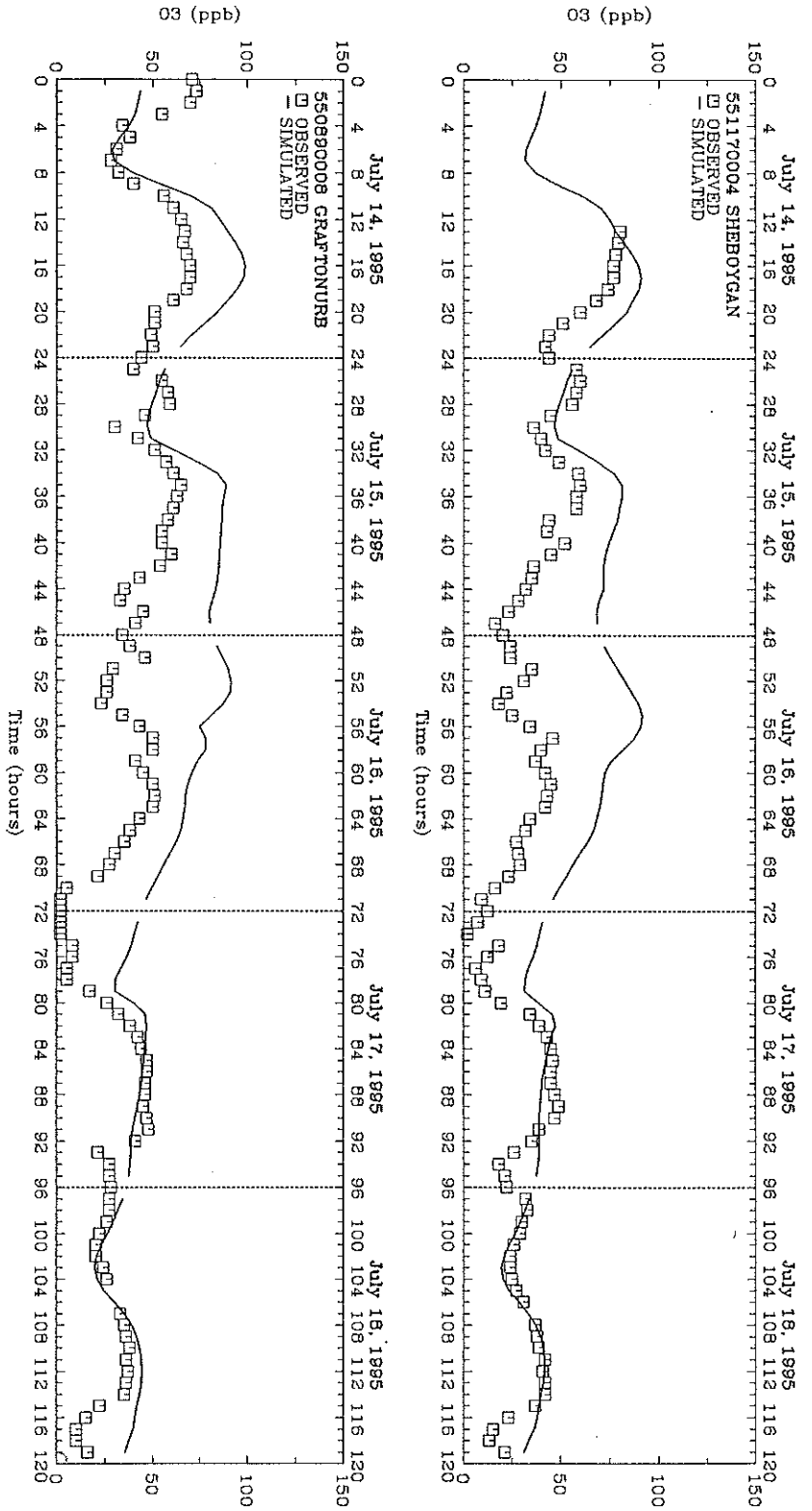
1-hour Time Series for the Ladco Domain
July 14-18, 1995 (95bas11v2 run)
camx 12M



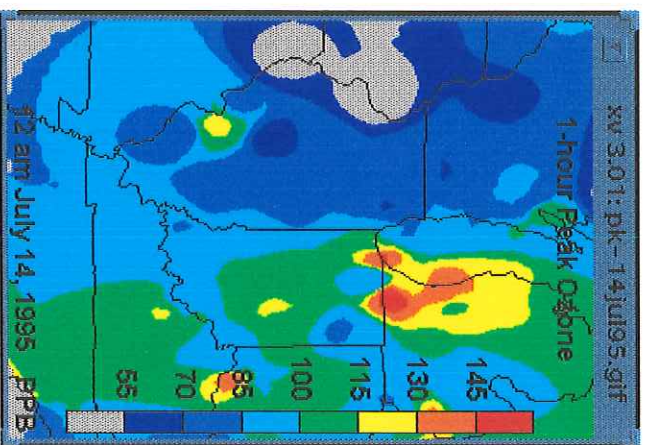
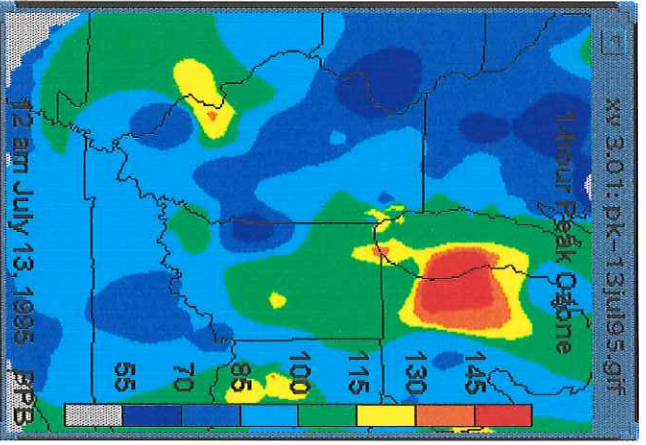
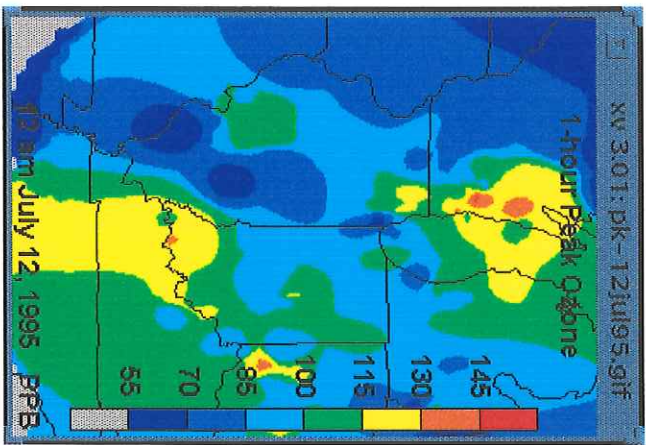
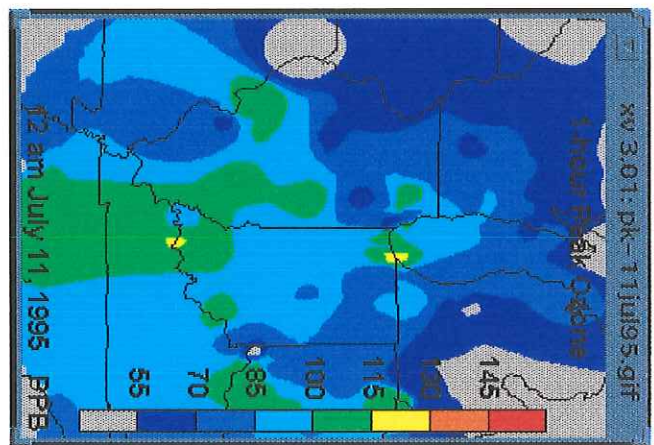
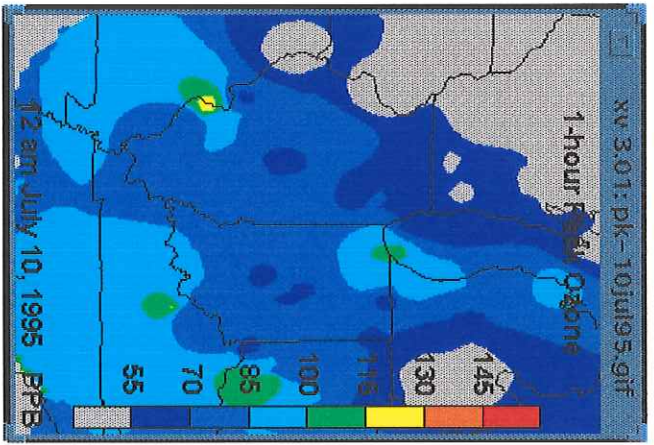
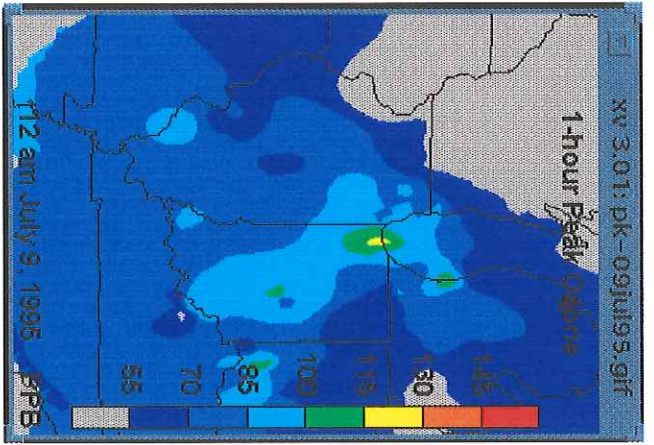
1-hour Time Series for the Ladco Domain
July 14-18, 1995 (95bas11v2 run)
camx 12M

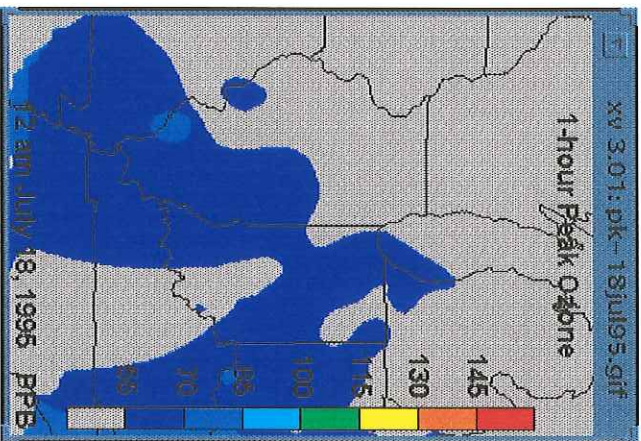
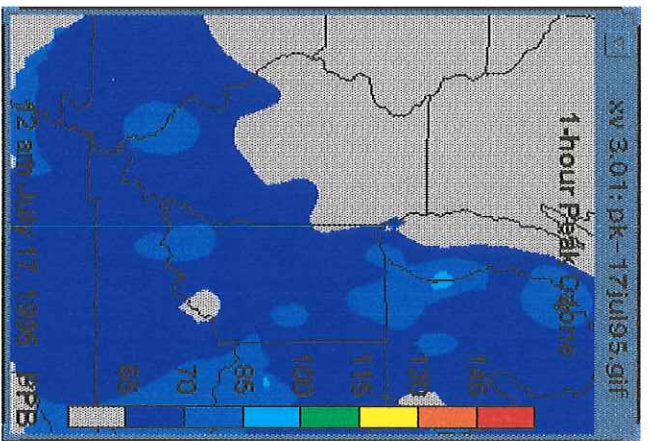
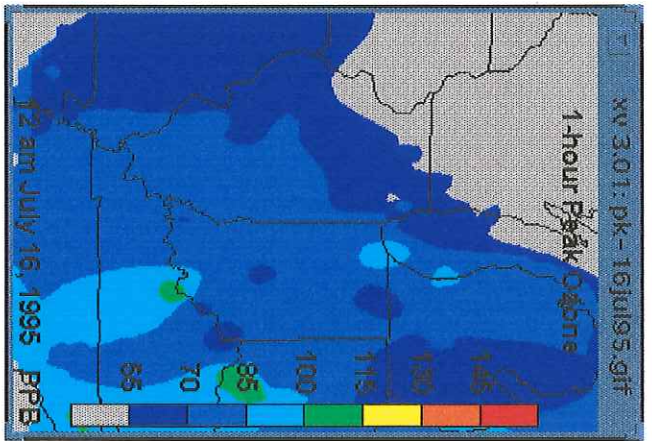
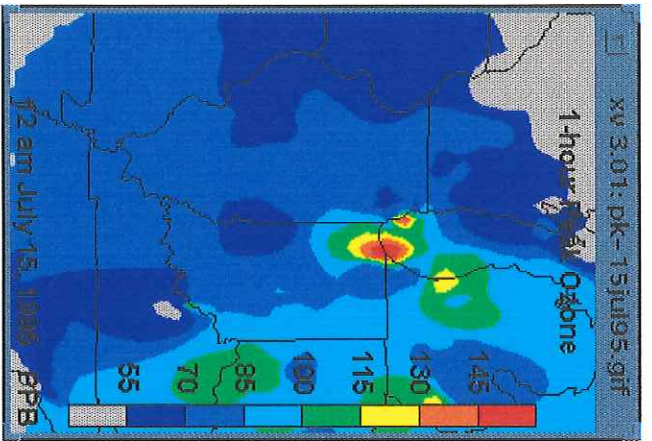


1-hour Time Series for the Ladco Domain
July 14-18, 1995 (95bas11v2 run)
camx 12M

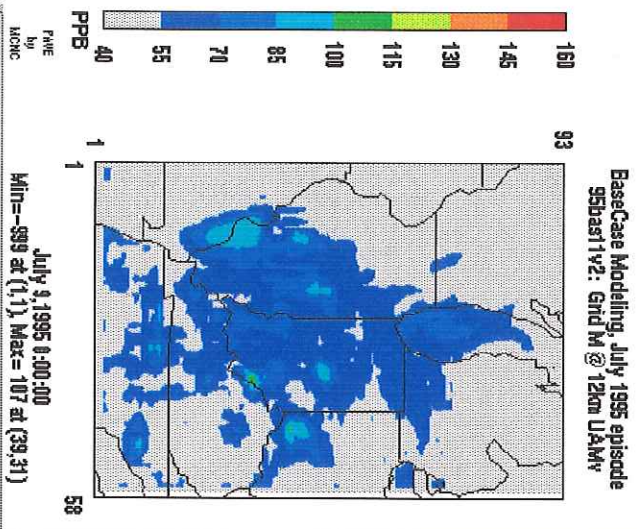


1-hour Time Series for the Ladco Domain
July 14-18, 1995 (95bas11v2 run)
camx 12M

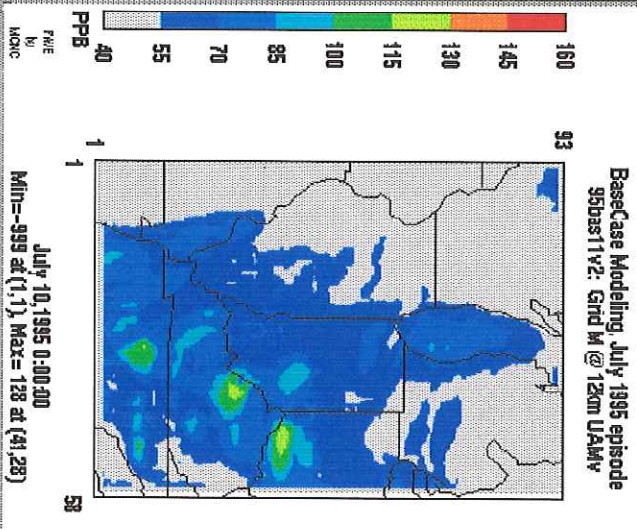




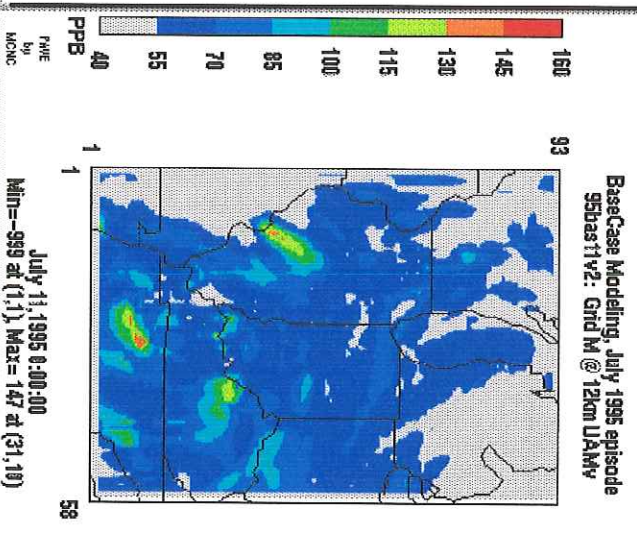
Daily Peak 1-Hour Ozone



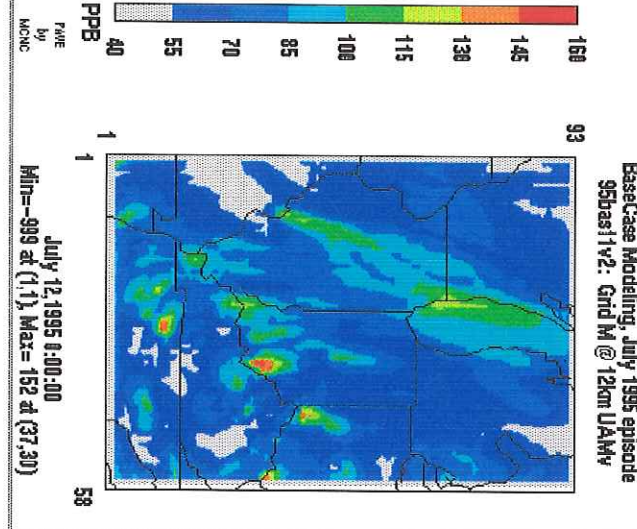
Daily Peak 1-Hour Ozone



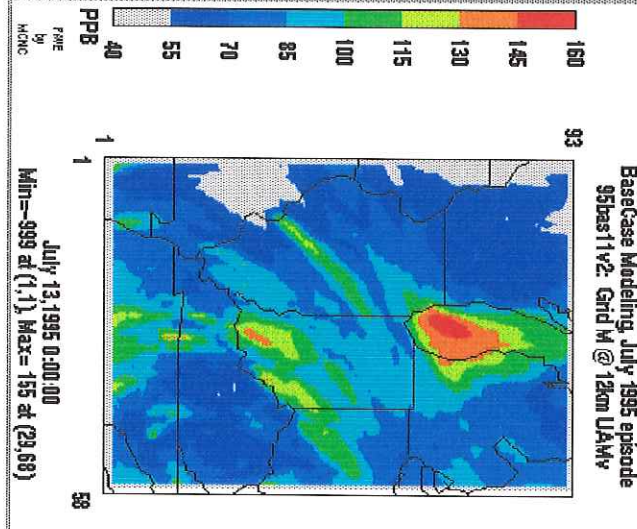
Daily Peak 1-Hour Ozone



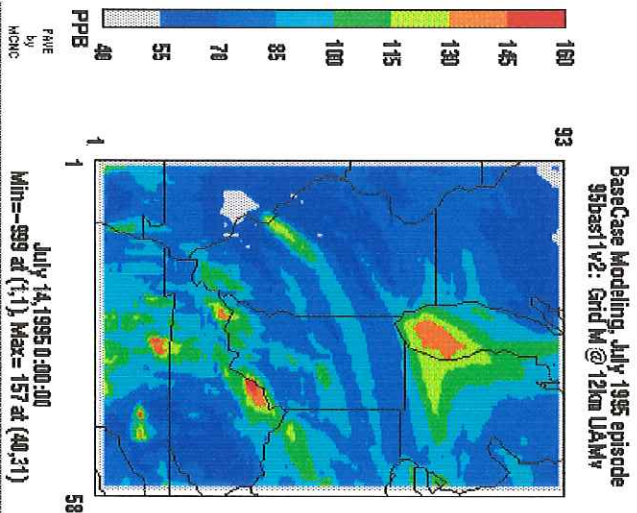
Daily Peak 1-Hour Ozone



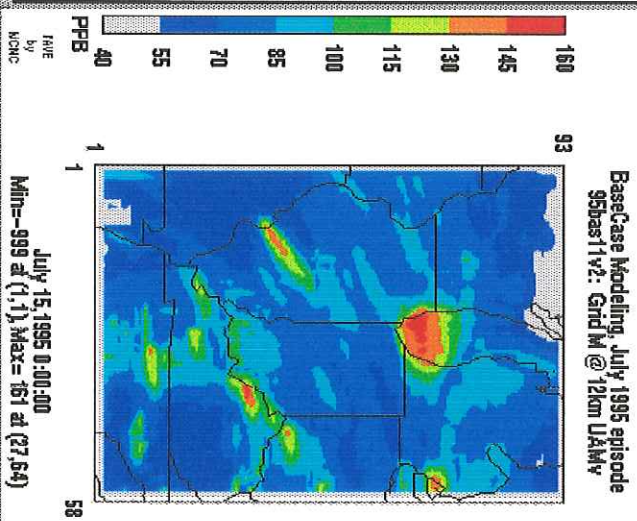
Daily Peak 1-Hour Ozone



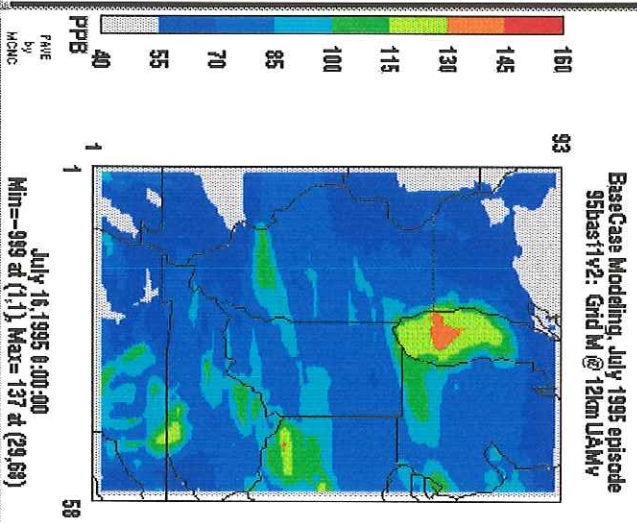
Daily Peak 1-Hour Ozone



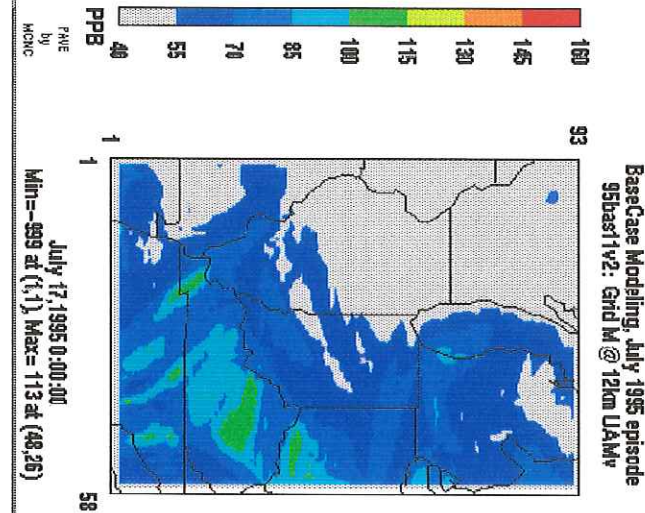
Daily Peak 1-Hour Ozone



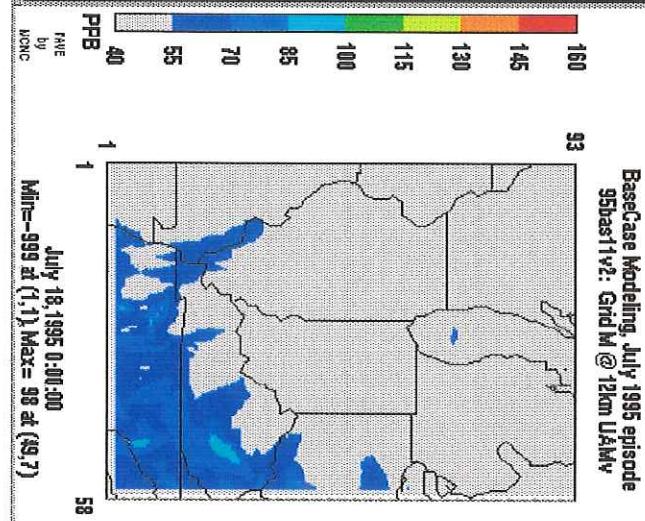
Daily Peak 1-Hour Ozone



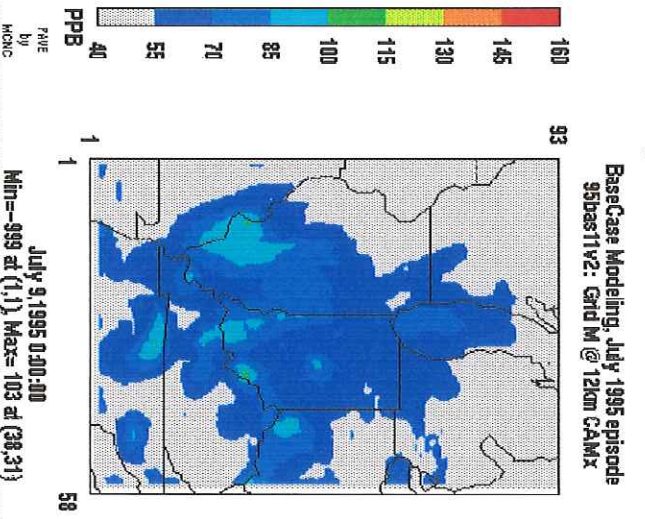
Daily Peak 1-Hour Ozone



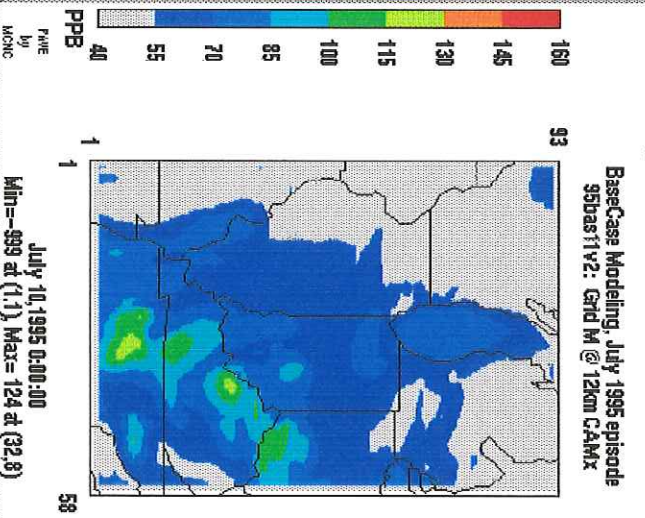
Daily Peak 1-Hour Ozone



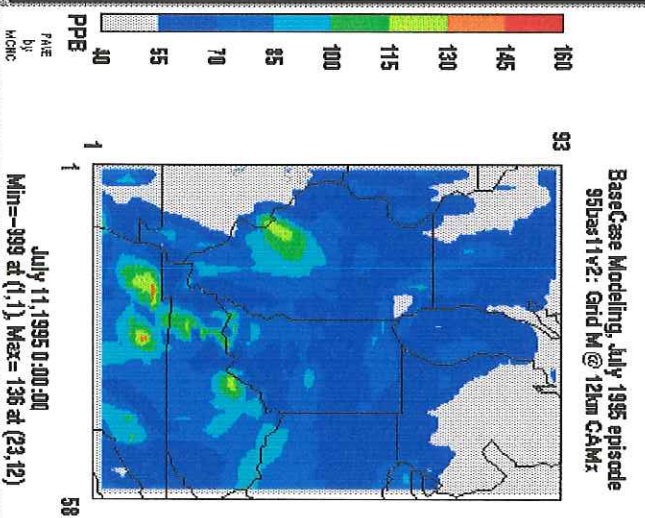
Daily Peak 1-Hour Ozone



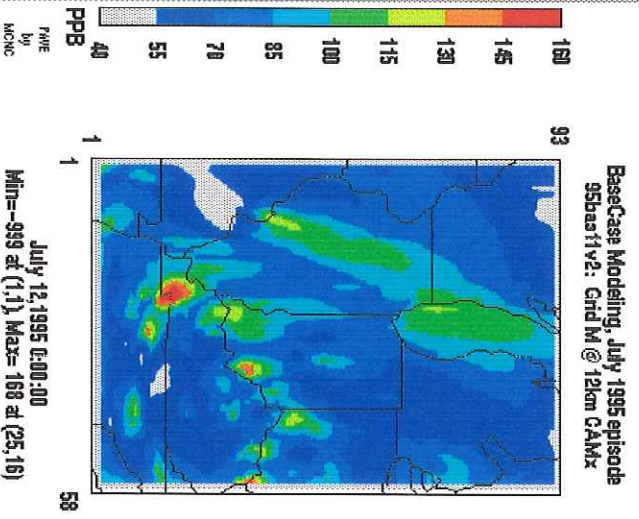
Daily Peak 1-Hour Ozone



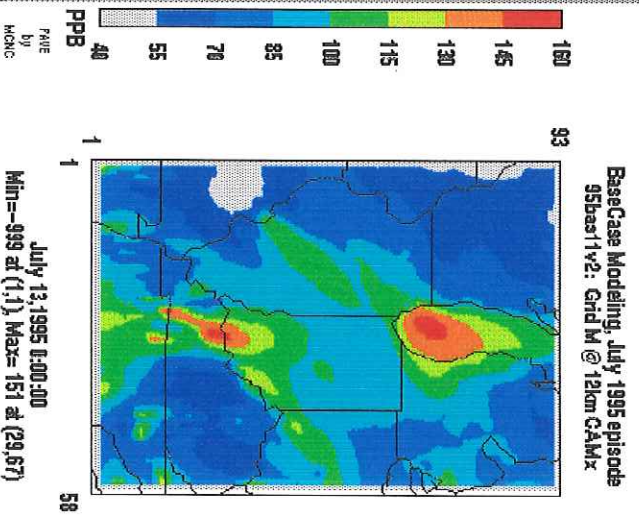
Daily Peak 1-Hour Ozone



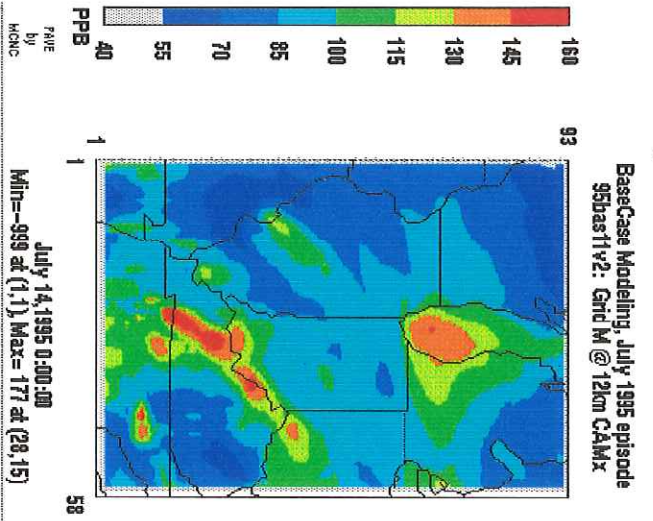
Daily Peak 1-Hour Ozone



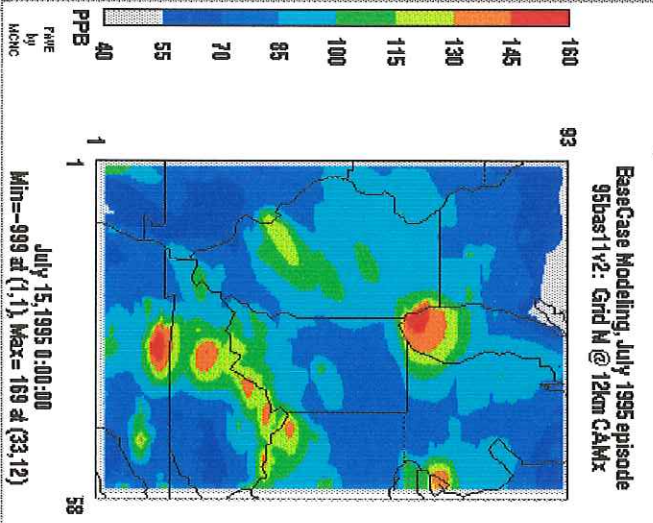
Daily Peak 1-Hour Ozone



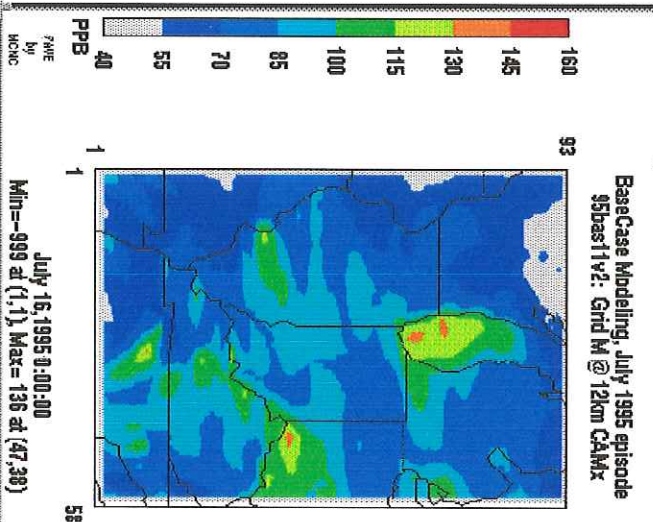
Daily Peak 1-Hour Ozone



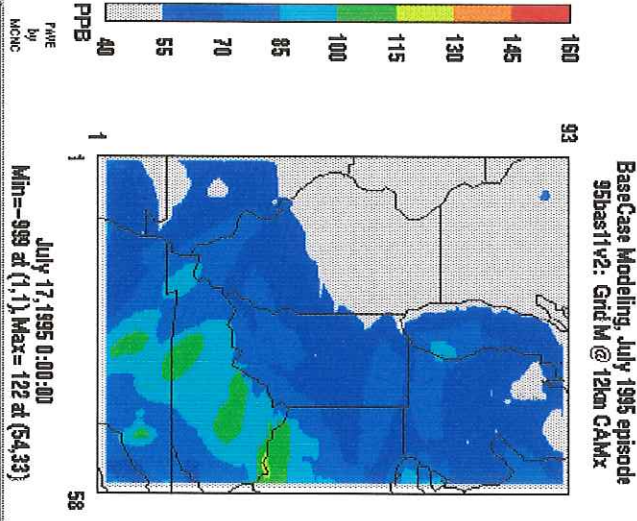
Daily Peak 1-Hour Ozone



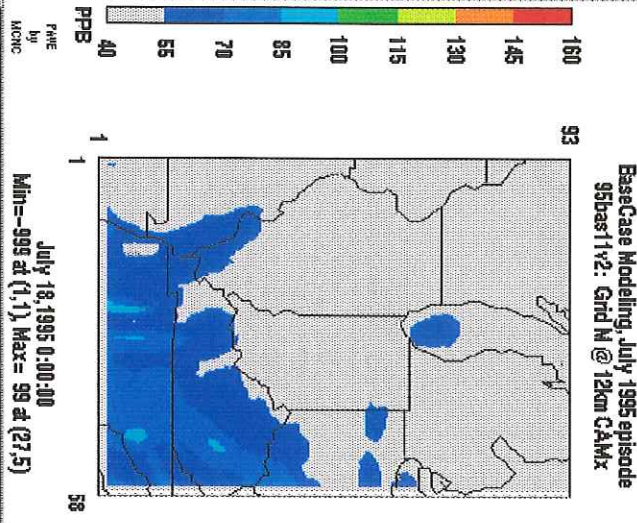
Daily Peak 1-Hour Ozone



Daily Peak 1-Hour Ozone



Daily Peak 1-Hour Ozone



Sensitivity Runs

Model runs for June 1995 (12km):

sens1 SR1 w/ -50% anthropogenic VOC (UAM-V)
 sens2 SR1 w/ -50% anthropogenic NOx (UAM-V)

sens3 SR1 w/ -50% anthropogenic VOC (CAMX)
 sens4 SR1 w/ -50% anthropogenic NOx (CAMX)

sens5 SR1 w/ -50% isoprene in SE MO (CAMX)
 sens6 sens3 w/ -50% isoprene in SE MO (CAMX)
 sens7 sens4 w/ -50% isoprene in SE MO (CAMX)

Model runs for June 1991 (12km):

sens91 backcast 1996 emissions to 1991
 (elevated x 1.3, low-level VOC x 1.6,
 low-level NOx x 0.75)

sens1C higher initial concentrations

Sensitivity Results: Findings

UAM-V and CAMx respond similarly to VOC and NOx emissions reductions

Ozarks isoprene volcano has small effect on Lake Michigan area (June 1995 episode)

Model performance for 1991 episodes improves with "actual" emission estimates

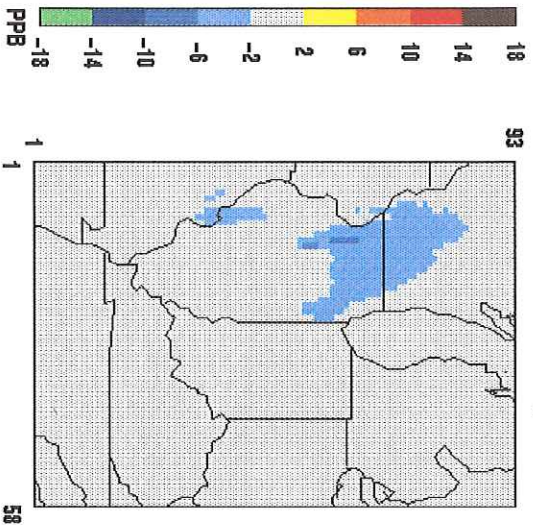
	OBS	95Bas UAM-V	95Bas CAMx	SR1 UAM-V	SR1 CAMx	sens3 CAMx	sens1 UAM-V	sens2 UAM-V	sens1 CAMx	sens2 CAMx	sens4 CAMx	sens5 CAMx
Jun15	125	84	82	80	78	78	75	74	74	74	74	73
Jun16	124	97	89	93	87	87	89	80	83	80	83	80
Jun17	145	129	113	122	108	106	114	106	99	98	97	97
Jun18	131	129	124	120	120	119	110	113	108	107	107	107
Jun19	118	118	106	111	103	103	105	112	97	102	97	102
Jun20	97	121	117	112	110	110	107	94	106	96	106	96
Jun21	112	123	119	121	117	117	119	112	115	108	115	108
Jun22	119	131	124	131	124	124	128	117	121	116	121	116
Jun23	123	131	124	126	119	119	124	112	116	115	116	115
Jun24	166	136	138	133	134	134	122	126	130	130	130	130
Jun25	108	131	131	126	126	126	116	116	118	116	118	116

No. Grid Cells > 100 ppb

	OBS	95Bas UAM-V	95Bas CAMx	SR1 UAM-V	SR1 CAMx	-50% ISOP sens3 CAMx	-50% VOC sens1 UAM-V	-50% NOx sens2 UAM-V	-50% VOC sens1 CAMx	-50% NOx sens2 CAMx	-50% VOC sens4 CAMx	-50% NOx sens5 CAMx
Jun15	0	0	0	0	0	0	0	0	0	0	0	0
Jun16	0	0	0	0	0	0	0	0	0	0	0	0
Jun17	140	140	120	79	54	39	15	13	0	0	0	0
Jun18	176	176	162	112	111	109	59	47	67	16	60	13
Jun19	91	91	76	19	8	8	6	10	0	3	0	3
Jun20	17	17	20	16	18	17	10	0	10	0	10	0
Jun21	34	34	43	35	41	41	27	16	35	13	35	13
Jun22	182	182	162	172	147	147	152	97	125	49	125	49
Jun23	181	181	233	149	196	196	131	66	177	48	177	48
Jun24	290	290	358	250	311	311	234	55	299	81	299	81
Jun25	191	191	247	112	191	191	89	20	175	36	175	36

Ozone Difference Plot

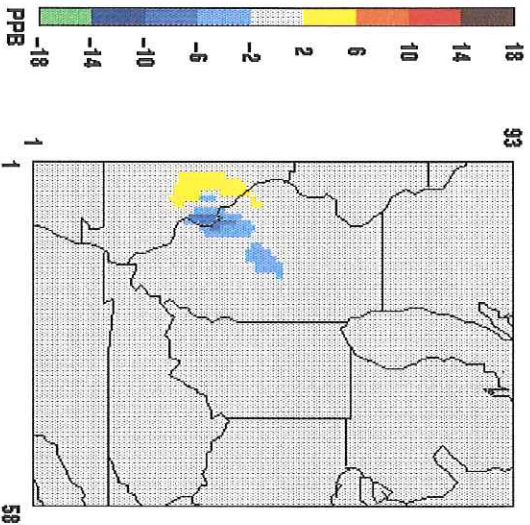
CAMx sens3-07caat1v2 Grid-M 12km
Effect of 50% redn. in SE MO Biogenic Emissions



June 15, 1995 0:00:00
Min= -7 at (15,54) Max= 1 at (4,27)

Ozone Difference Plot

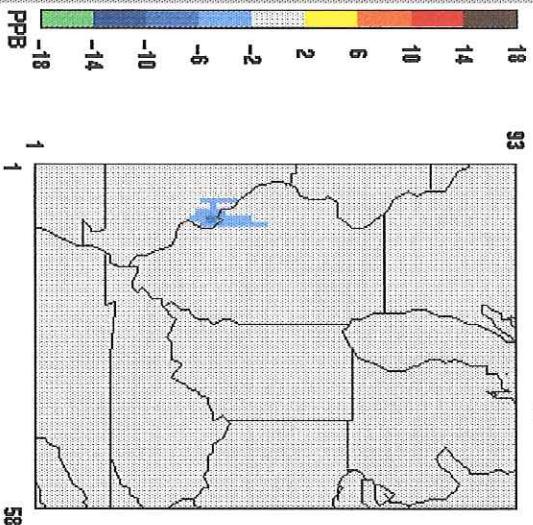
CAMx sens3-07caat1v2 Grid-M 12km
Effect of 50% redn. in SE MO Biogenic Emissions



June 18, 1995 0:00:00
Min= -9 at (11,36) Max= 3 at (5,37)

Ozone Difference Plot

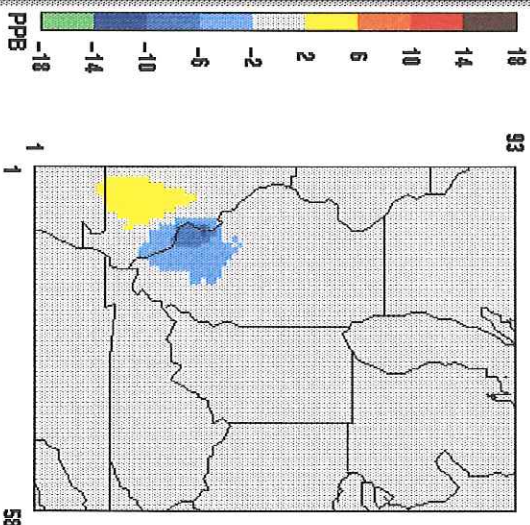
CAMx sens3-07caat1v2 Grid-M 12km
Effect of 50% redn. in SE MO Biogenic Emissions



June 16, 1995 0:00:00
Min= -7 at (10,35) Max= 1 at (6,28)

Ozone Difference Plot

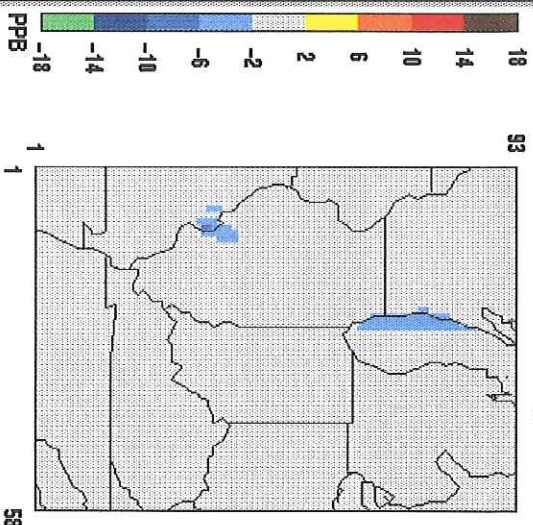
CAMx sens3-07caat1v2 Grid-M 12km
Effect of 50% redn. in SE MO Biogenic Emissions



June 19, 1995 0:00:00
Min= -12 at (11,33) Max= 4 at (7,23)

Ozone Difference Plot

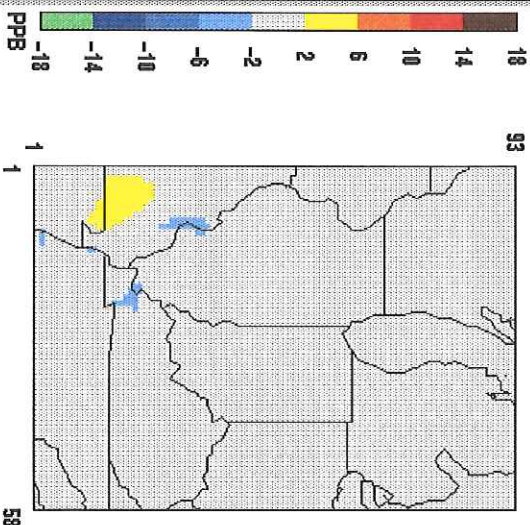
CAMx sens3-07caat1v2 Grid-M 12km
Effect of 50% redn. in SE MO Biogenic Emissions



June 17, 1995 0:00:00
Min= -7 at (11,34) Max= 2 at (9,21)

Ozone Difference Plot

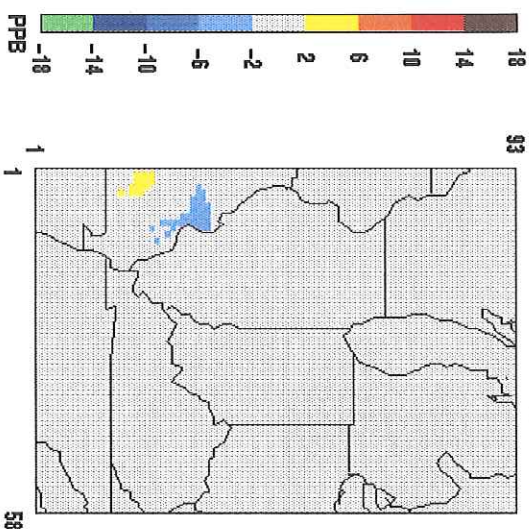
CAMx sens3-07caat1v2 Grid-M 12km
Effect of 50% redn. in SE MO Biogenic Emissions



June 20, 1995 0:00:00
Min= -4 at (11,32) Max= 4 at (8,15)

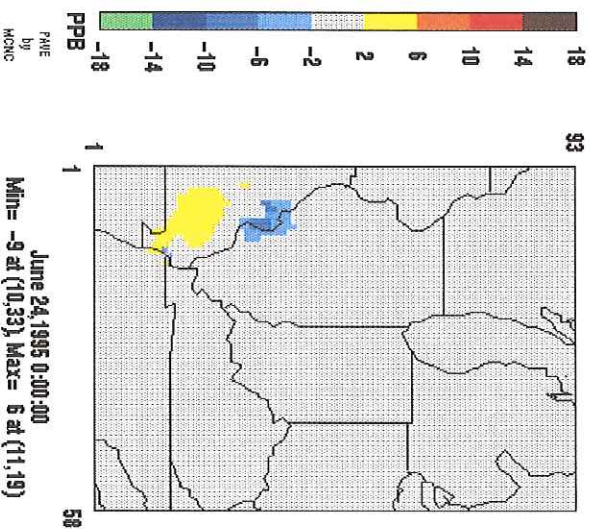
Ozone Difference Plot

CAMx sens3-07caat1v2 Grid-M 12km
Effect of 50% redn. in SE MO Biogenic Emissions



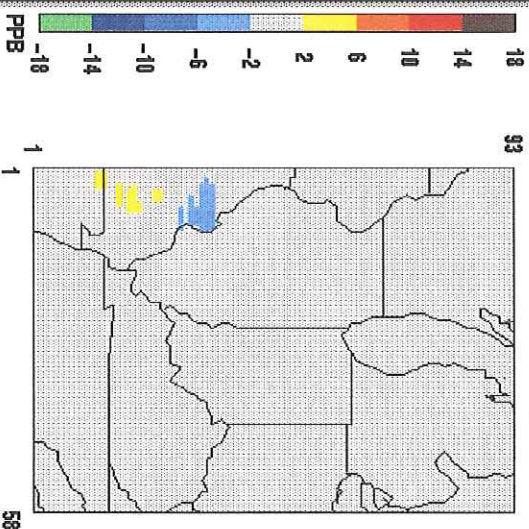
Ozone Difference Plot

CAMx sens3-07caat1v2 Grid-M 12km
Effect of 50% redn. in SE MO Biogenic Emissions



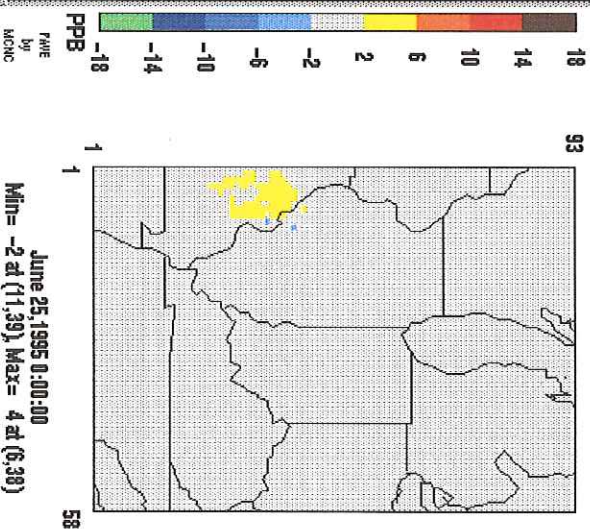
Ozone Difference Plot

CAMx sens3-07caat1v2 Grid-M 12km
Effect of 50% redn. in SE MO Biogenic Emissions



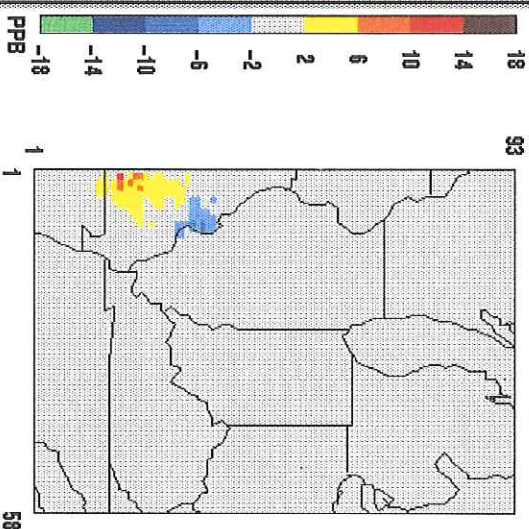
Ozone Difference Plot

CAMx sens3-07caat1v2 Grid-M 12km
Effect of 50% redn. in SE MO Biogenic Emissions



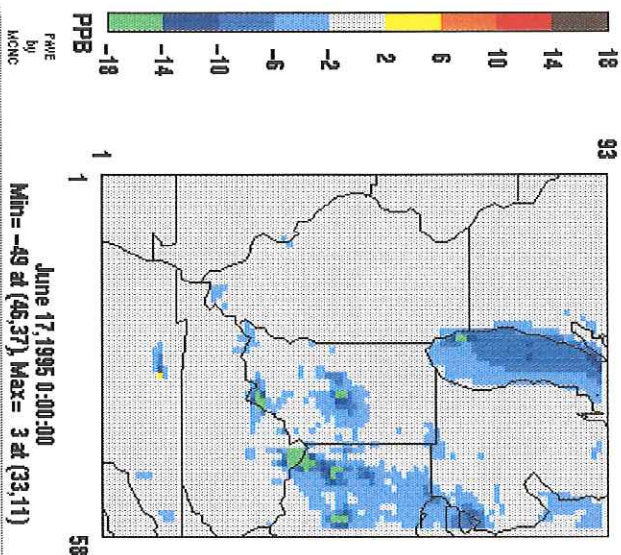
Ozone Difference Plot

CAMx sens3-07caat1v2 Grid-M 12km
Effect of 50% redn. in SE MO Biogenic Emissions



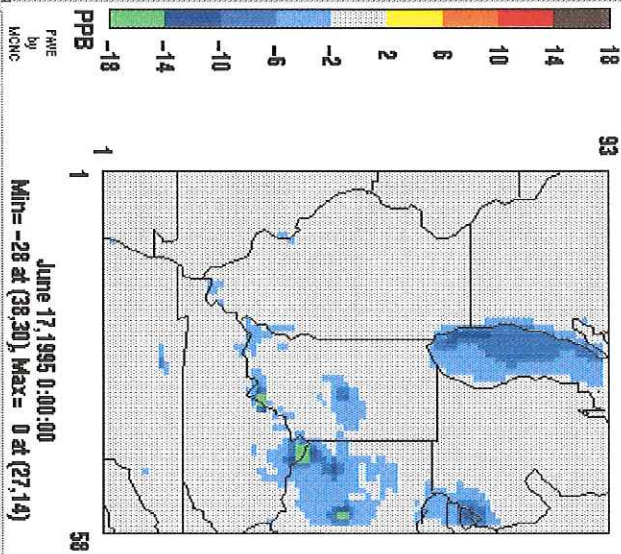
Ozone Difference Plot

UAMV sens1-07caat1v2 Grid-M 12km
Effect of 50% VOC redn over CAA



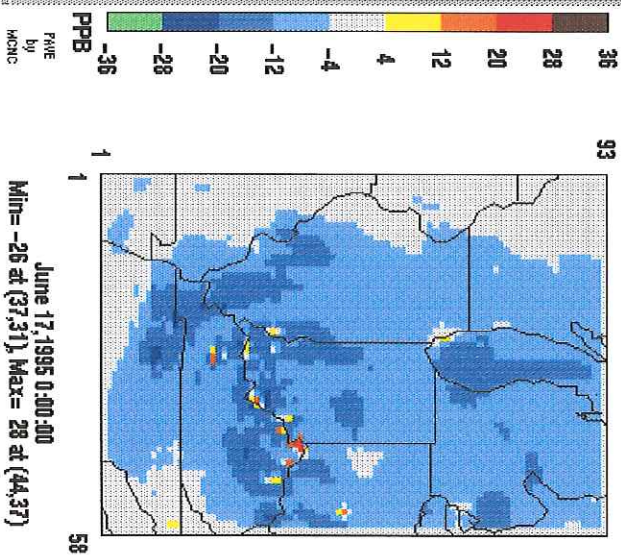
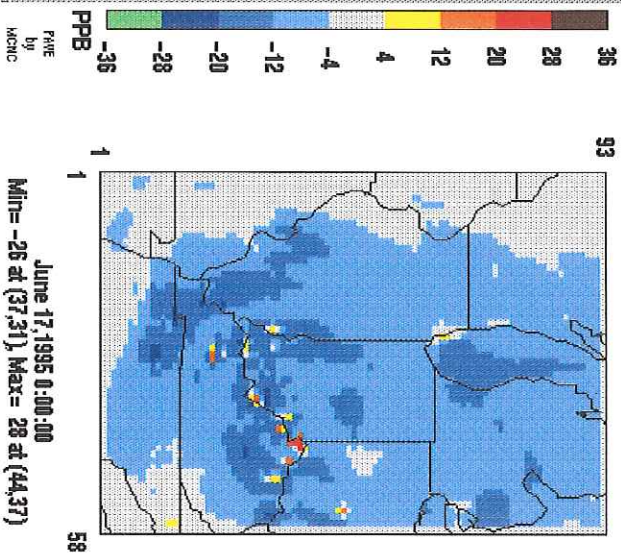
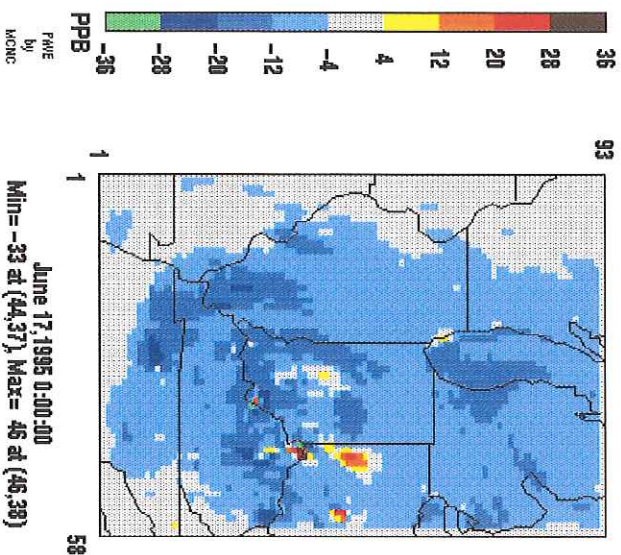
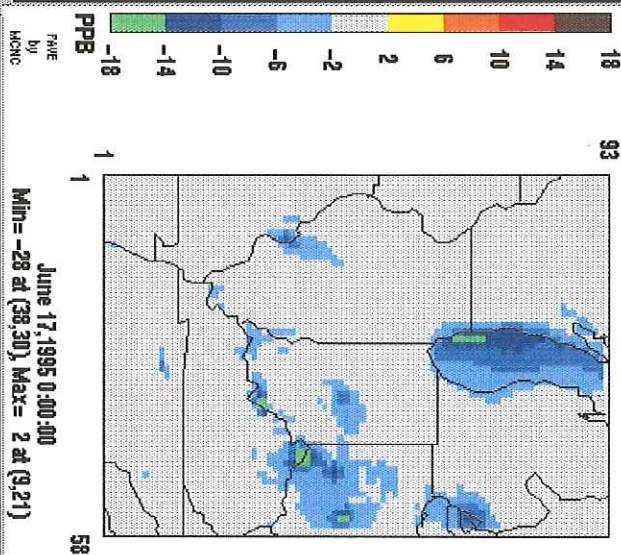
Ozone Difference Plot

CAMx sens1-07caat1v2 Grid-M 12km
Effect of 50% VOC redn over CAA



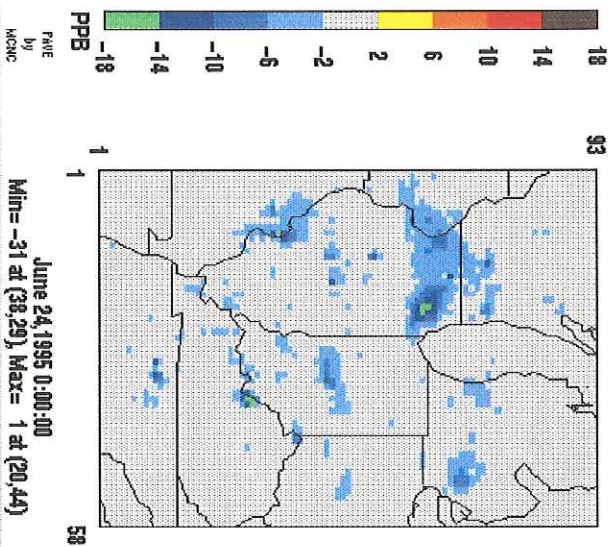
Ozone Difference Plot

CAMx sens4-07caat1v2 Grid-M 12km
Effect of 50% redn. in SE MO Biogenic Emissions + 50% VOC redn. acn



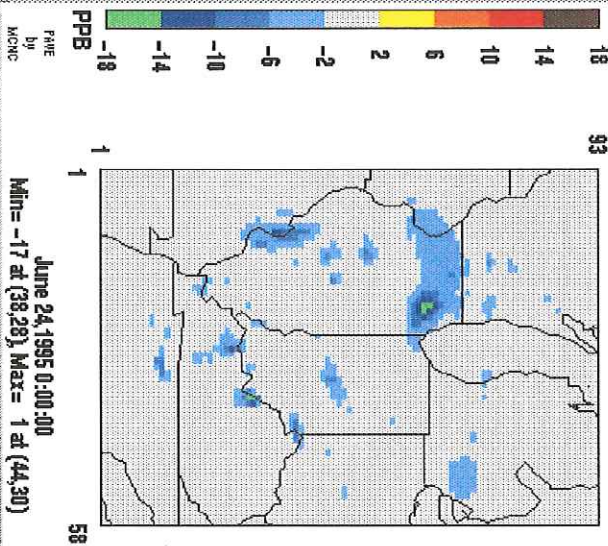
Ozone Difference Plot

UAMV sens1-07caat1v2 Grid-M 12km
Effect of 50% VOC redn over CAA



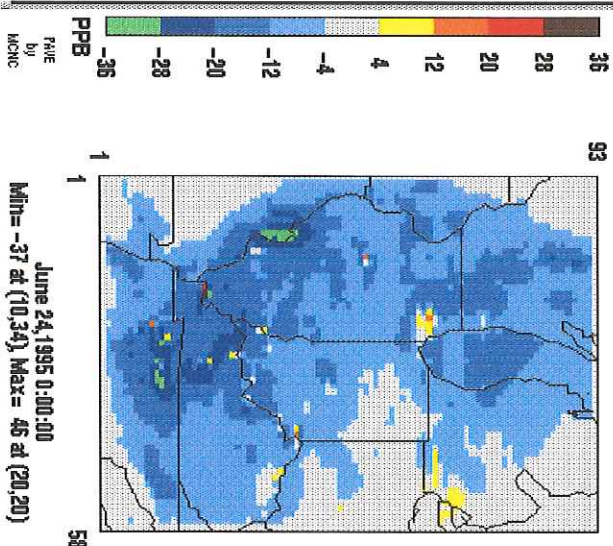
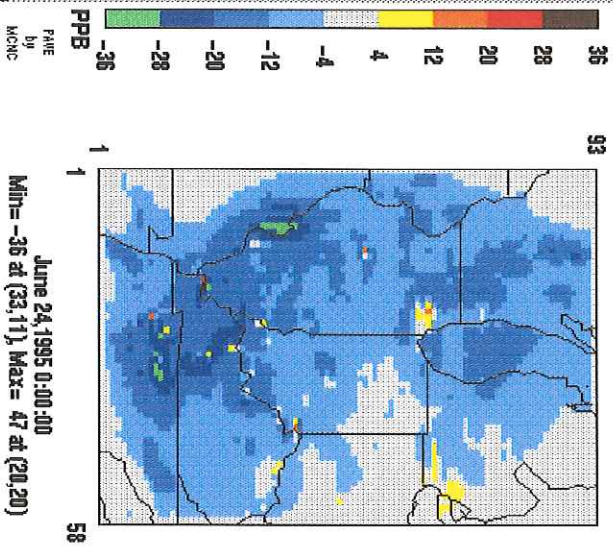
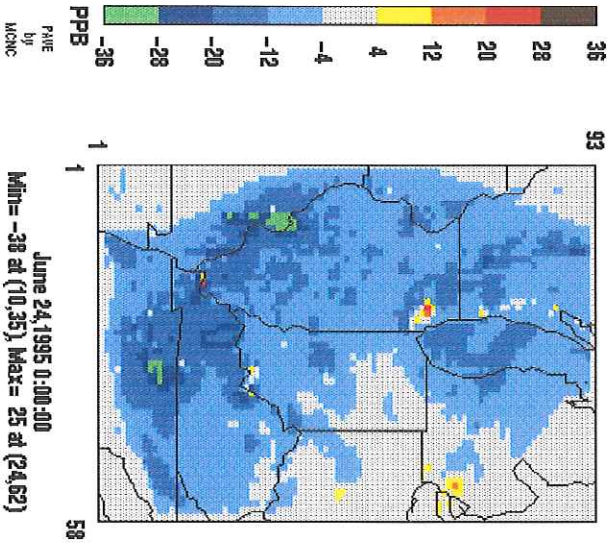
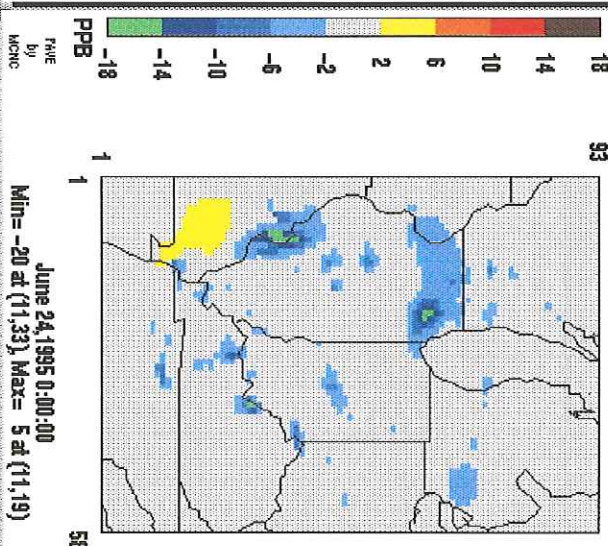
Ozone Difference Plot

CAMx sens1-07caat1v2 Grid-M 12km
Effect of 50% VOC redn over CAA

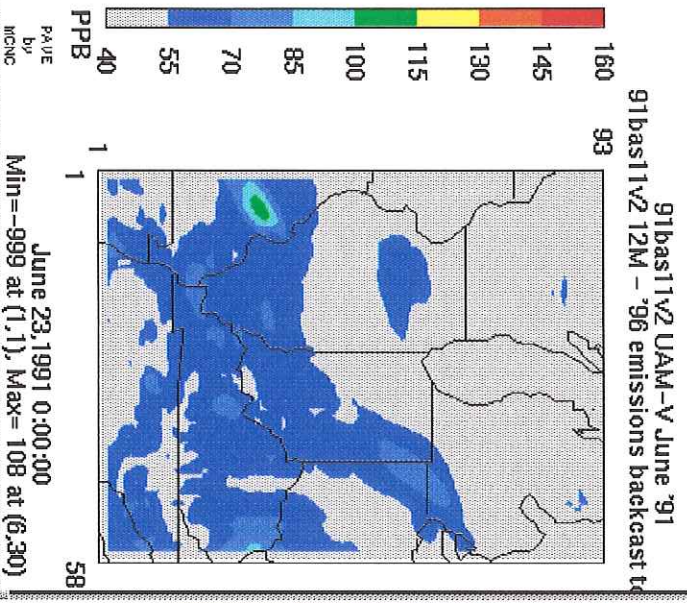


Ozone Difference Plot

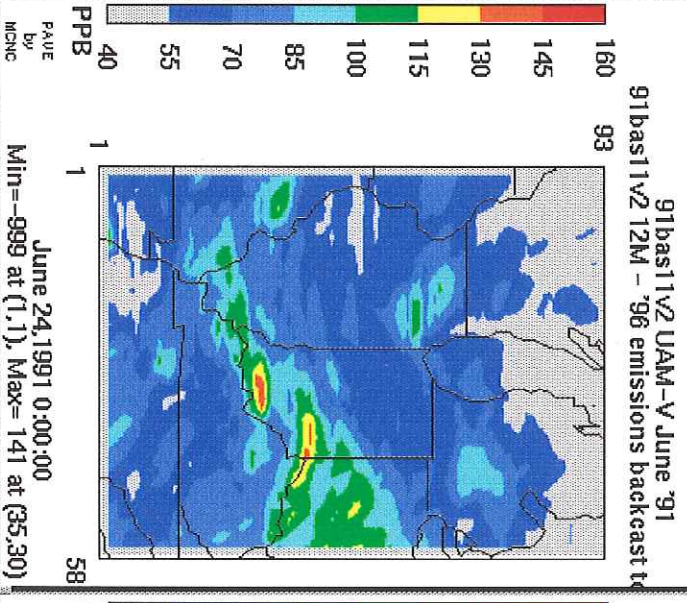
CAMx sens4-07caat1v2 Grid-M 12km
Effect of 50% redn. in SE MO Biogenic Emissions + 50% VOC redn. ac



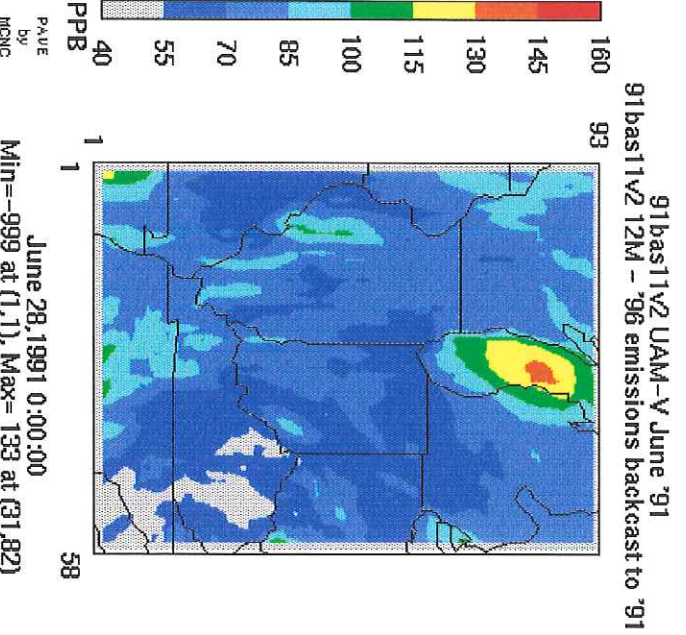
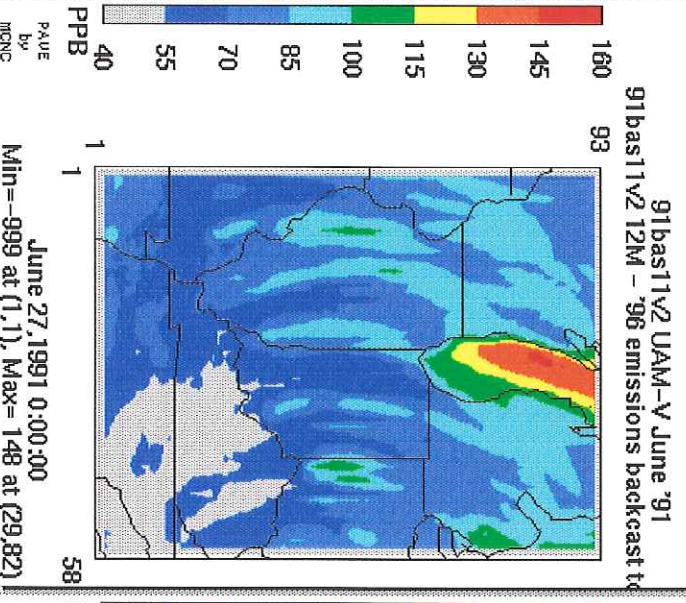
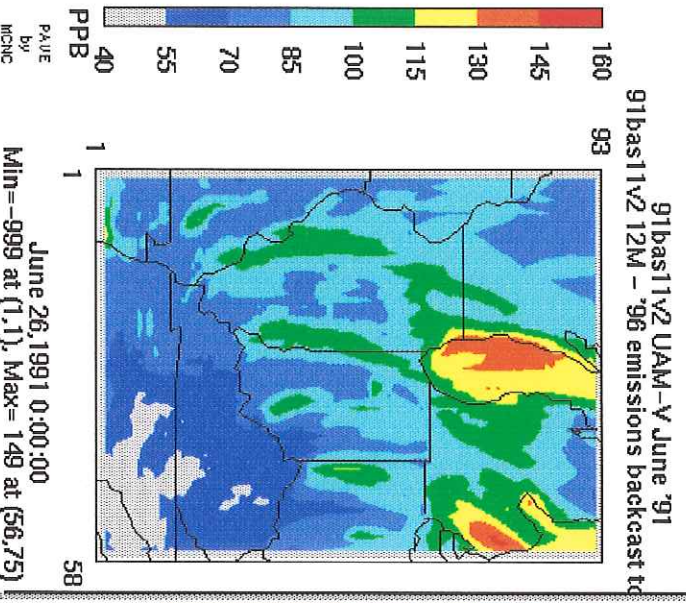
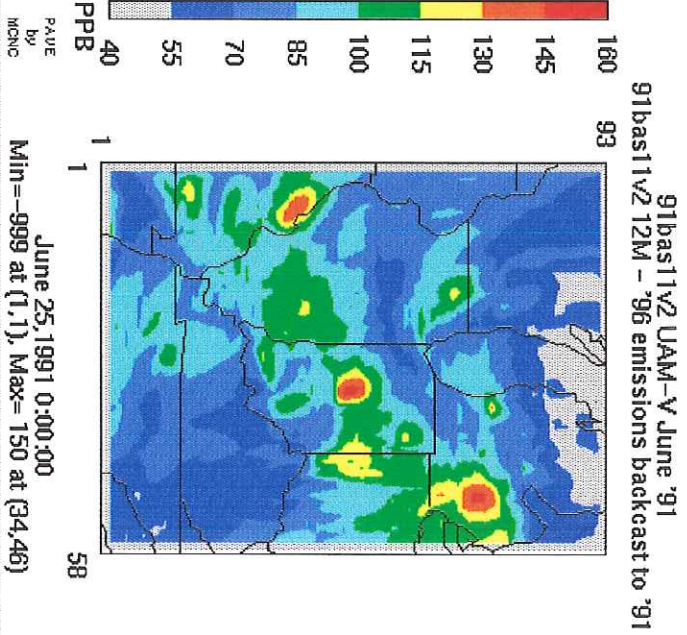
Daily Peak 1-Hour Ozone



Daily Peak 1-Hour Ozone



Daily Peak 1-Hour Ozone



Strategy Runs

SR1	CAA controls (same as 2007 base)
SR2	CAA controls + 0.25 utilities
SR3	CAA controls + 0.25 utilities + SIP Call non-utilities
SR4	CAA controls + 0.25 utilities + Tier II/Low S
SR5	CAA controls + 0.20 utilities
SR6	CAA controls + 0.15 utilities + SIP Call non-utilities
SR7	CAA controls + 0.25 utilities + SIP Call non-utilities (IL,IN,WI only) (IL,IN,WI only)

Note: CAA controls include Title IV, RFP (15% plans and "9% by '99"), NLEV, and RFG-II

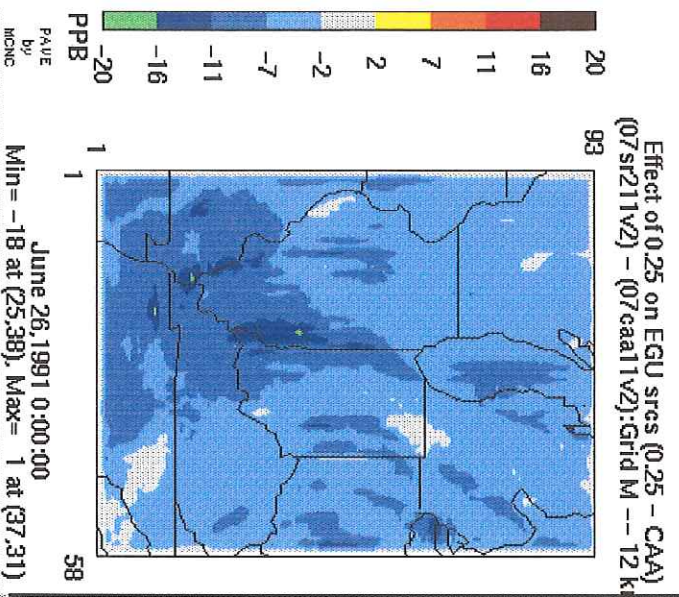
Non-utility SIP Call controls are:
 Non-EGU boilers and turbines -60%
 Stationary internal combustion engines -90%
 Cement manufacturing plants -30%
 Michigan utilities, non-utilities at State rule in SR2 - SR7

ROG	EGU	Non-EGU	Nonroad	ther Area	otor Veh	TOTAL	delta
95bas	31	2448	1738	4829	3694	12740	
SR1	38	1872	1382	4496	2756	10544	-2196
SR2	35	1882	1382	4496	2756	10551	
SR3	35	1882	1382	4496	2756	10551	
SR4	35	1882	1382	4496	2646	10441	-110
SR5	35	1882	1382	4496	2756	10551	
SR6	35	1882	1382	4496	2756	10551	
SR7	38	1878	1382	4496	2756	10550	

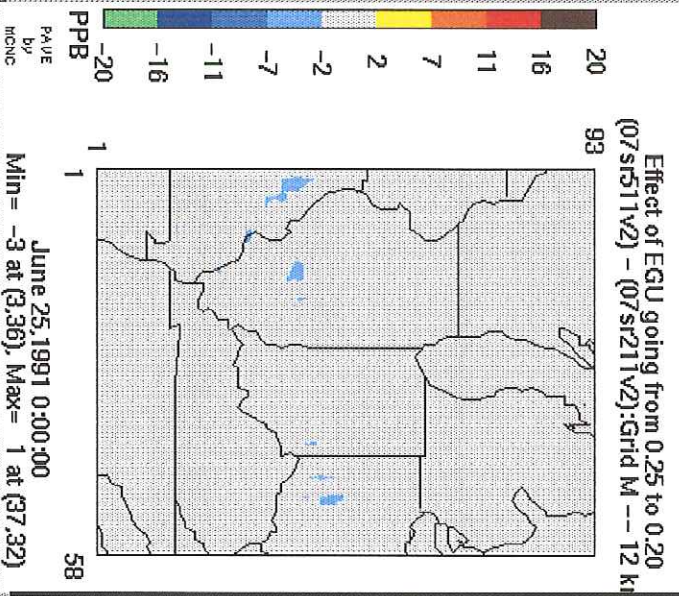
NOx

95bas	5792	1962	2140	792	5578	16264	
SR1	4913	2279	1555	963	3980	13690	-2574
SR2	2818	2185	1555	963	3980	11501	-2189
SR3	2816	1692	1555	963	3980	11006	-495 nonEGU controls
SR4	2818	2185	1555	963	3264	10785	-716 TierII/Low S
SR5	2379	2184	1555	963	3980	11061	-440 0.25-0.20 EGU
SR6	1951	1689	1555	963	3980	10138	-3552 0.15/SIP (SIP Call)
SR7	3689	2064	1555	963	3980	12251	-1245 0.25/SIP in nonLADCO States
							-1439 0.25/SIP in LADCO States
							-2684 0.25/SIP in Grid M

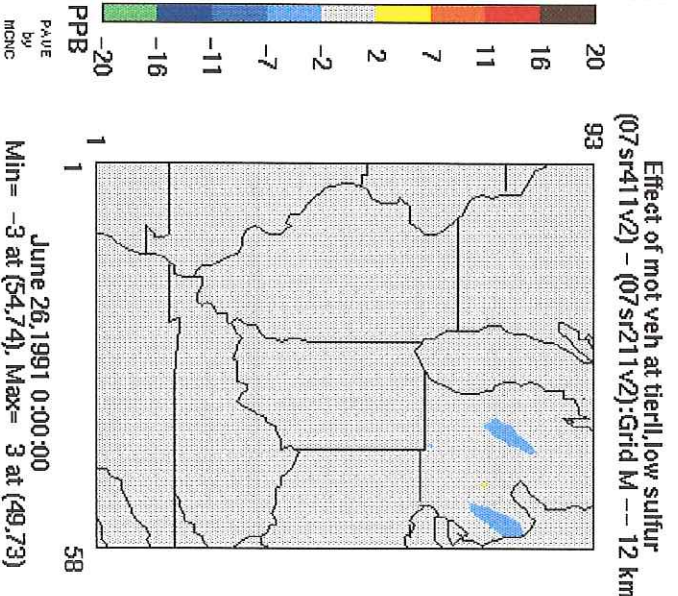
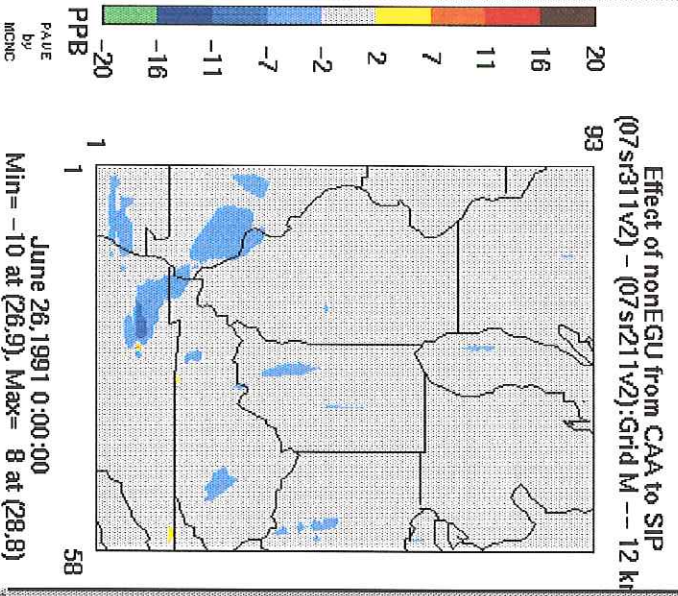
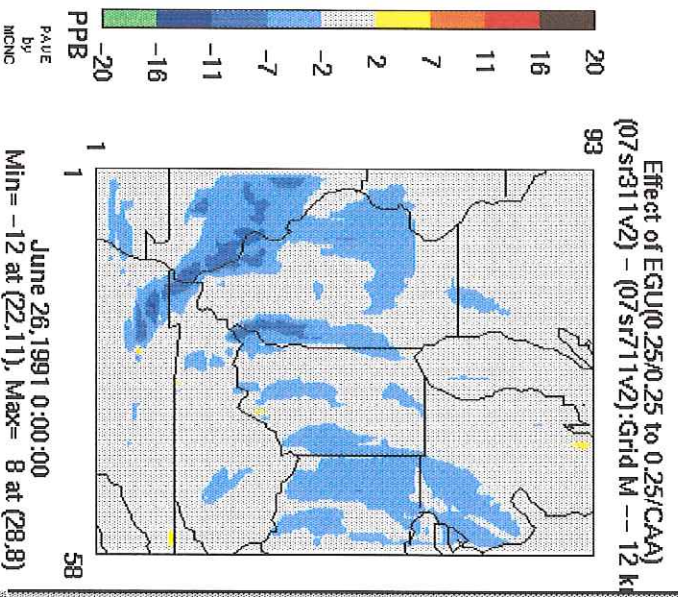
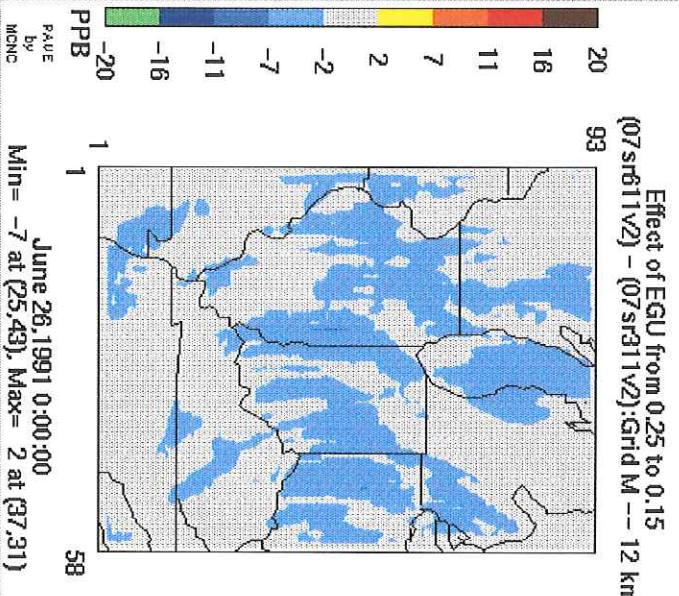
Ozone Difference Plot



Ozone Difference Plot



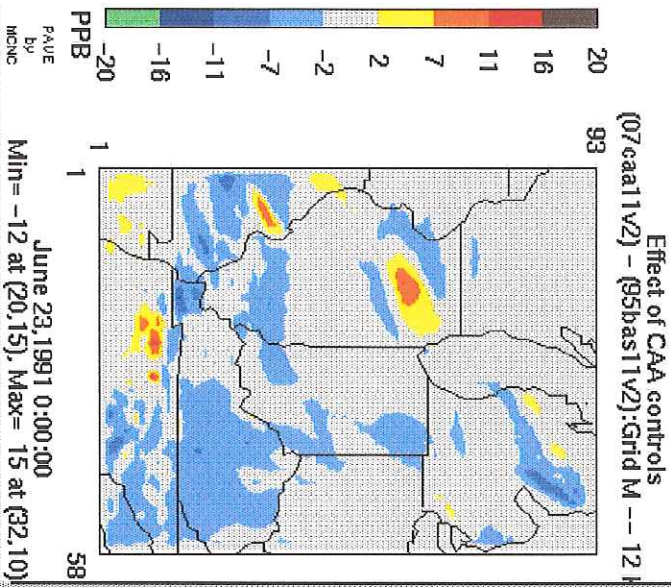
Ozone Difference Plot



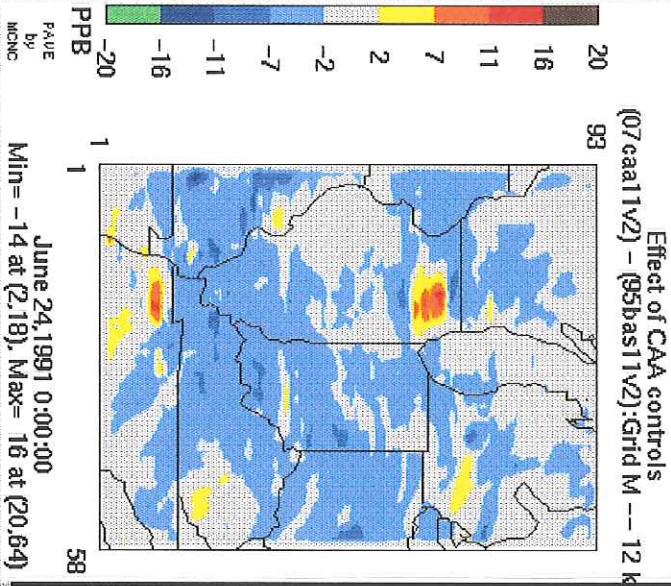
Effect of Growth and CAA Controls

**SR1 - 95Base
(-2200 TPD VOC
- 2600 TPD NOX)**

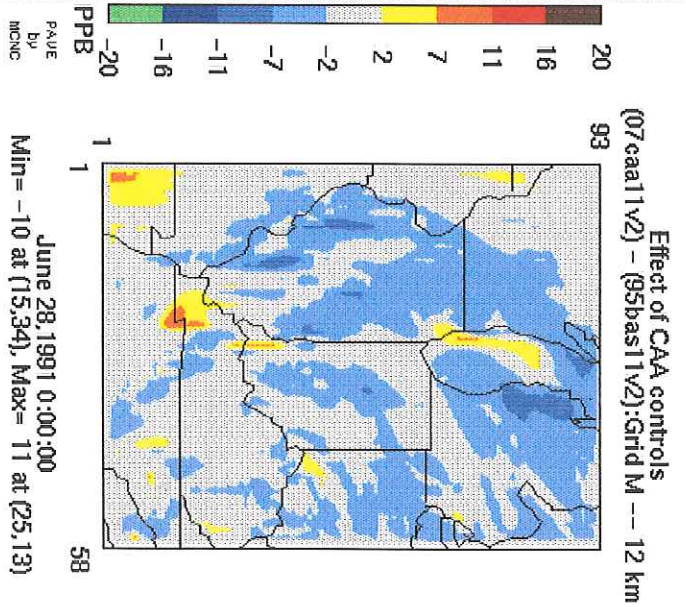
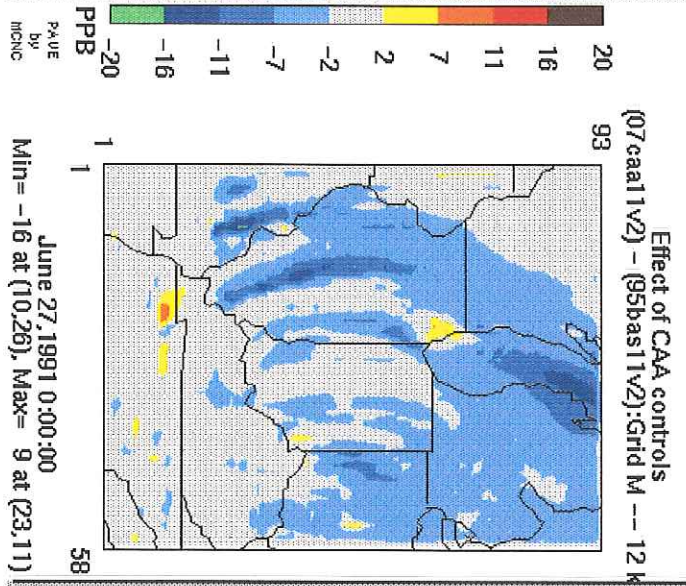
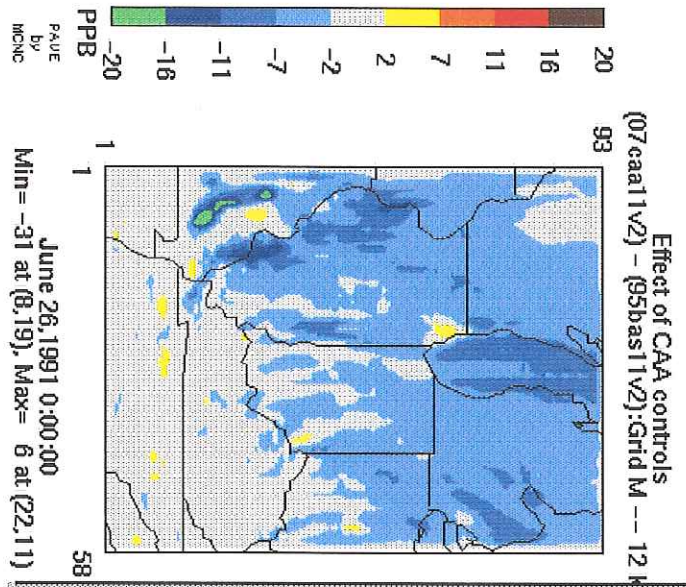
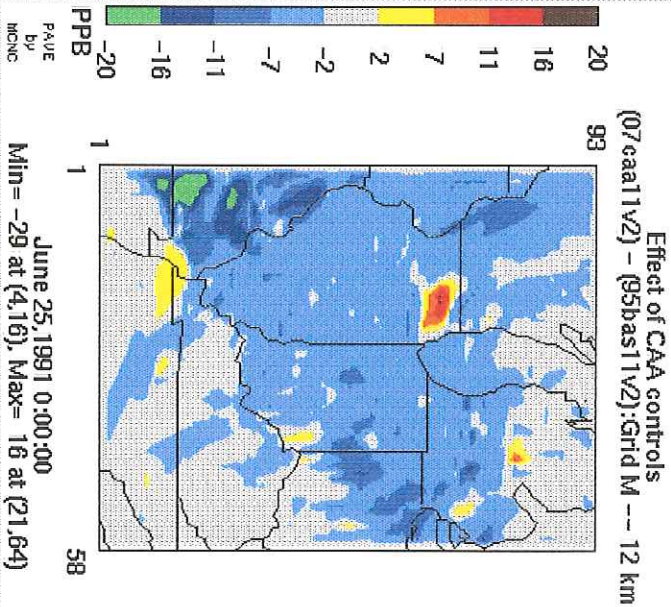
Ozone Difference Plot



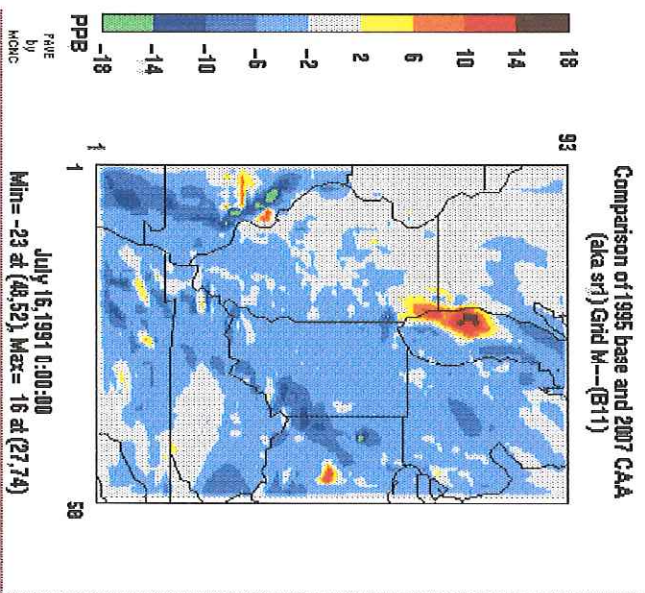
Ozone Difference Plot



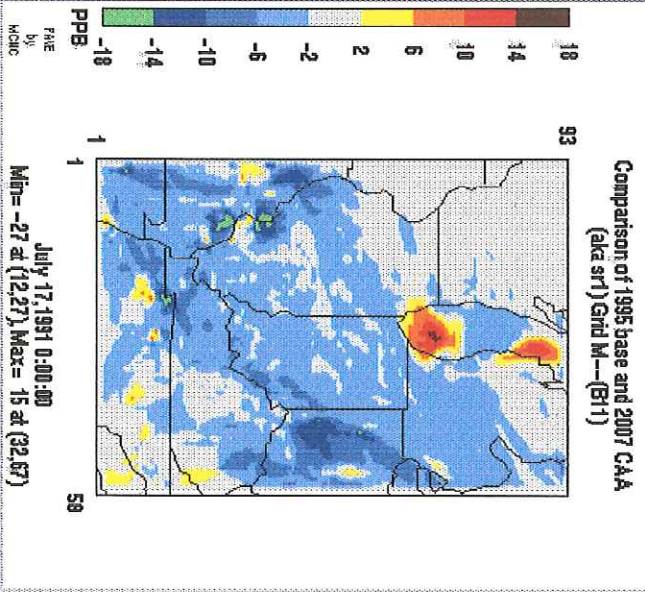
Ozone Difference Plot



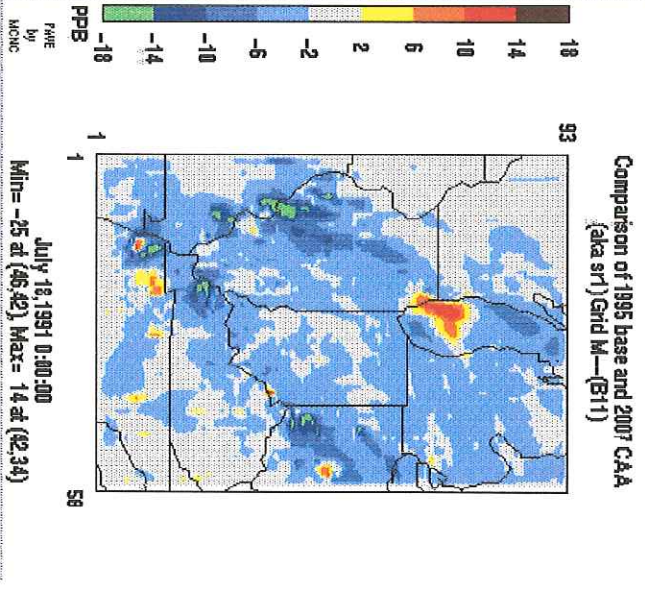
Peak 1-Hour Ozone Difference



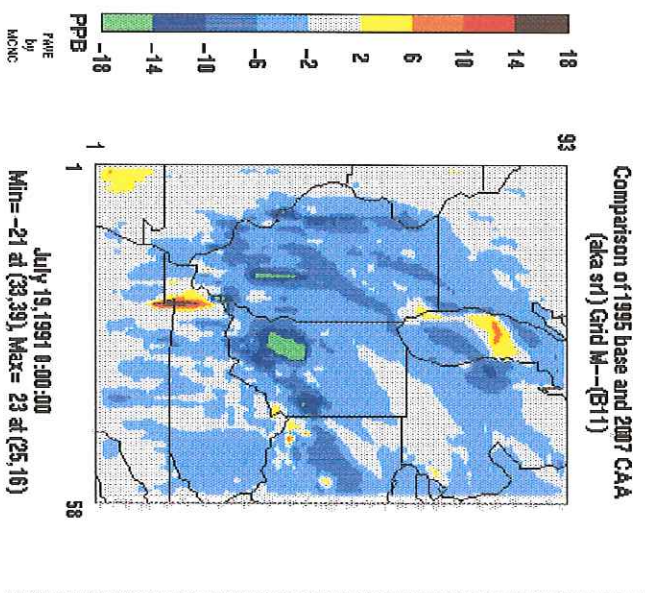
Peak 1-Hour Ozone Difference



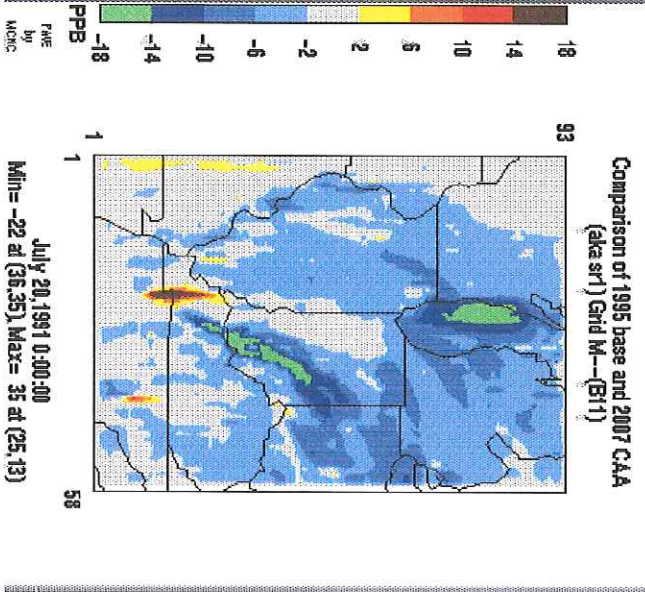
Peak 1-Hour Ozone Difference



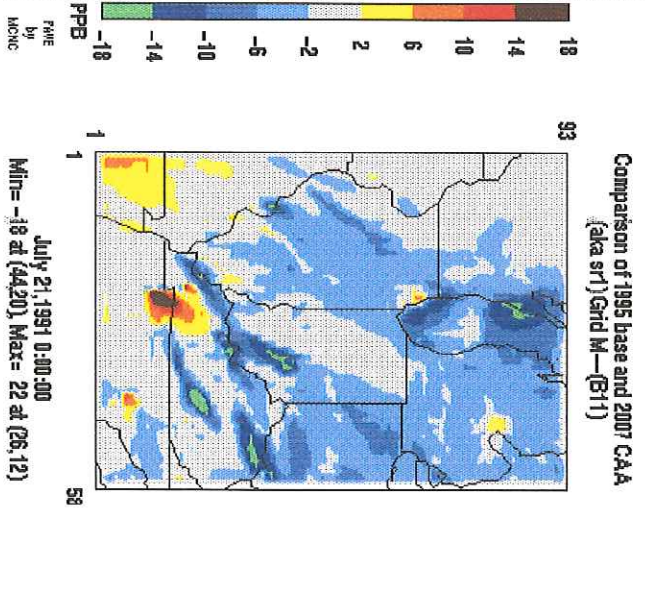
Peak 1-Hour Ozone Difference



Peak 1-Hour Ozone Difference

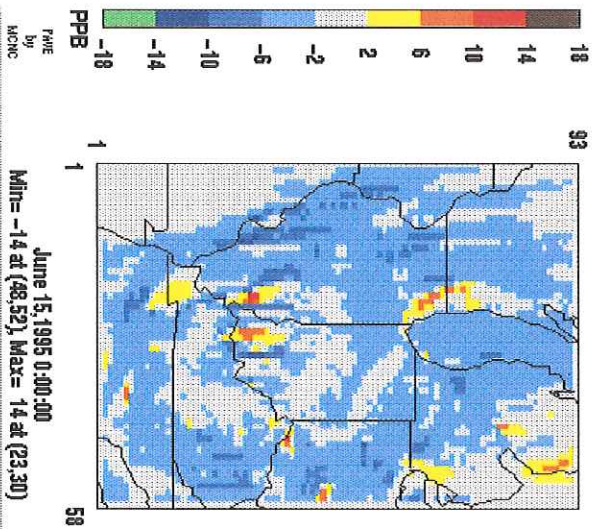


Peak 1-Hour Ozone Difference



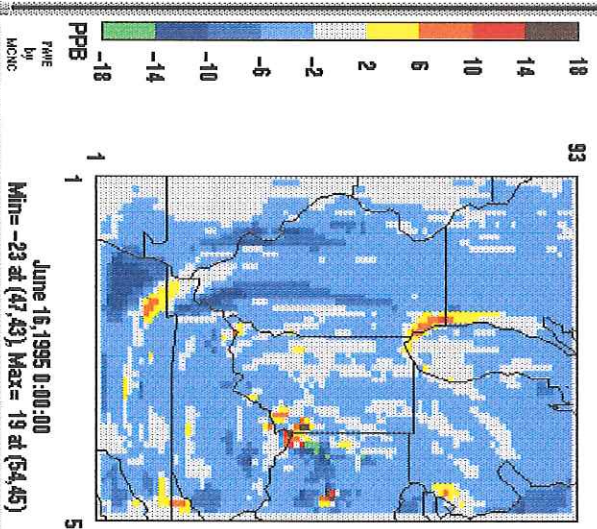
Ozone Difference Plot

UAMV 07caat1v2-95bas1v2 Grid-M 12km
Effect CAA controls over GM & LM



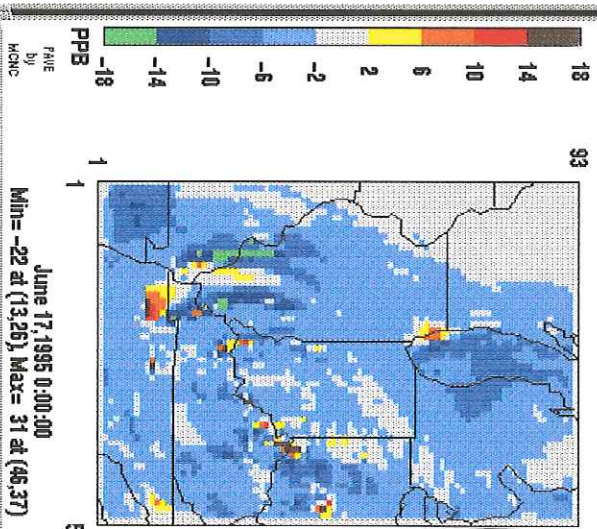
Ozone Difference Plot

UAMV 07caat1v2-95bas1v2 Grid-M 12km
Effect CAA controls over GM & LM



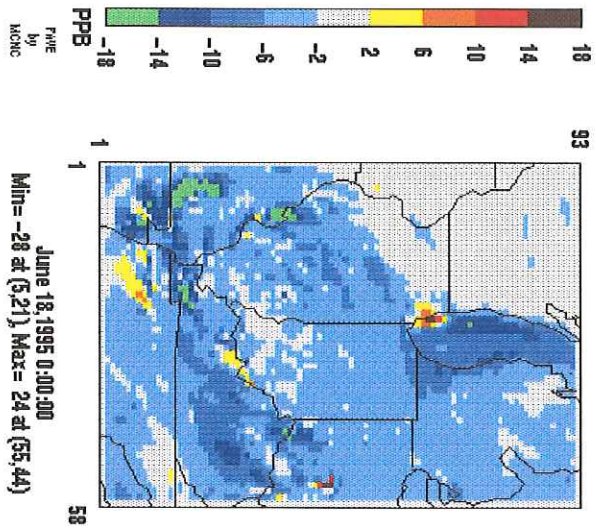
Ozone Difference Plot

UAMV 07caat1v2-95bas1v2 Grid-M 12km
Effect CAA controls over GM & LM



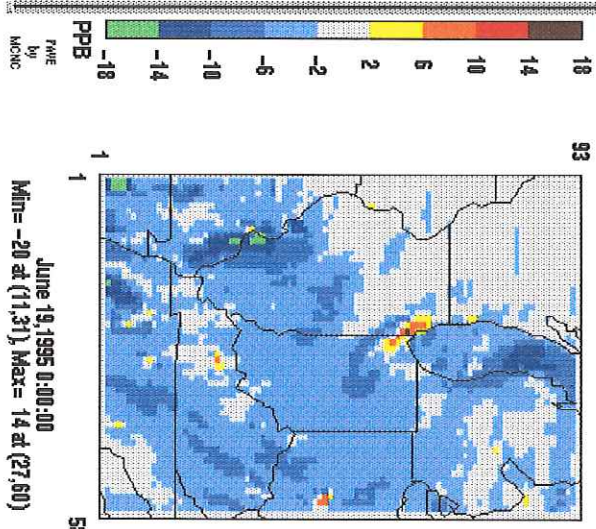
Ozone Difference Plot

UAMV 07caat1v2-95bas1v2 Grid-M 12km
Effect CAA controls over GM & LM



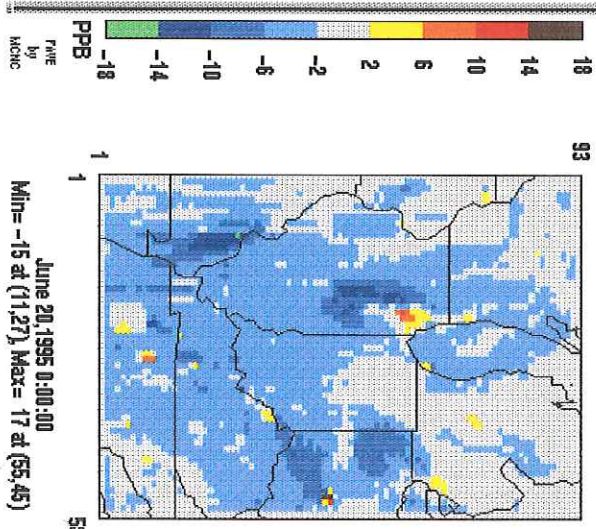
Ozone Difference Plot

UAMV 07caat1v2-95bas1v2 Grid-M 12km
Effect CAA controls over GM & LM

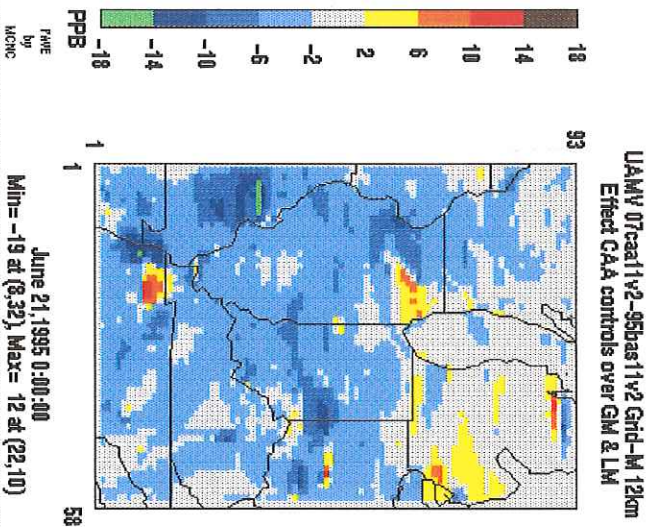


Ozone Difference Plot

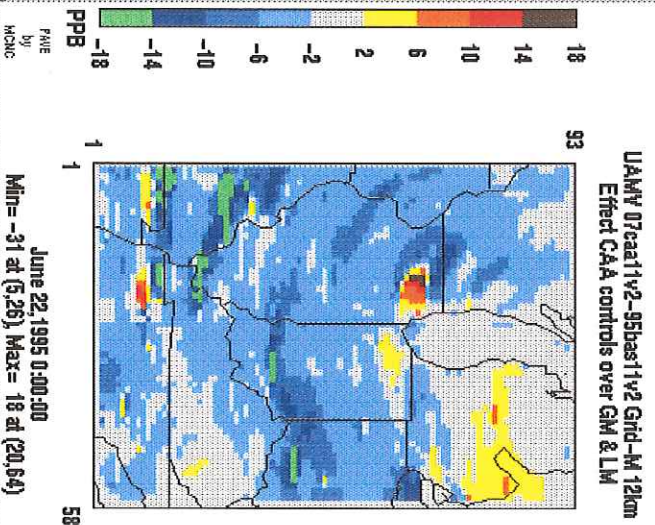
UAMV 07caat1v2-95bas1v2 Grid-M 12km
Effect CAA controls over GM & LM



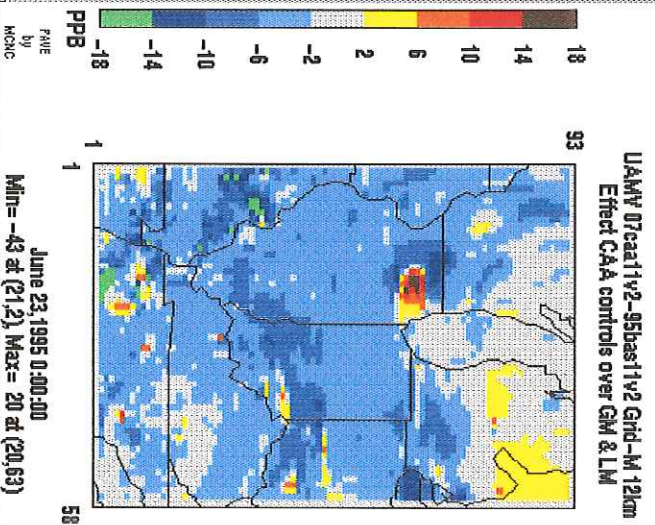
Ozone Difference Plot



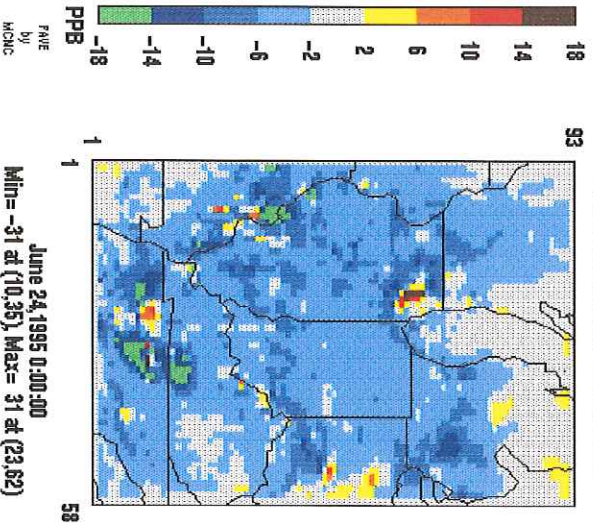
Ozone Difference Plot



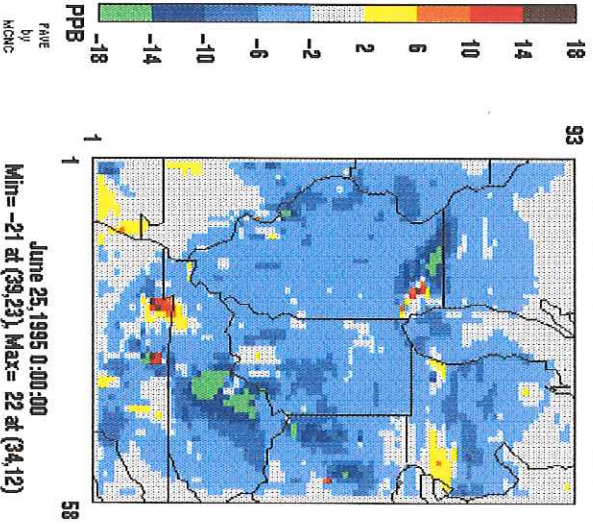
Ozone Difference Plot



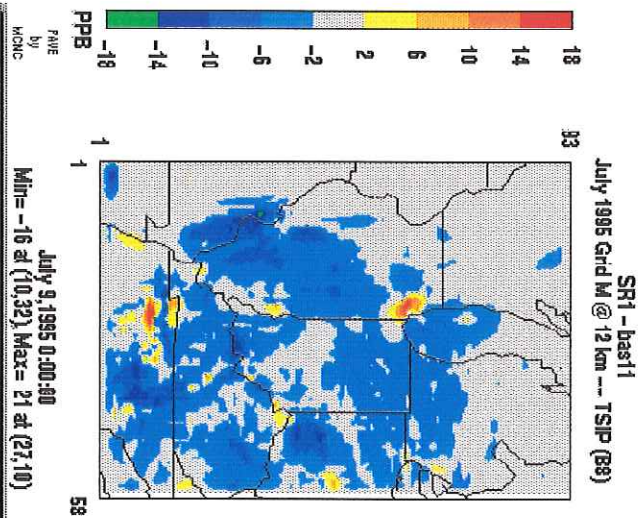
Ozone Difference Plot



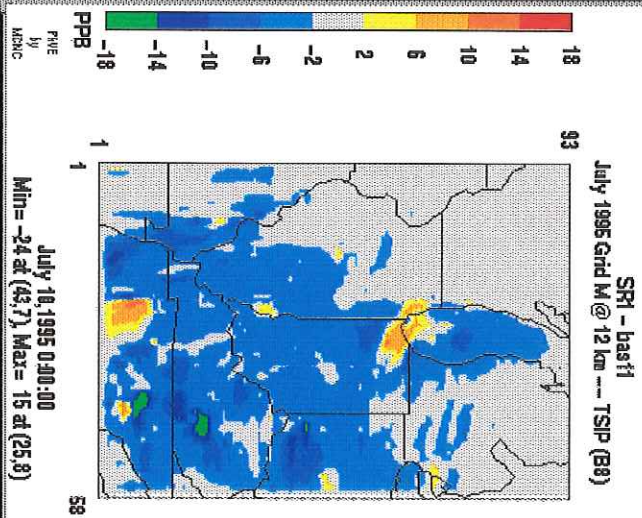
Ozone Difference Plot



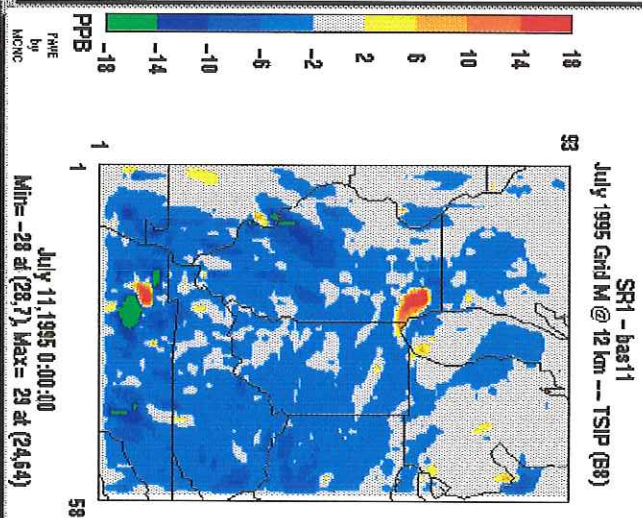
Max 1-Hour Ozone Difference



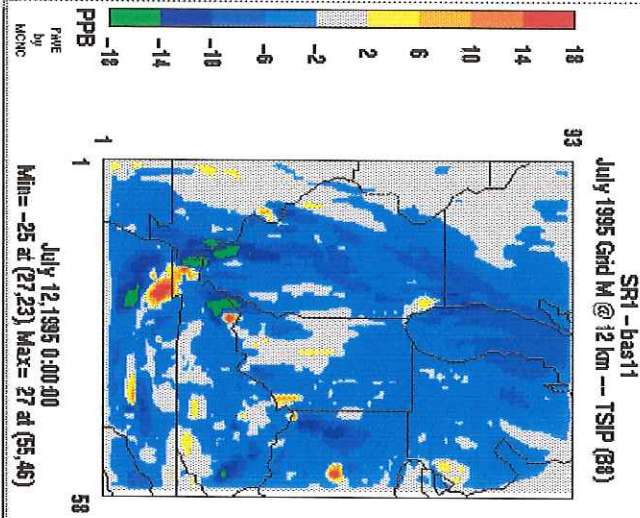
Max 1-Hour Ozone Difference



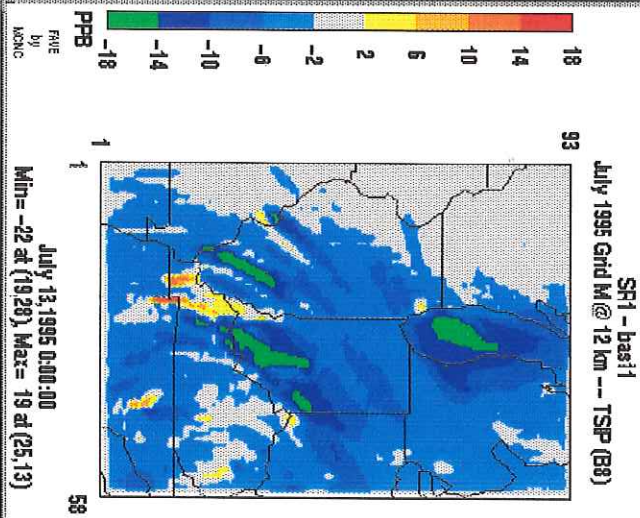
Max 1-Hour Ozone Difference



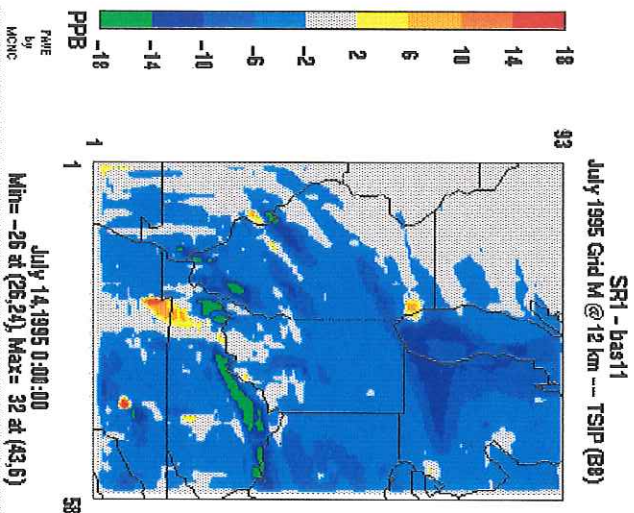
Max 1-Hour Ozone Difference



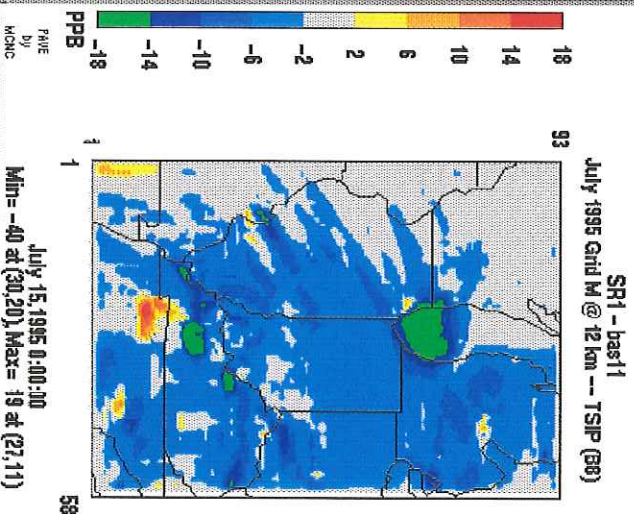
Max 1-Hour Ozone Difference



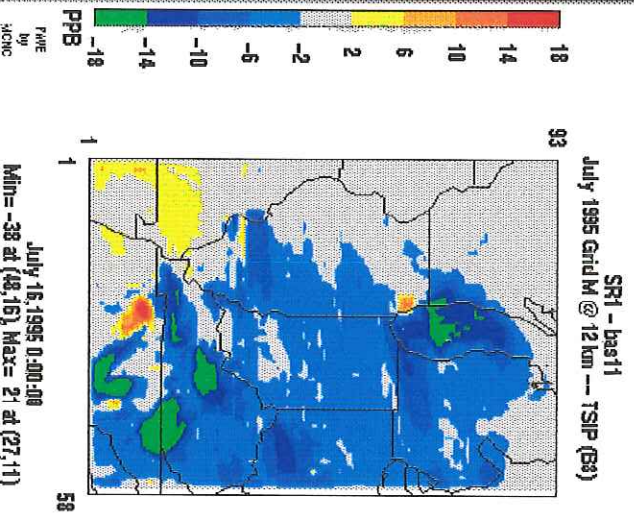
Max 1-Hour Ozone Difference



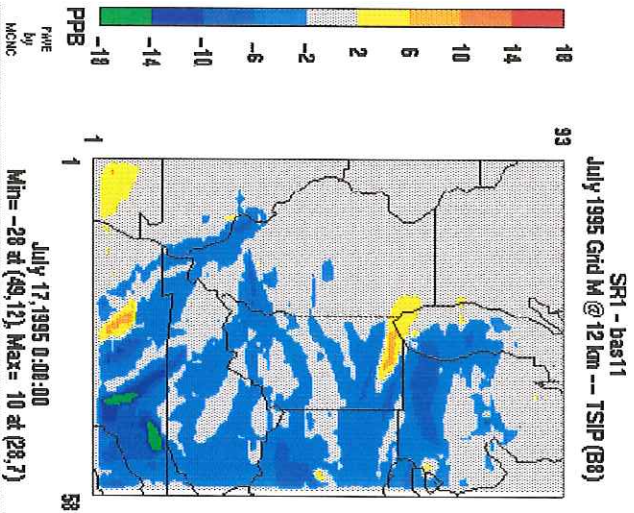
Max 1-Hour Ozone Difference



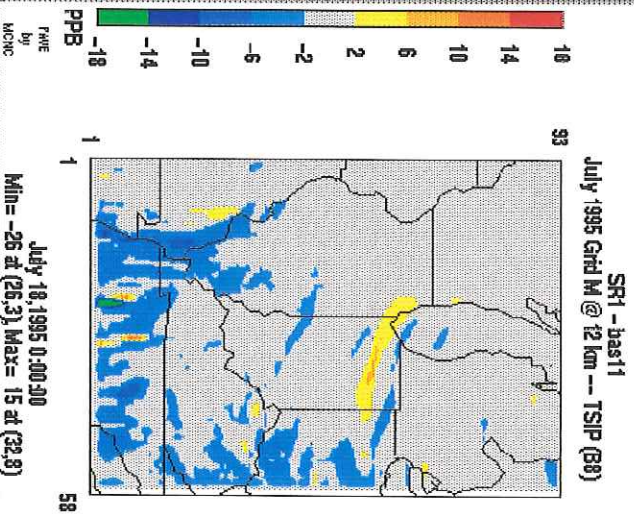
Max 1-Hour Ozone Difference



Max 1-Hour Ozone Difference



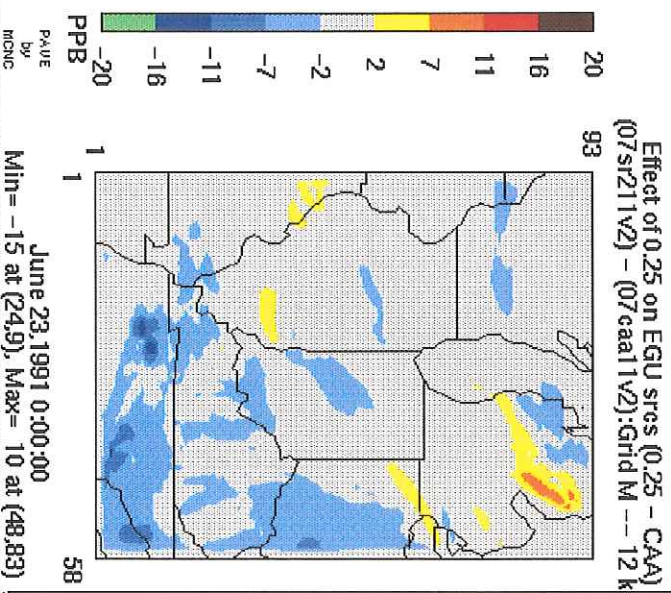
Max 1-Hour Ozone Difference



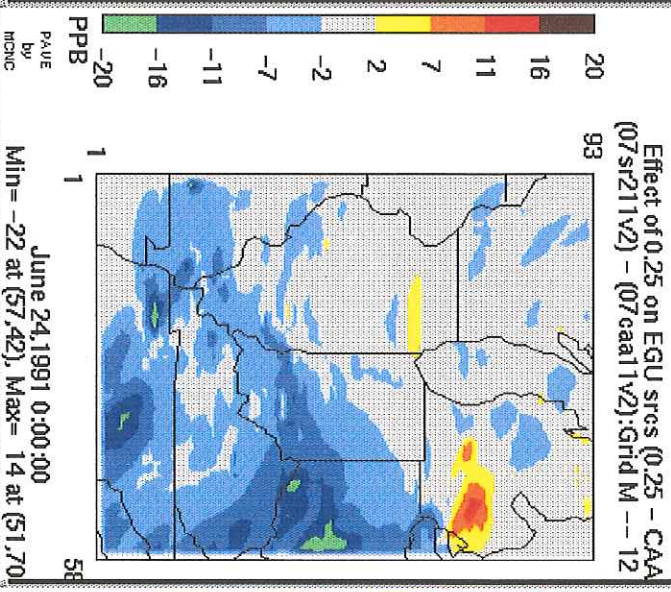
SR2 - SR1 (-2200 TPD NOx)

Effect of 0.25EGU

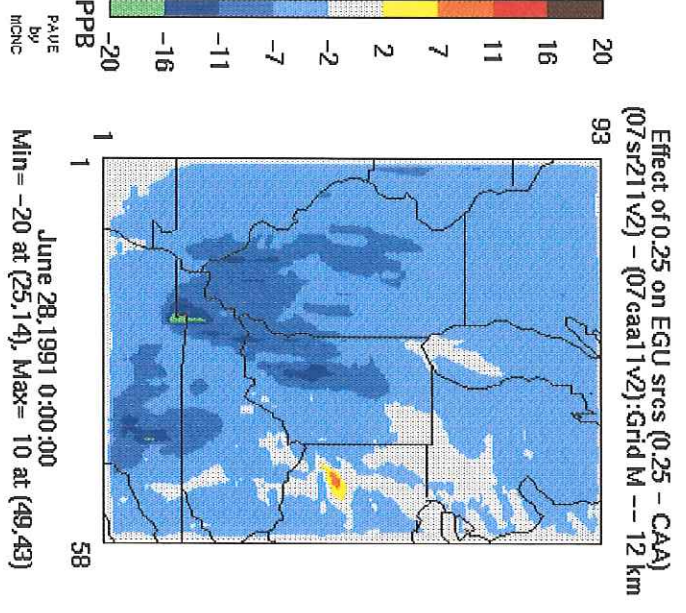
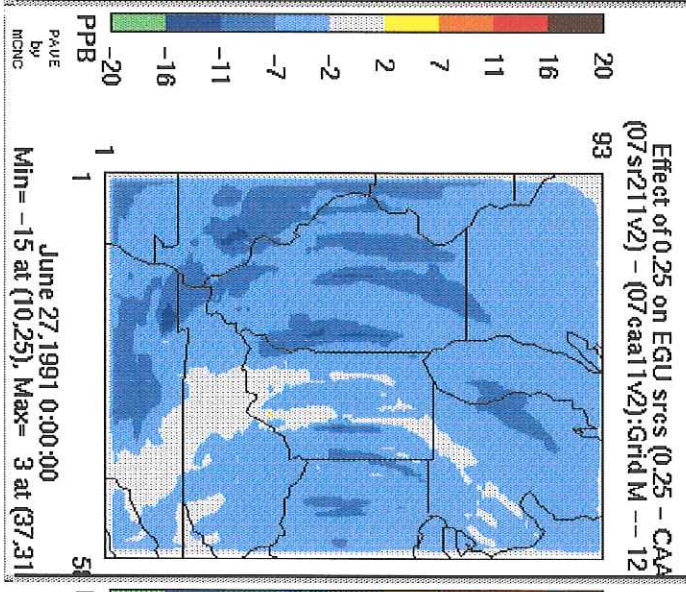
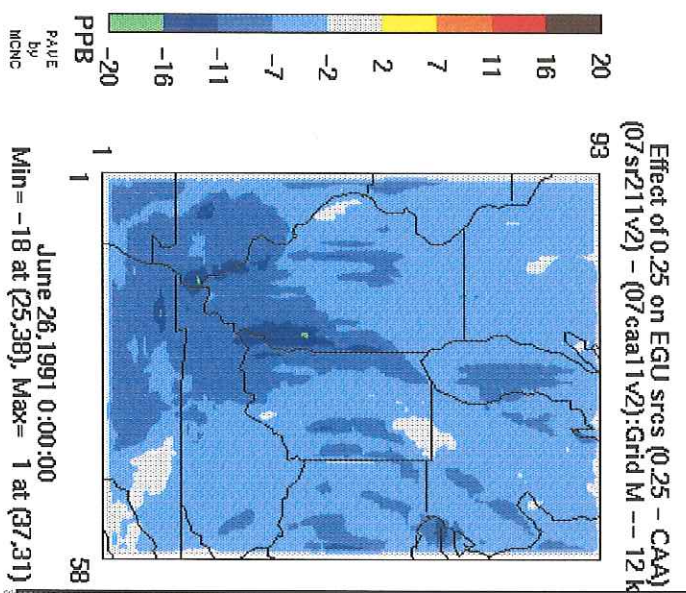
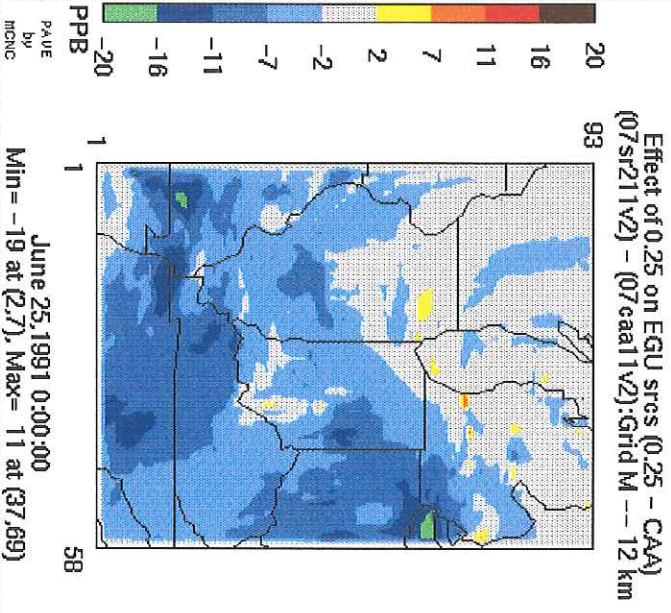
Ozone Difference Plot



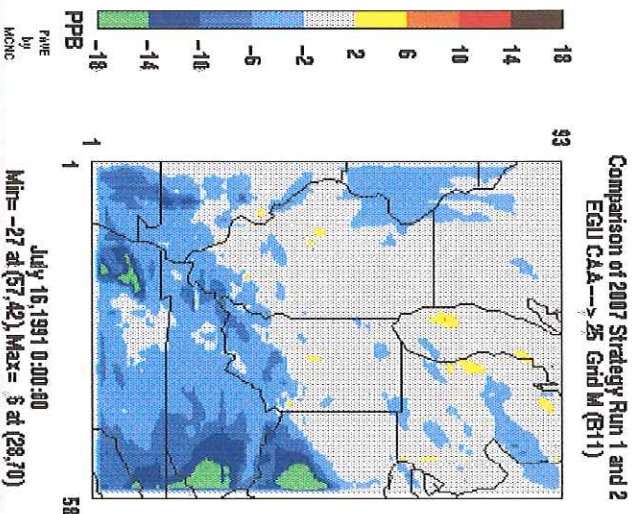
Ozone Difference Plot



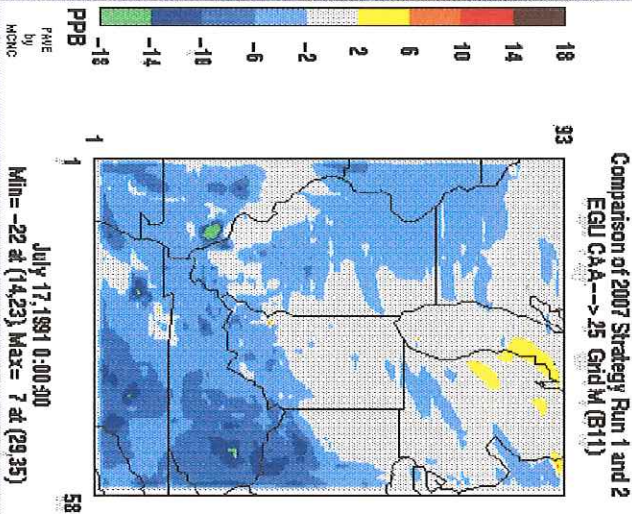
Ozone Difference Plot



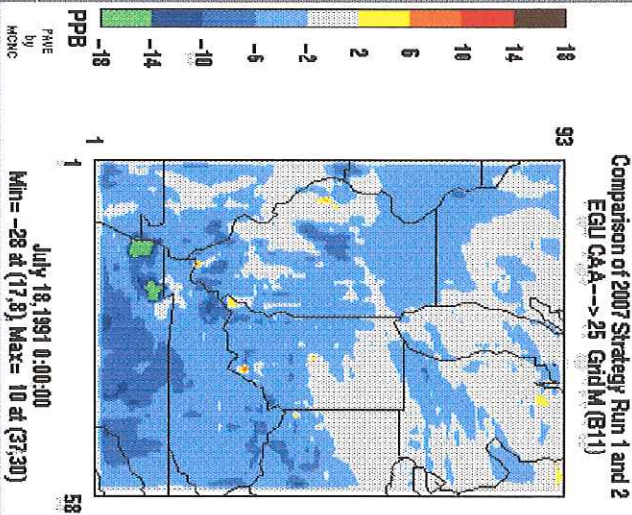
Peak 1-Hour Ozone Difference



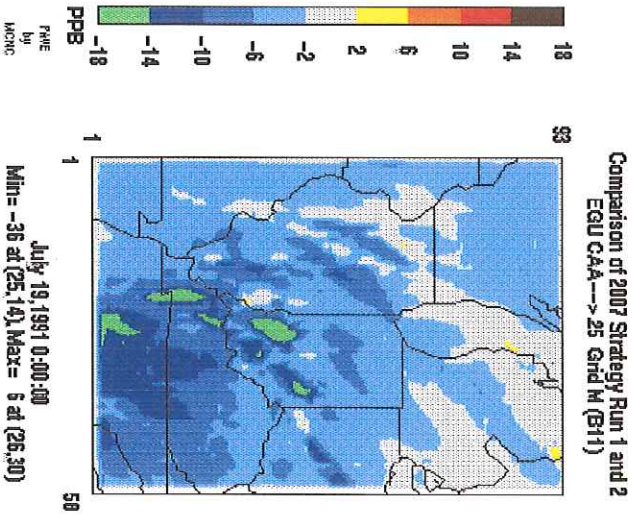
Peak 1-Hour Ozone Difference



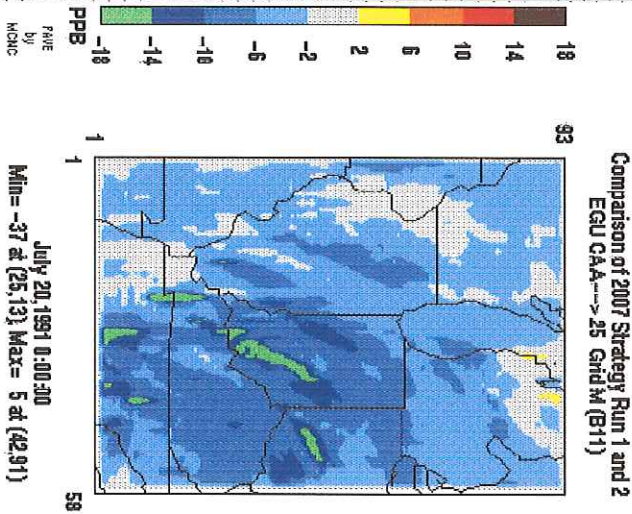
Peak 1-Hour Ozone Difference



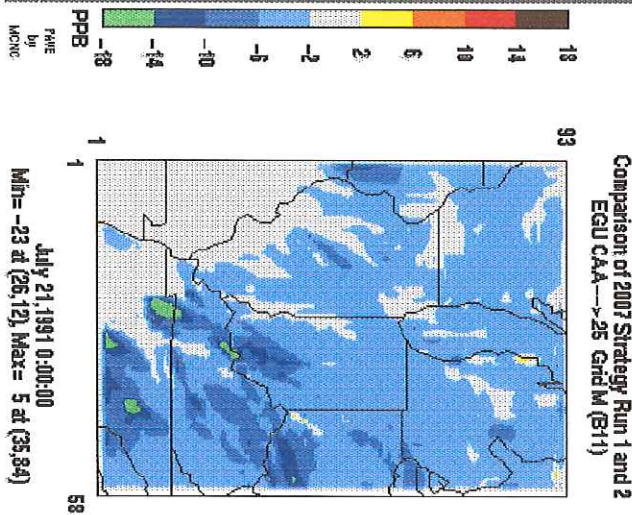
Peak 1-Hour Ozone Difference



Peak 1-Hour Ozone Difference

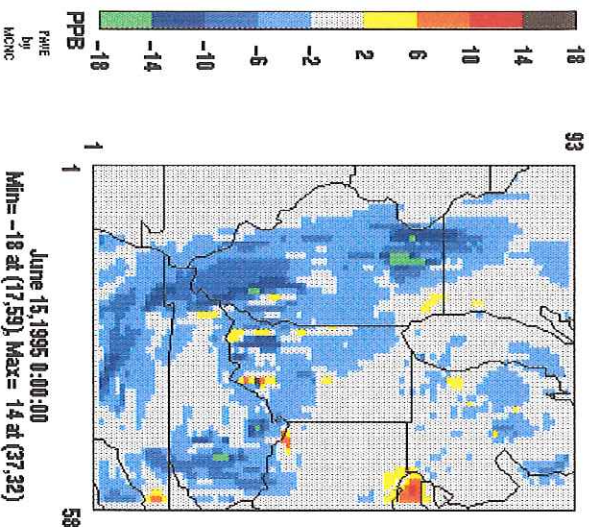


Peak 1-Hour Ozone Difference



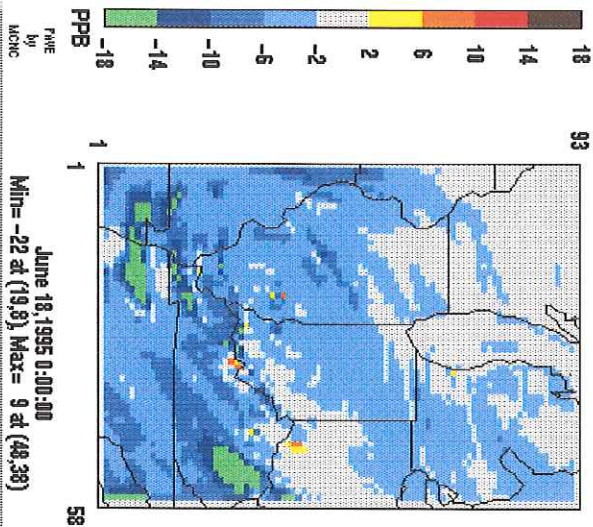
Ozone Difference Plot

UAMV 07sr21v2-07caat1v2 Grid-M 12km
Effect of 0.25 EGU over CAA



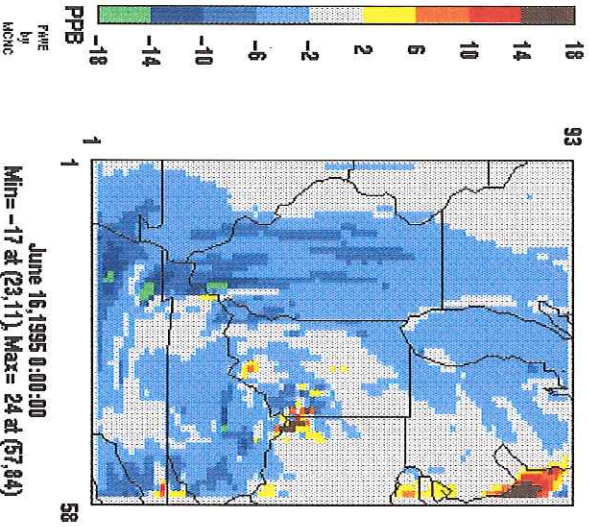
Ozone Difference Plot

UAMV 07sr21v2-07caat1v2 Grid-M 12km
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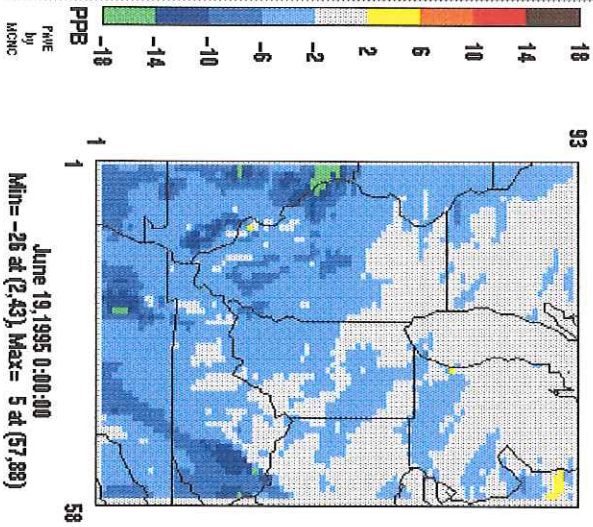
Ozone Difference Plot

UAMV 07sr21v2-07caat1v2 Grid-M 12km
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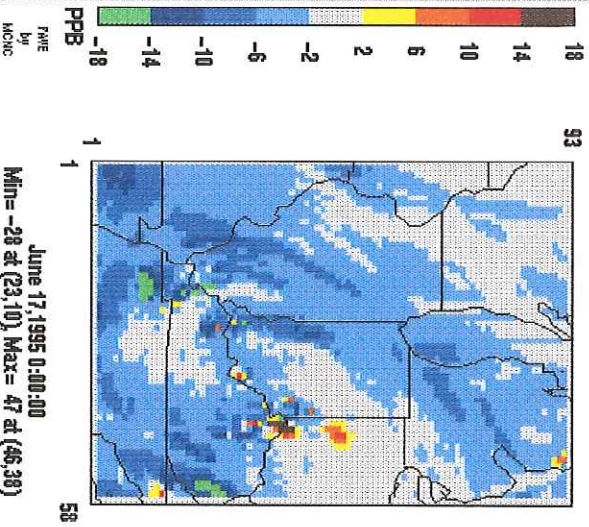
Ozone Difference Plot

UAMV 07sr21v2-07caat1v2 Grid-M 12km
Effect of 0.25 EGU over CAA



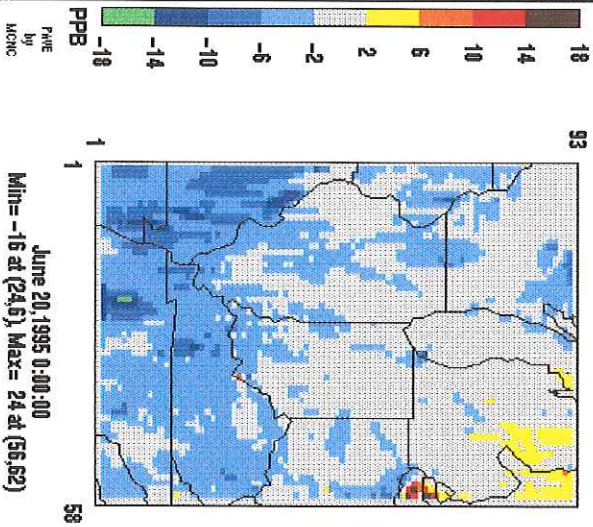
Ozone Difference Plot

UAMV 07sr21v2-07caat1v2 Grid-M 12km
Effect of 0.25 EGU over CAA



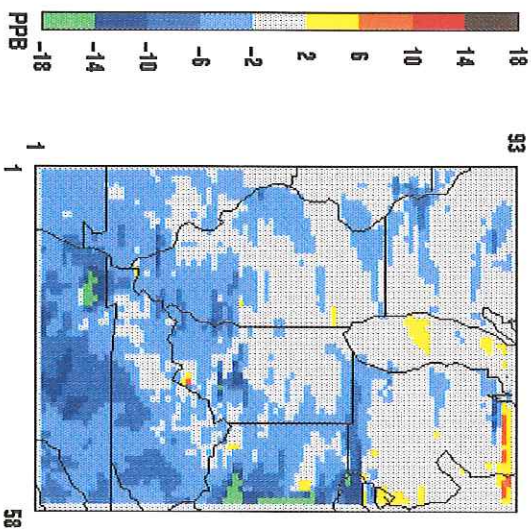
Ozone Difference Plot

UAMV 07sr21v2-07caat1v2 Grid-M 12km
Effect of 0.25 EGU over CAA



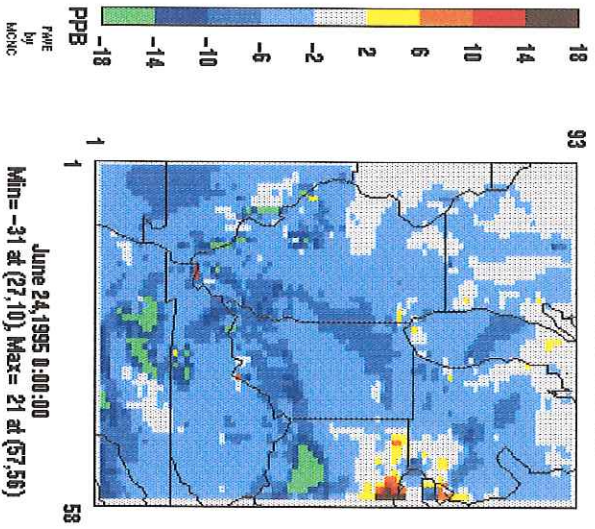
Ozone Difference Plot

UAMV 07sr211v2-07caat1v2 Grid-M 12km
Effect of 0.25 EGU over CAA



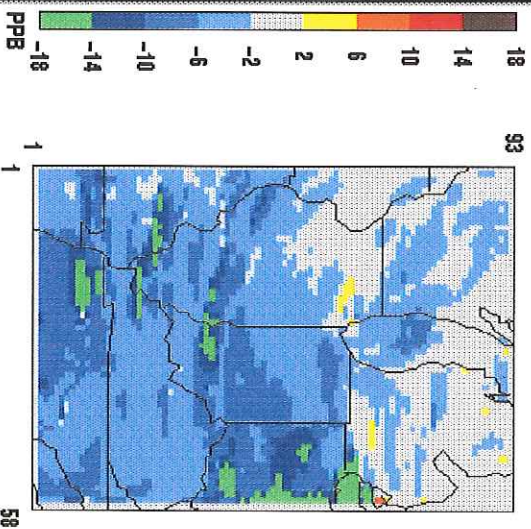
Ozone Difference Plot

UAMV 07sr211v2-07caat1v2 Grid-M 12km
Effect of 0.25 EGU over CAA



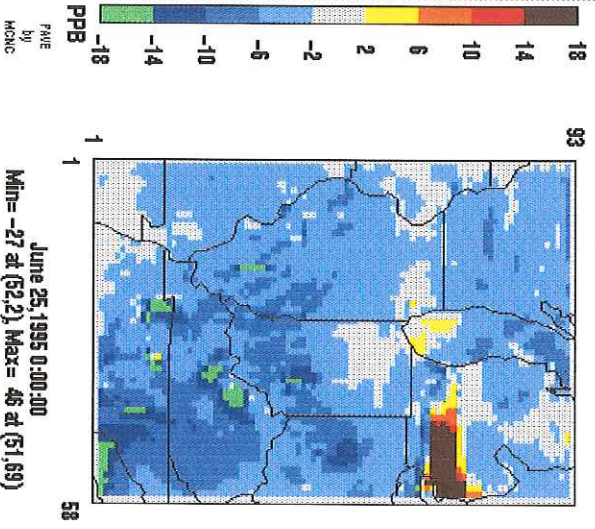
Ozone Difference Plot

UAMV 07sr211v2-07caat1v2 Grid-M 12km
Effect of 0.25 EGU over CAA



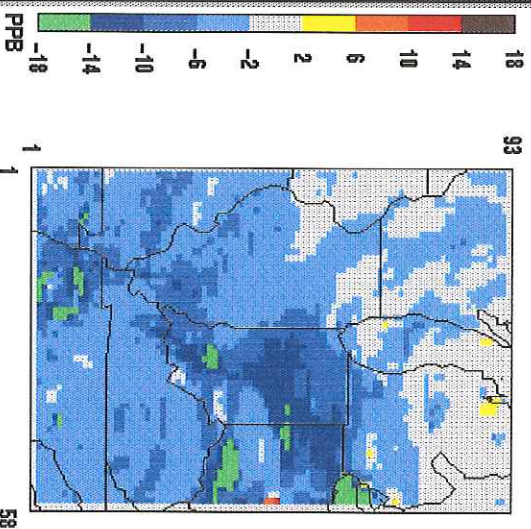
Ozone Difference Plot

UAMV 07sr211v2-07caat1v2 Grid-M 12km
Effect of 0.25 EGU over CAA

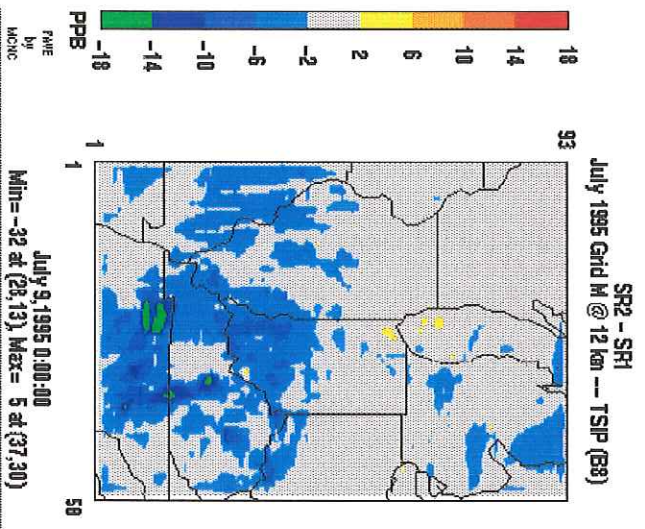


Ozone Difference Plot

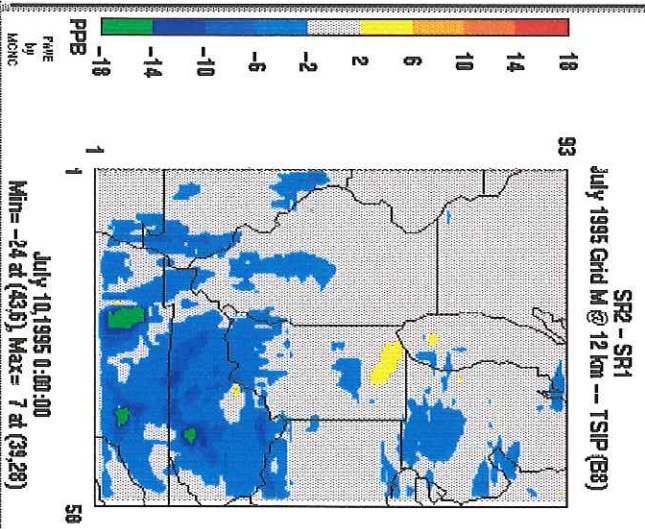
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Effect of 0.25 EGU over CAA



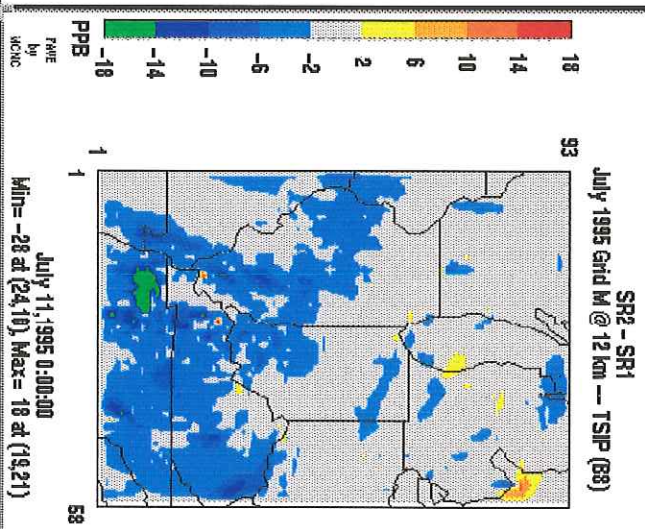
Max 1-Hour Ozone Difference



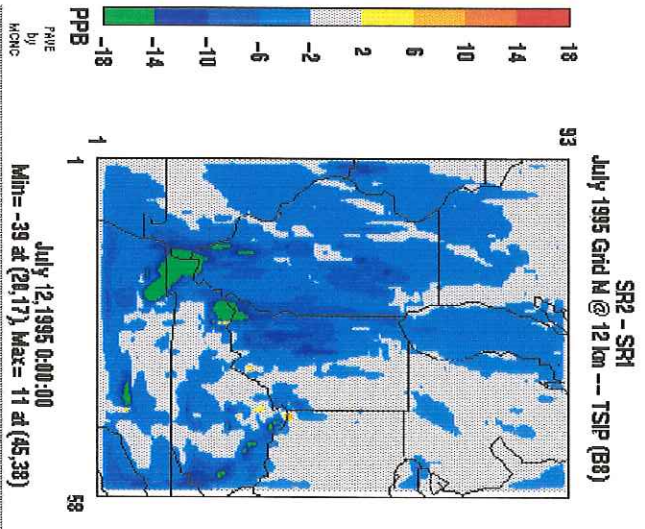
Max 1-Hour Ozone Difference



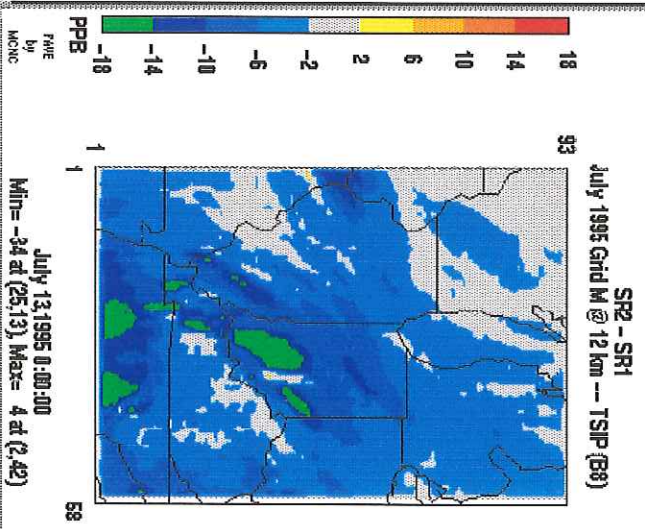
Max 1-Hour Ozone Difference



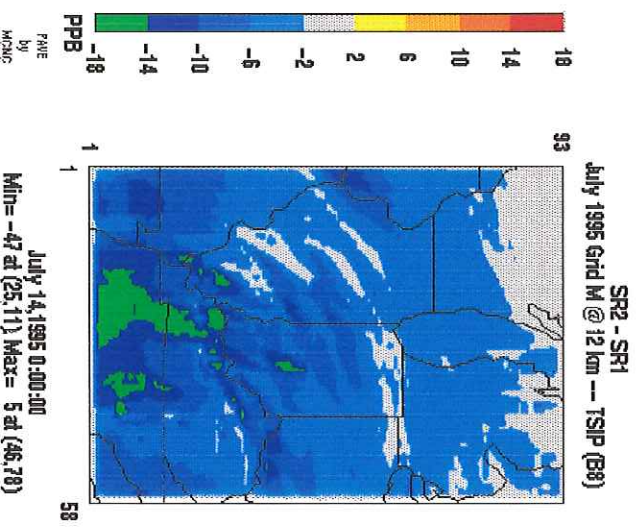
Max 1-Hour Ozone Difference



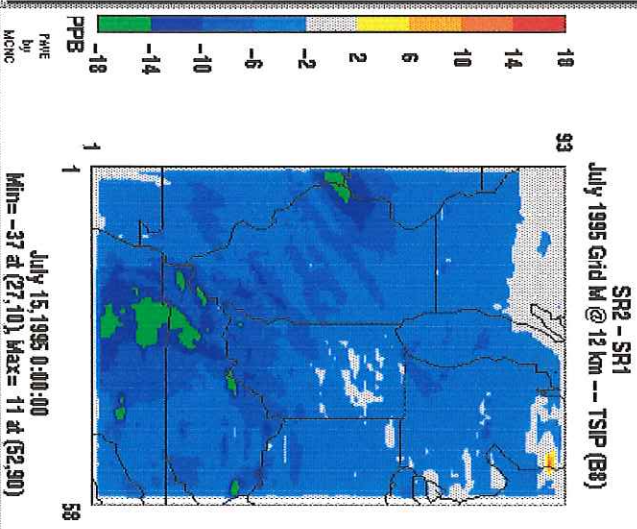
Max 1-Hour Ozone Difference



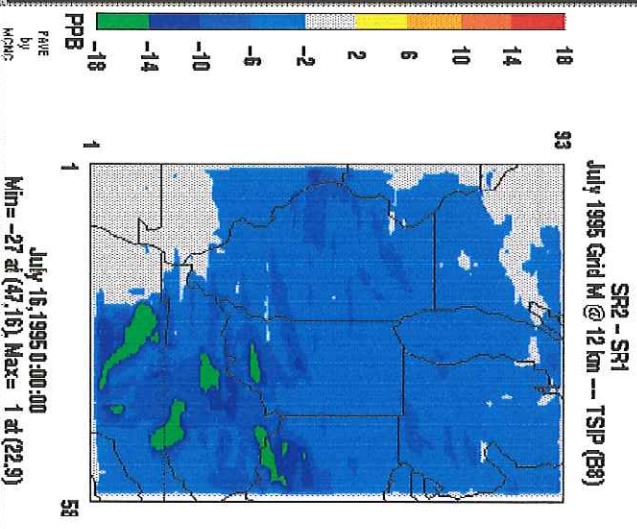
Max 1-Hour Ozone Difference



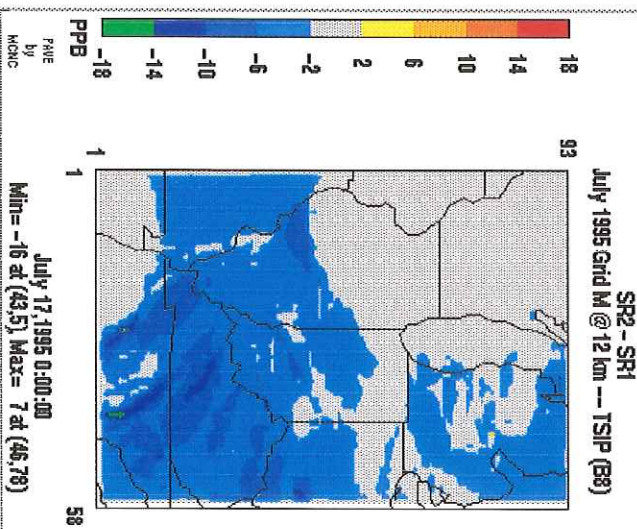
Max 1-Hour Ozone Difference



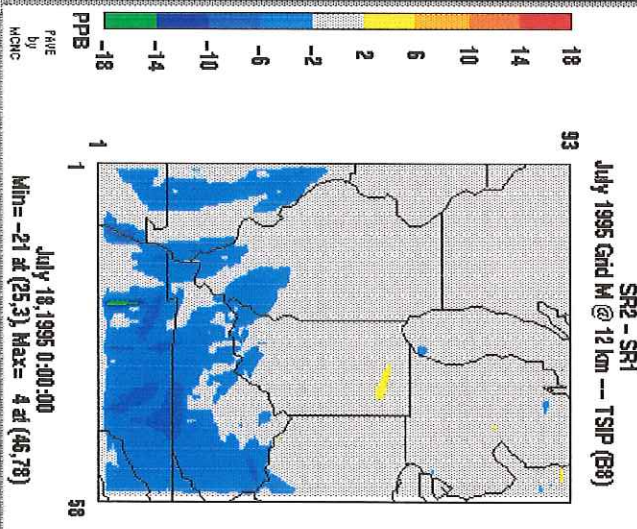
Max 1-Hour Ozone Difference



Max 1-Hour Ozone Difference

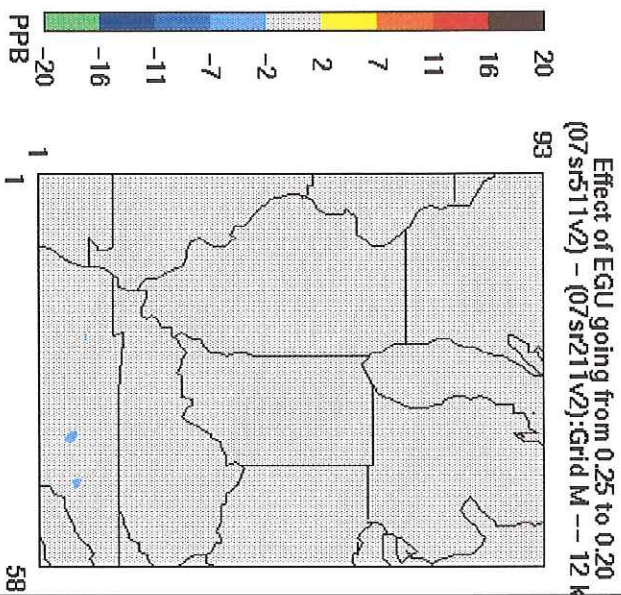


Max 1-Hour Ozone Difference

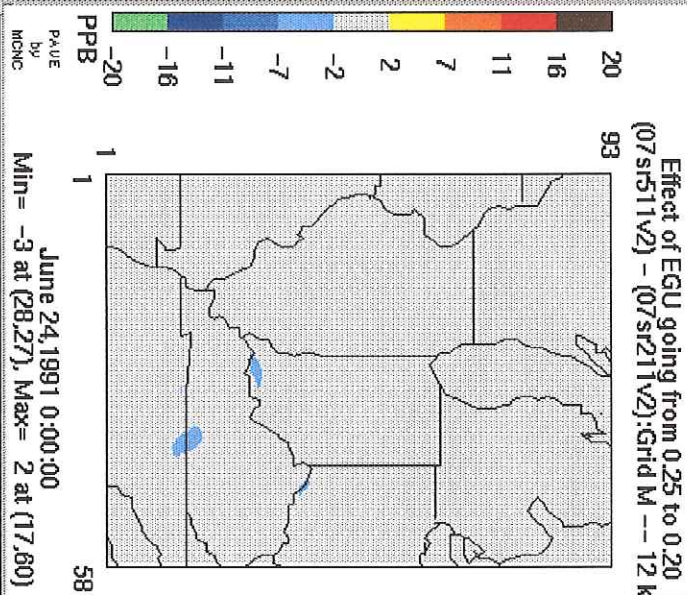


Effect of 0.25EGU - 0.20EGU
SR5 - SR2 **(-440 TPD NOX)**

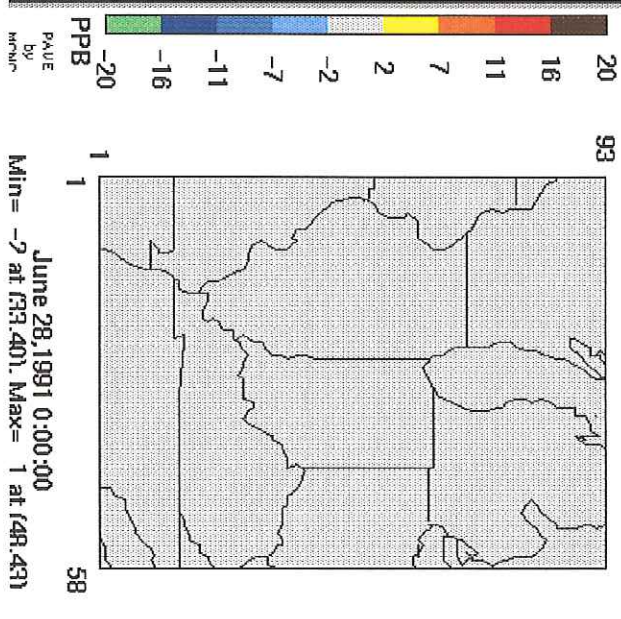
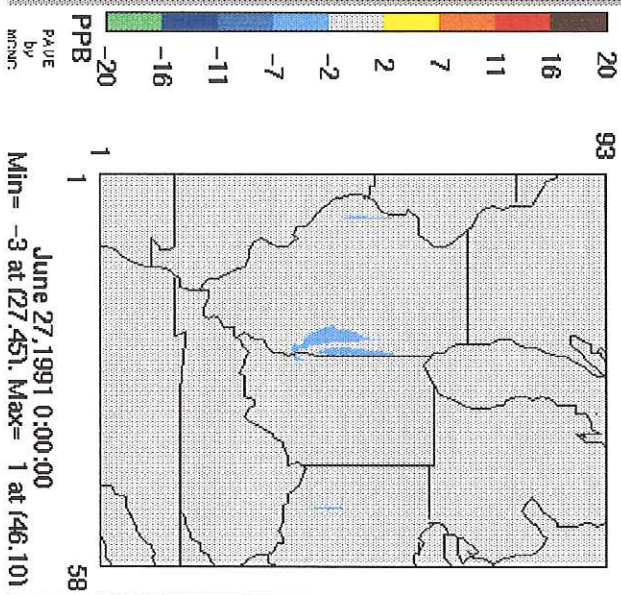
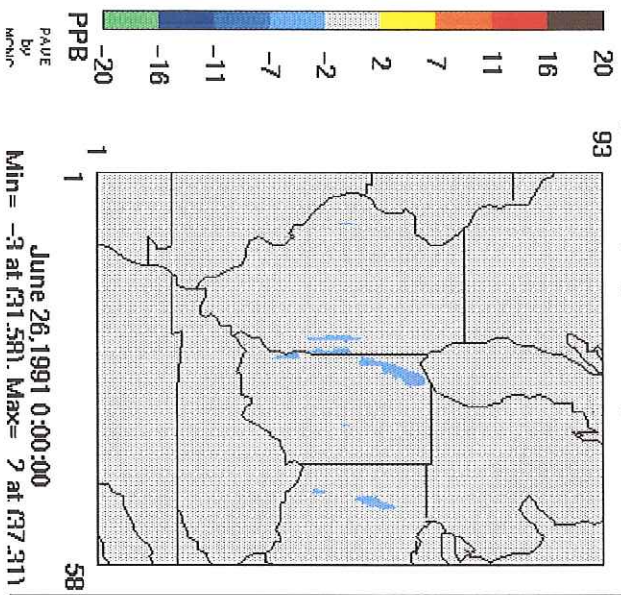
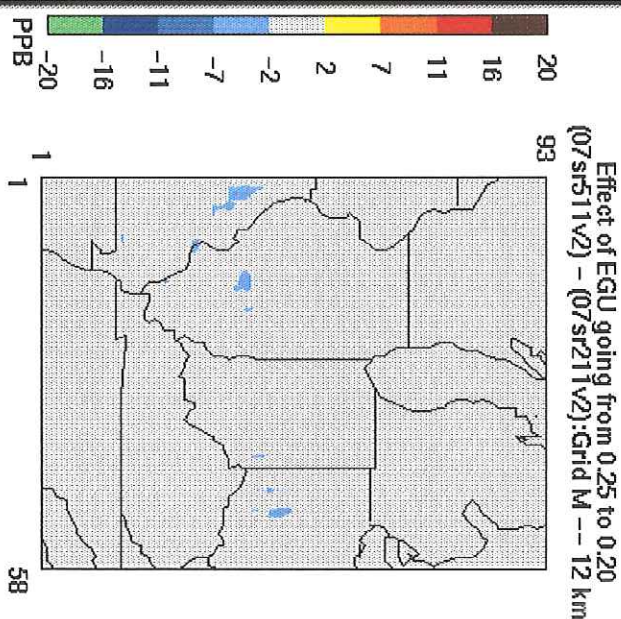
Ozone Difference Plot



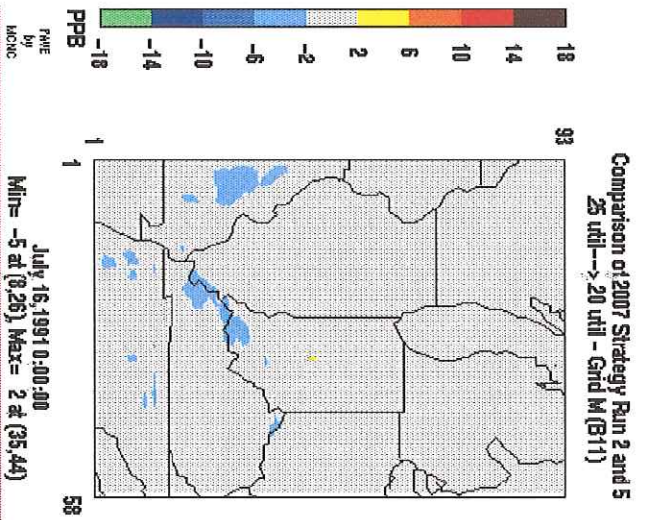
Ozone Difference Plot



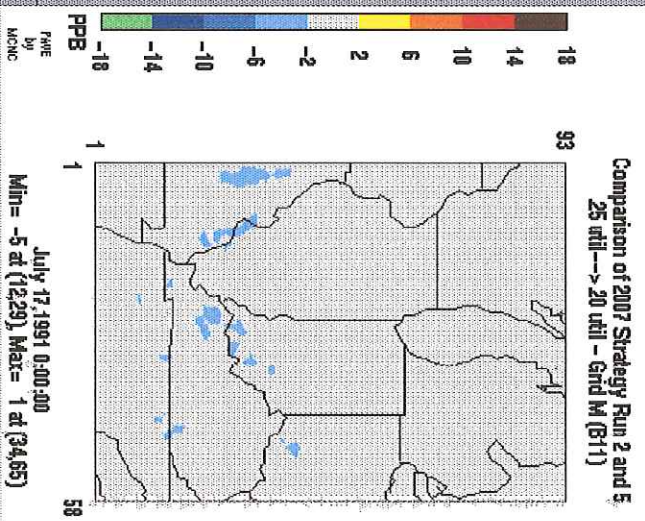
Ozone Difference Plot



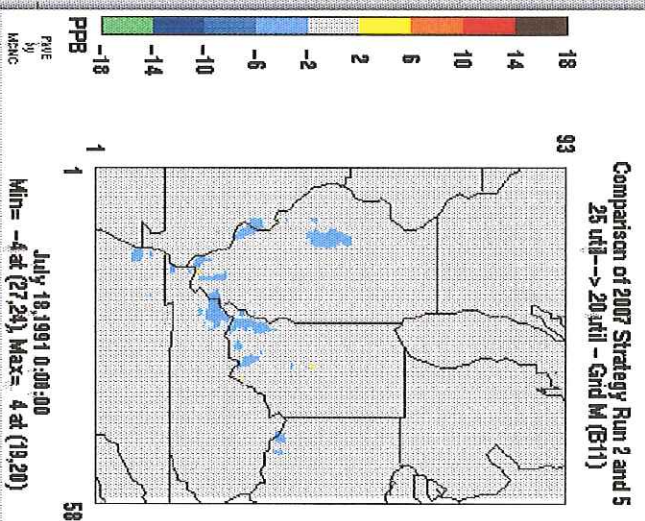
Peak 1-Hour Ozone Difference



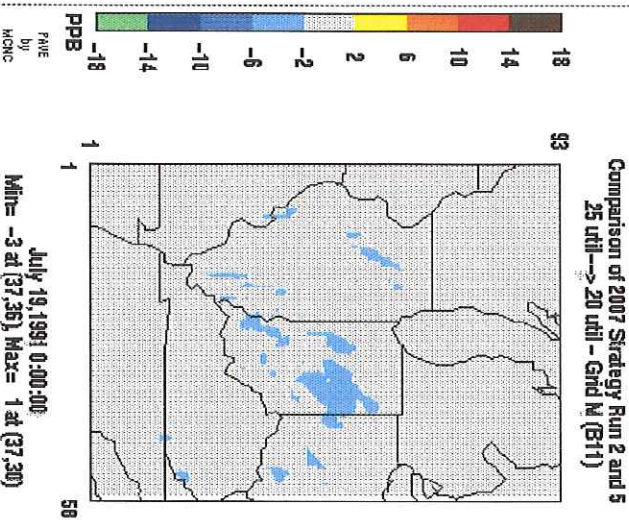
Peak 1-Hour Ozone Difference



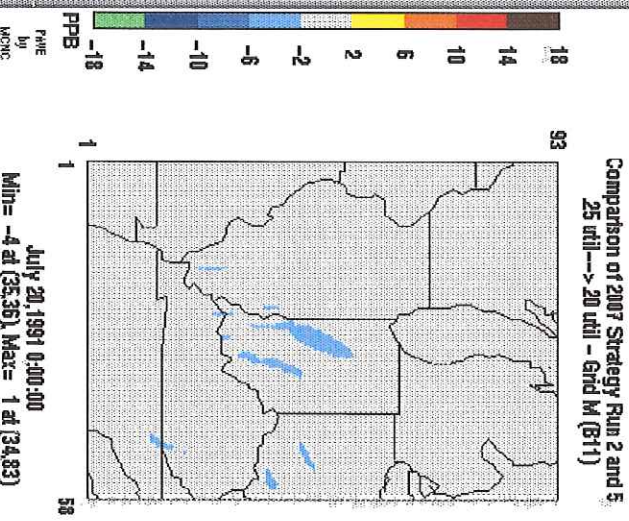
Peak 1-Hour Ozone Difference



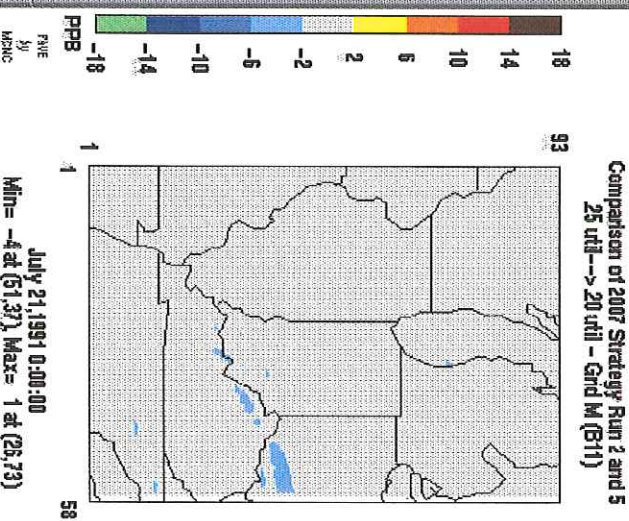
Peak 1-Hour Ozone Difference



Peak 1-Hour Ozone Difference

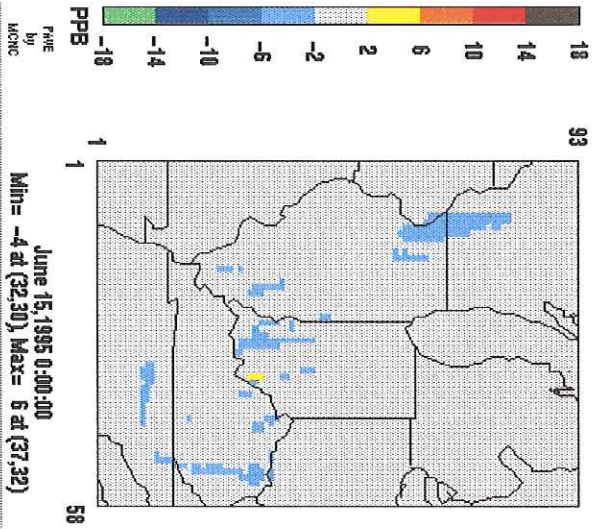


Peak 1-Hour Ozone Difference



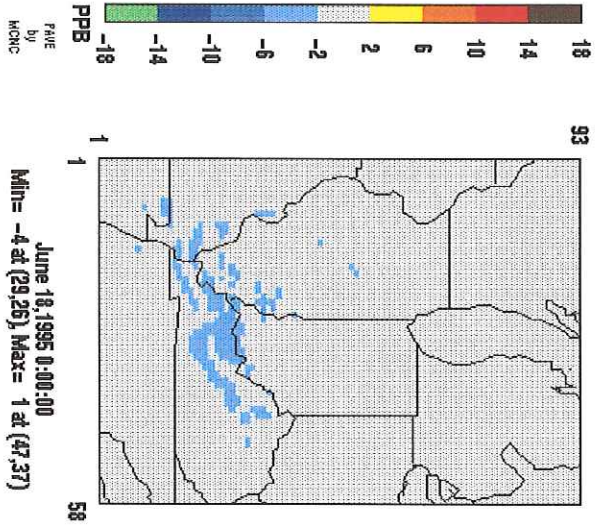
Ozone Difference Plot

UAMV 07s511v2-07s211v2 Grid-M 12km
Effect of 0.20EGU over 0.25EGU in CAA



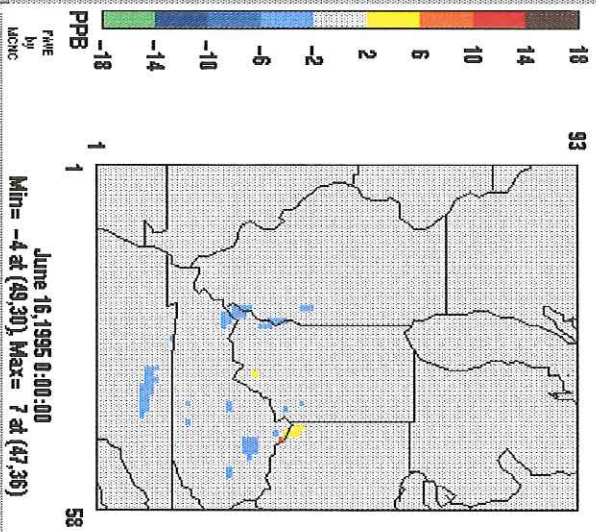
Ozone Difference Plot

UAMV 07s511v2-07s211v2 Grid-M 12km
Effect of 0.20EGU over 0.25EGU in CAA



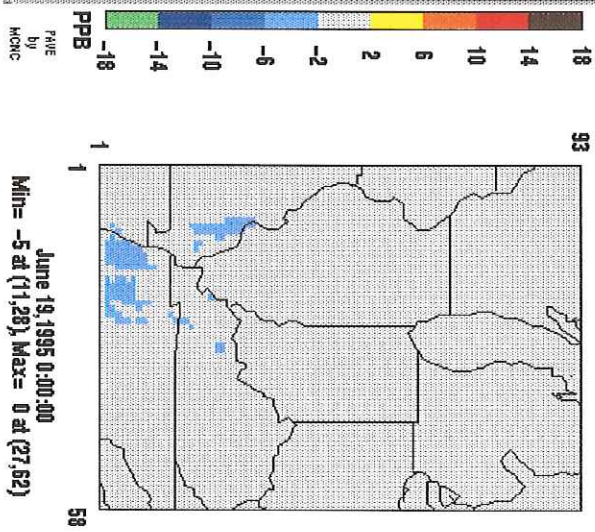
Ozone Difference Plot

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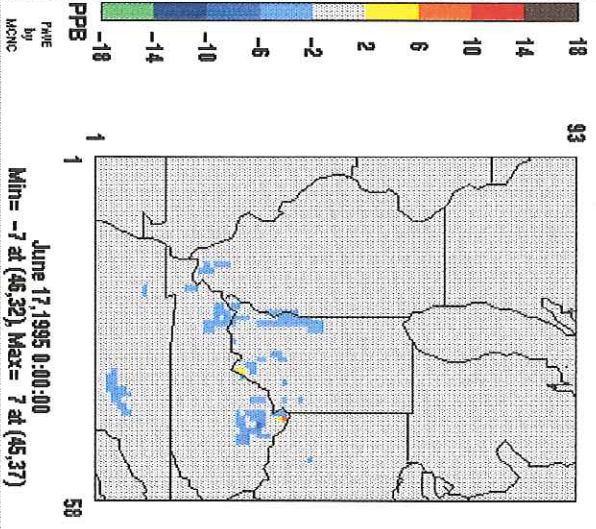
Ozone Difference Plot

UAMV 07s511v2-07s211v2 Grid-M 12km
Effect of 0.20EGU over 0.25EGU in CAA



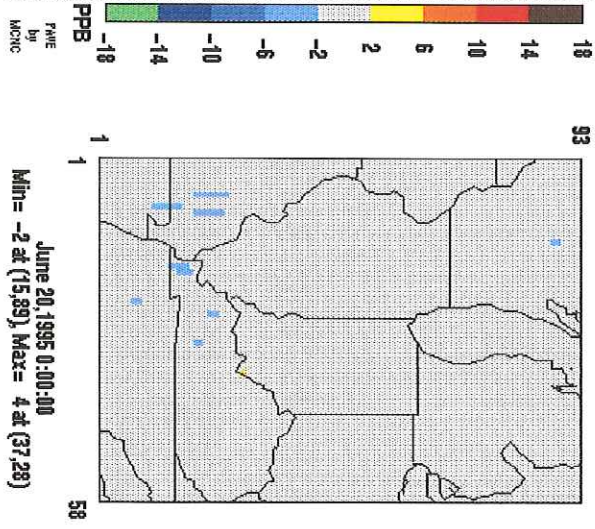
Ozone Difference Plot

UAMV 07s511v2-07s211v2 Grid-M 12km
Effect of 0.20EGU over 0.25EGU in CAA



Ozone Difference Plot

UAMV 07s511v2-07s211v2 Grid-M 12km
Effect of 0.20EGU over 0.25EGU in CAA



Ozone Difference Plot

UAMV 07s511v2-07s211v2 Grid-M 12km
Effect of 0.20EGU over 0.25EGU in CAA



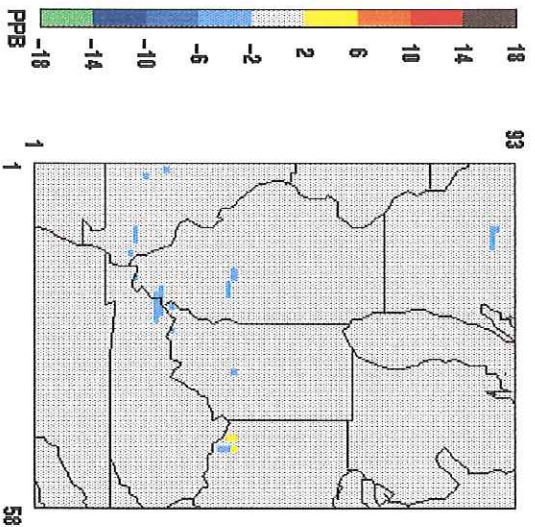
Ozone Difference Plot

UAMV 07s511v2-07s211v2 Grid-M 12km
Effect of 0.20EGU over 0.25EGU in CAA



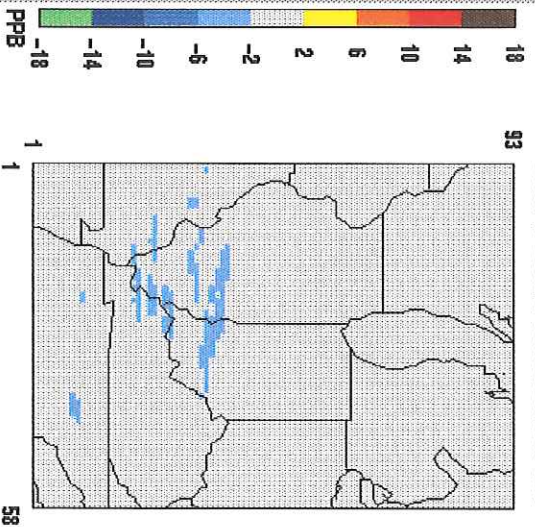
Ozone Difference Plot

UAMV 07sr511v2-07sr211v2 Grid-M 12km
Effect of 0.20EGU over 0.25EGU in CAA



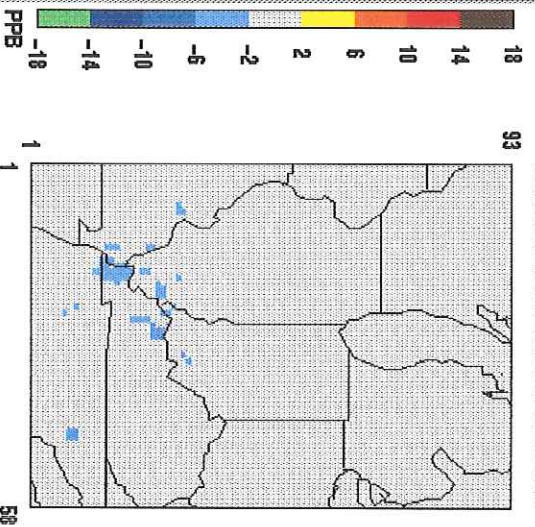
Ozone Difference Plot

UAMV 07sr511v2-07sr211v2 Grid-M 12km
Effect of 0.20EGU over 0.25EGU in CAA



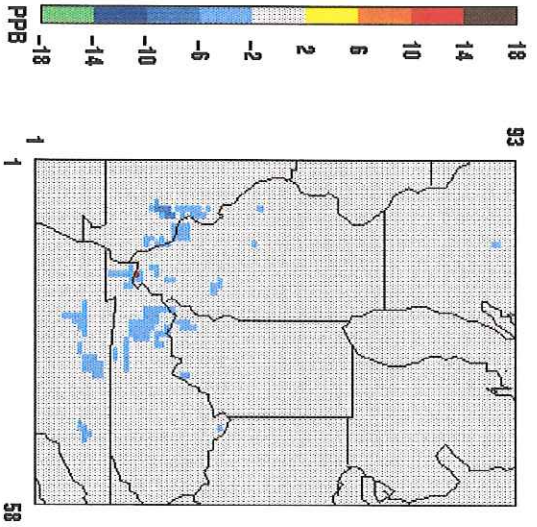
Ozone Difference Plot

UAMV 07sr511v2-07sr211v2 Grid-M 12km
Effect of 0.20EGU over 0.25EGU in CAA



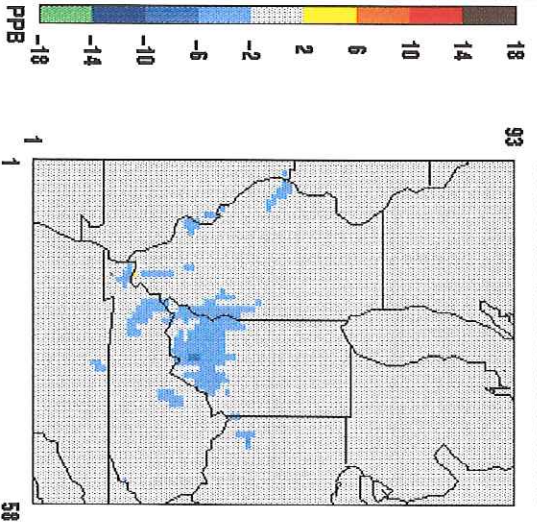
Ozone Difference Plot

UAMV 07sr511v2-07sr211v2 Grid-M 12km
Effect of 0.20EGU over 0.25EGU in CAA

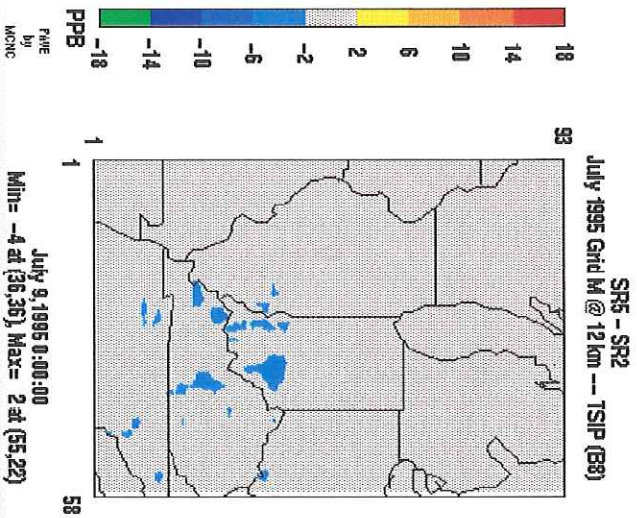


Ozone Difference Plot

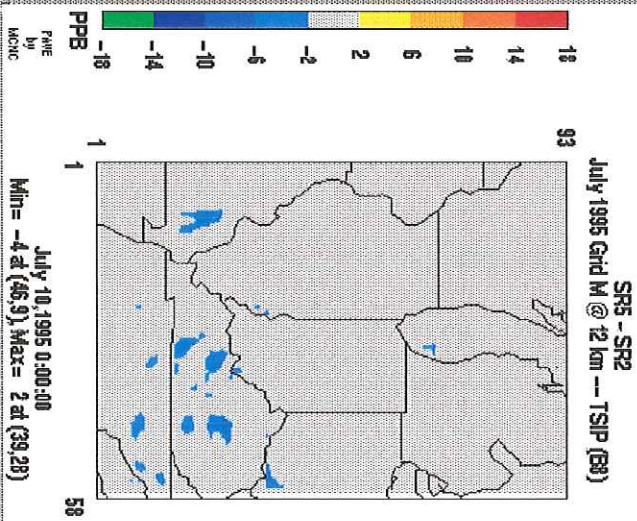
UAMV 07sr511v2-07sr211v2 Grid-M 12km
Effect of 0.20EGU over 0.25EGU in CAA



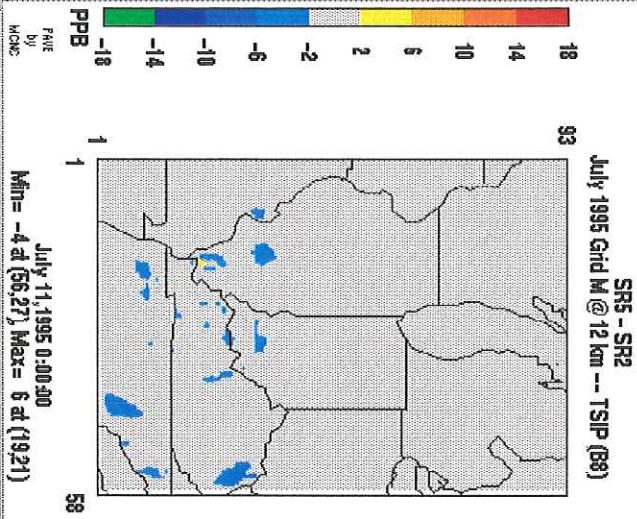
Max 1-Hour Ozone Difference



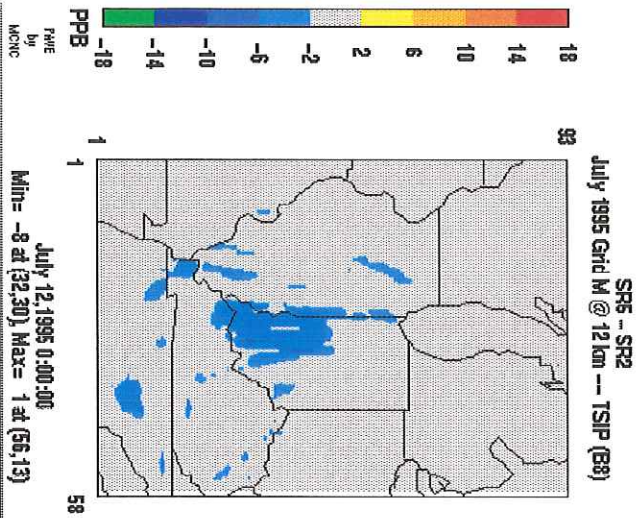
Max 1-Hour Ozone Difference



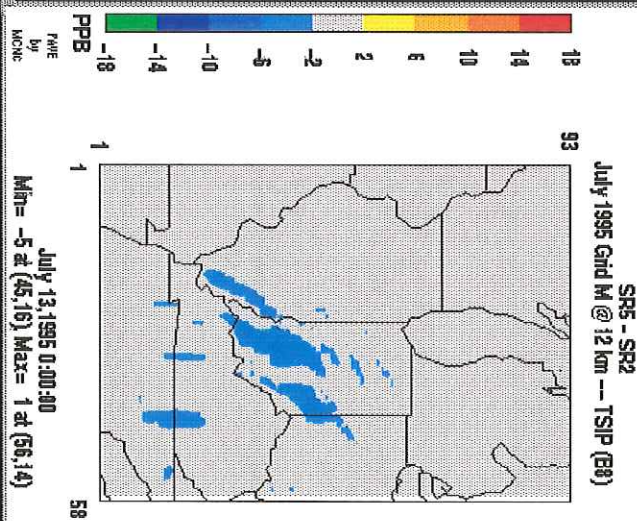
Max 1-Hour Ozone Difference



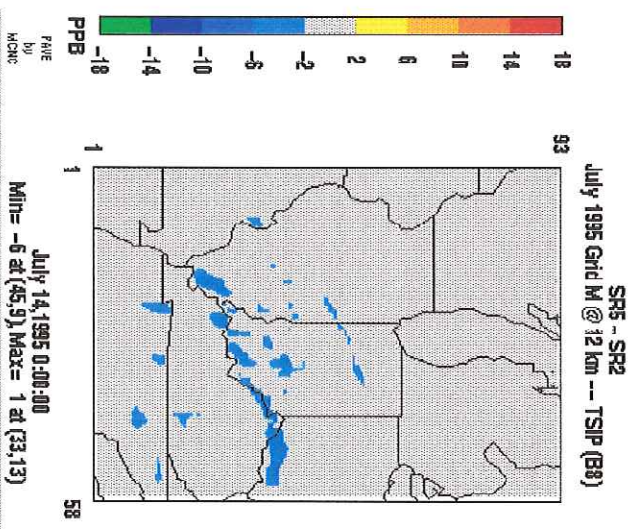
Max 1-Hour Ozone Difference



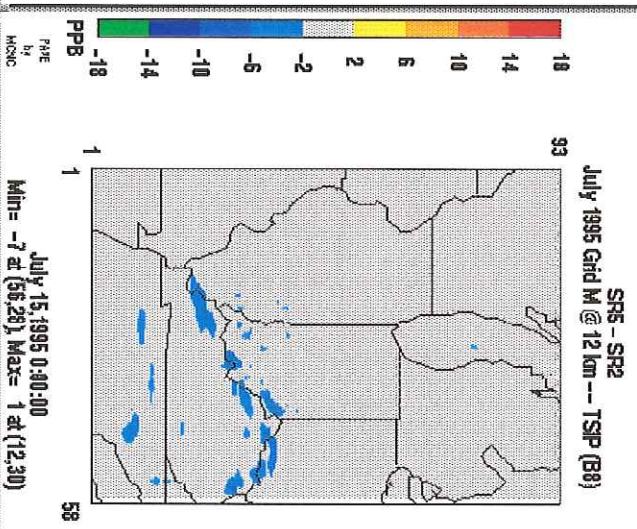
Max 1-Hour Ozone Difference



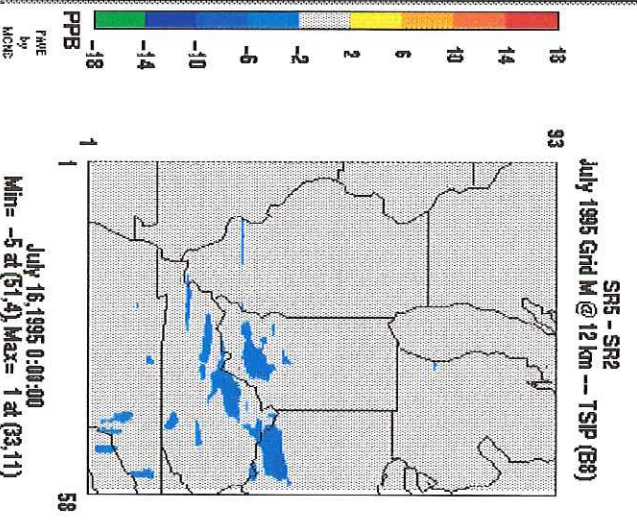
Max 1-Hour Ozone Difference



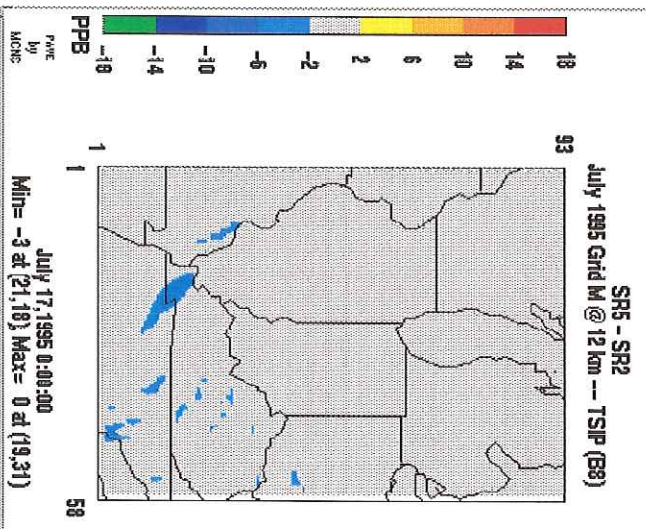
Max 1-Hour Ozone Difference



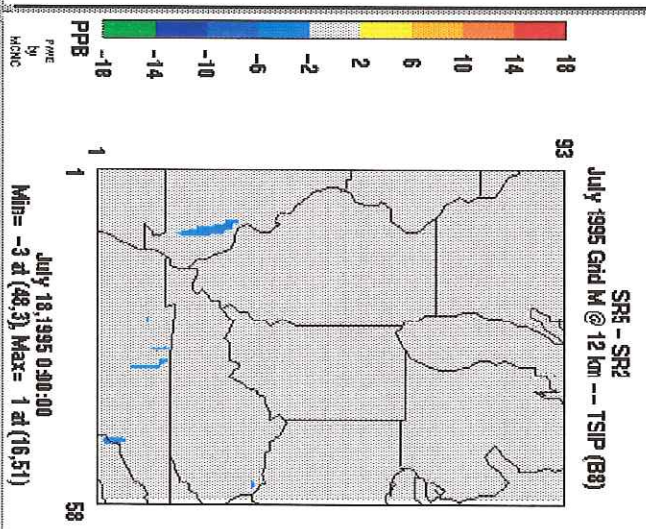
Max 1-Hour Ozone Difference



Max 1-Hour Ozone Difference

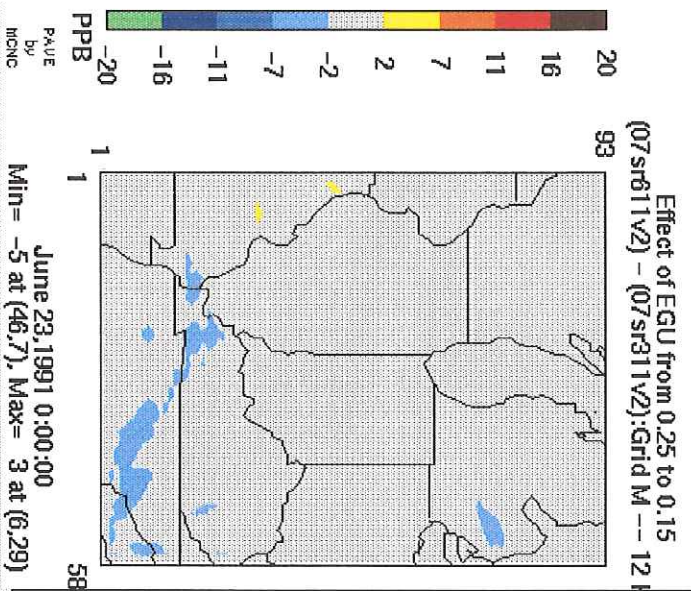


Max 1-Hour Ozone Difference

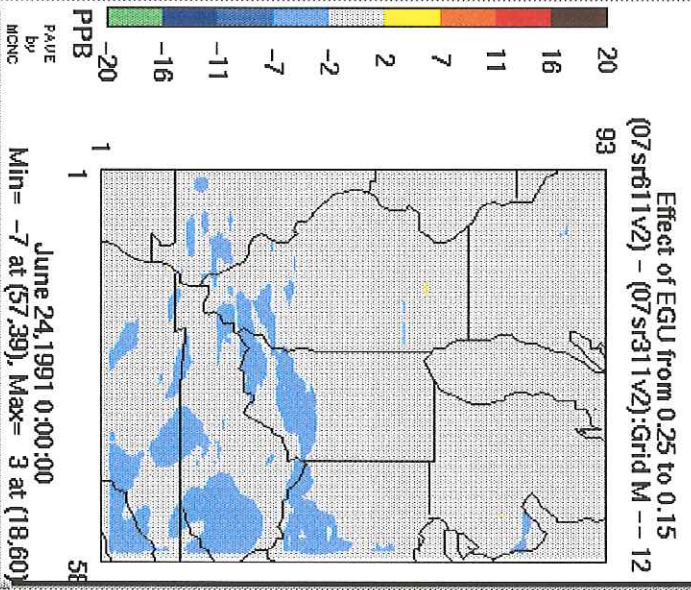


Effect of 0.25EGU - 0.15EGU
SR6 - SR3 (-870 TPD NOx)

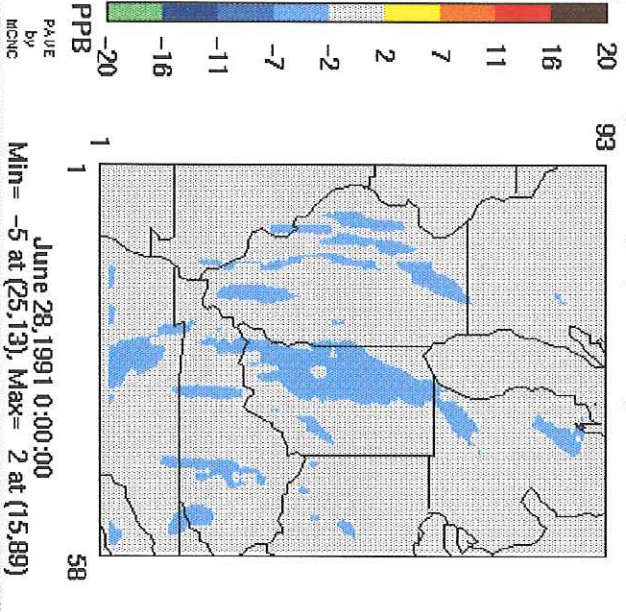
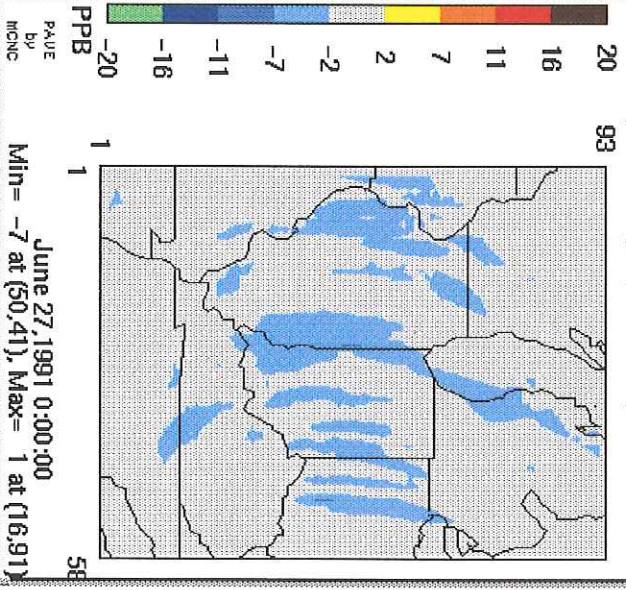
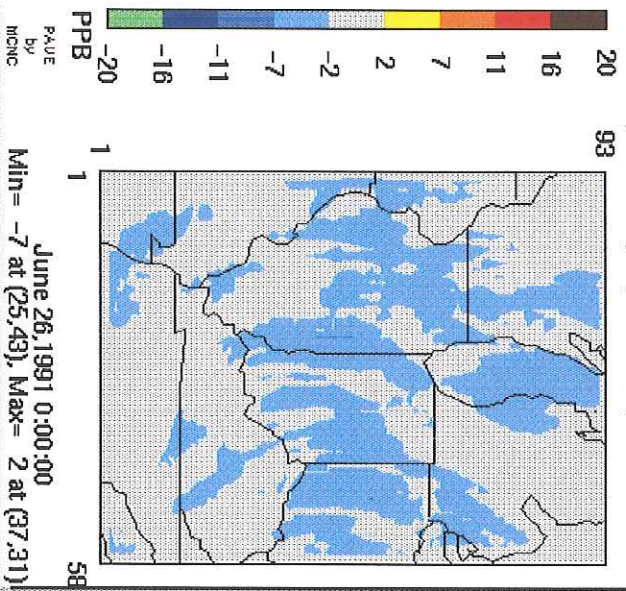
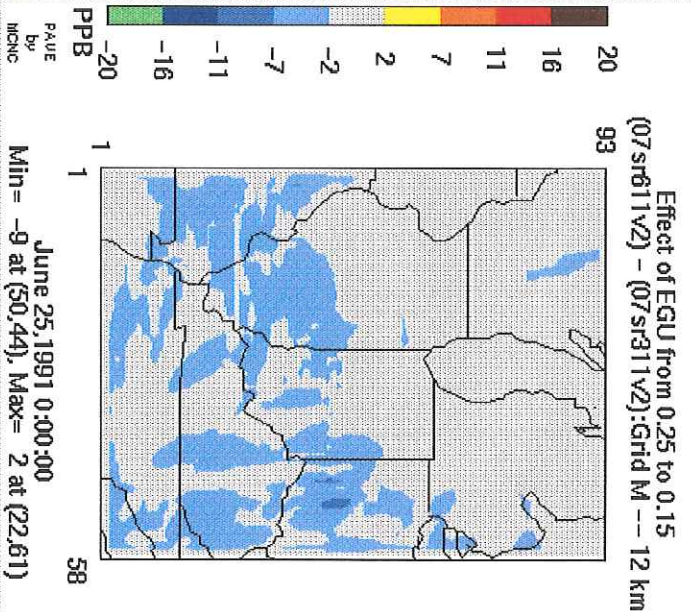
Ozone Difference Plot



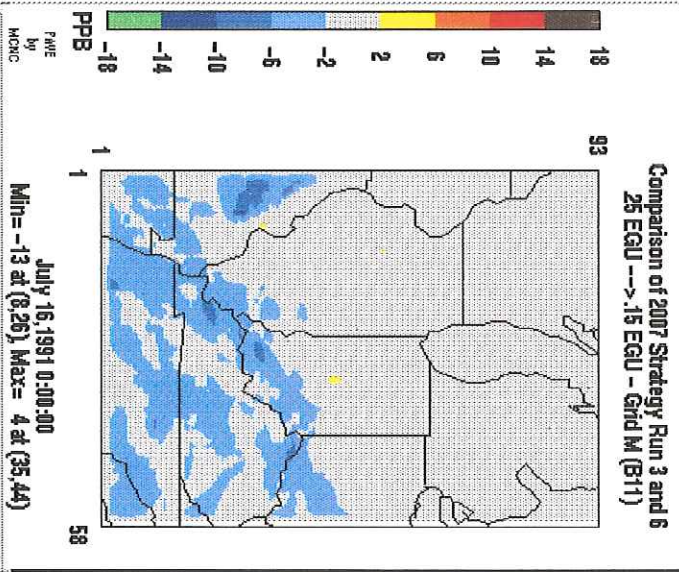
Ozone Difference Plot



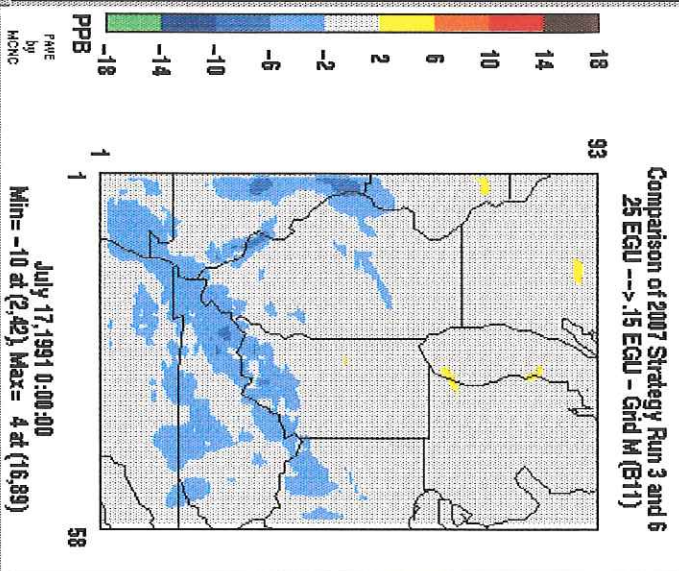
Ozone Difference Plot



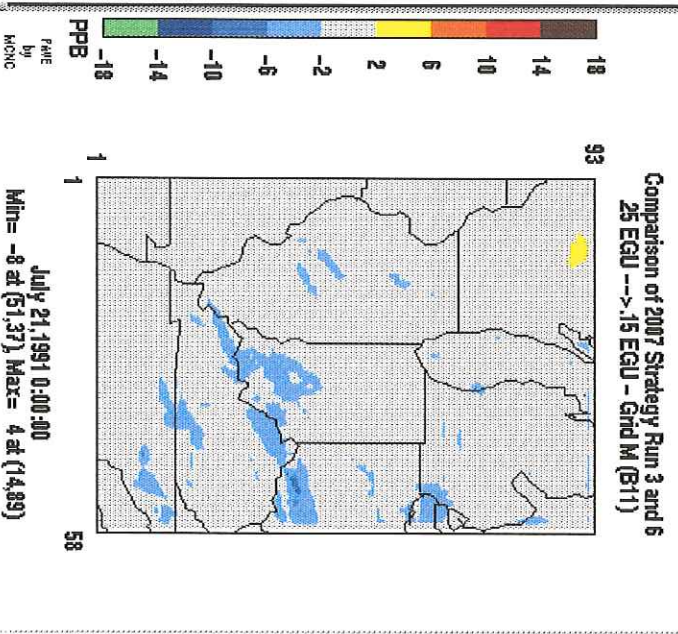
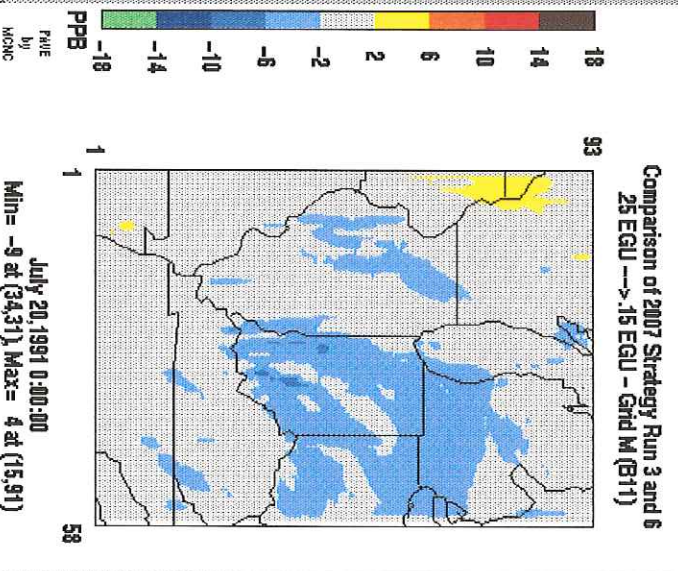
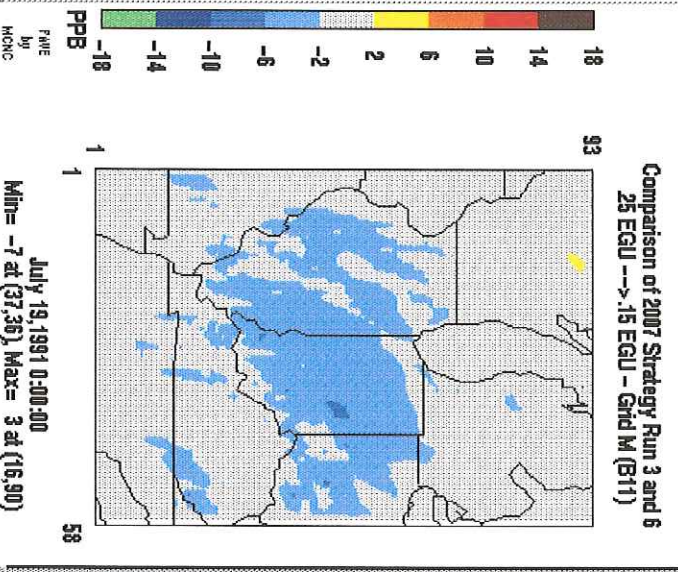
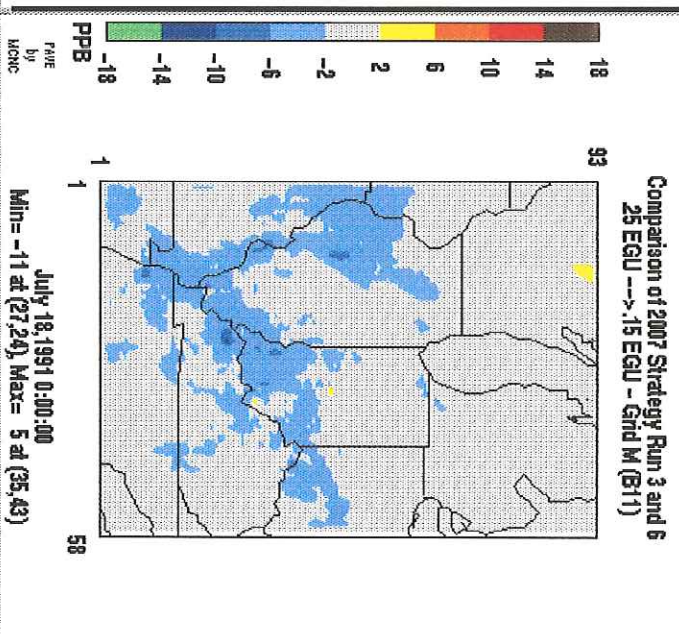
Peak 1-Hour Ozone Difference



Peak 1-Hour Ozone Difference

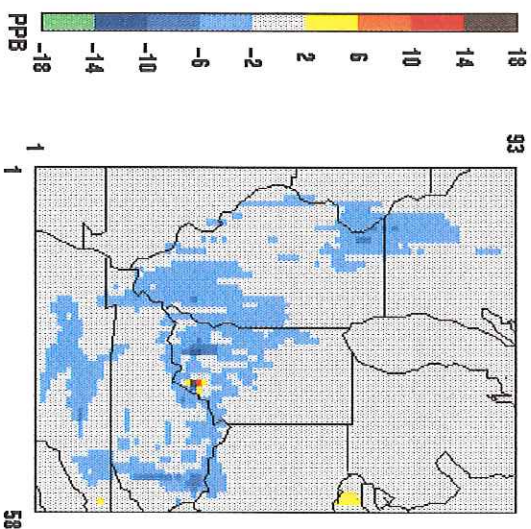


Peak 1-Hour Ozone Difference



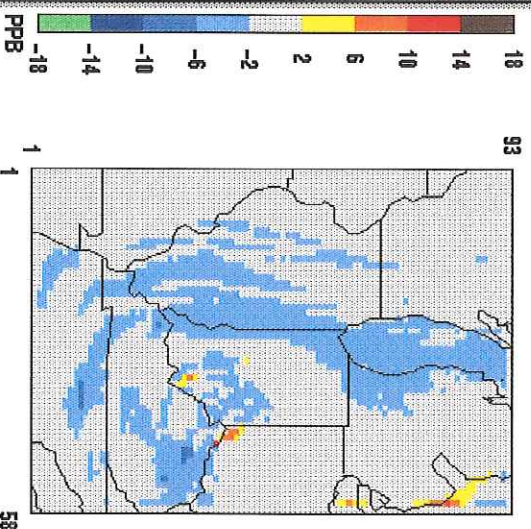
Ozone Difference Plot

UAMV 07sr611v2-07sr311v2 Grid-M 12km
Effect of 0.15EGU over 0.25EGU in SIP



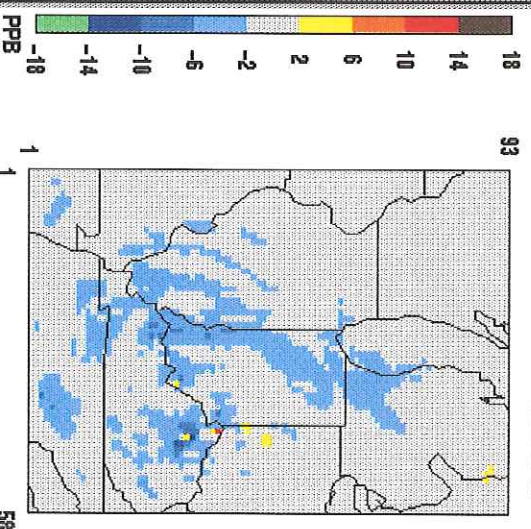
Ozone Difference Plot

UAMV 07sr611v2-07sr311v2 Grid-M 12km
Effect of 0.15EGU over 0.25EGU in SIP



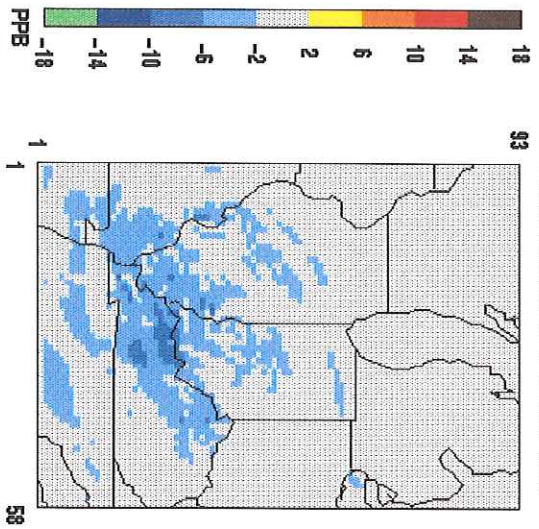
Ozone Difference Plot

UAMV 07sr611v2-07sr311v2 Grid-M 12km
Effect of 0.15EGU over 0.25EGU in SIP



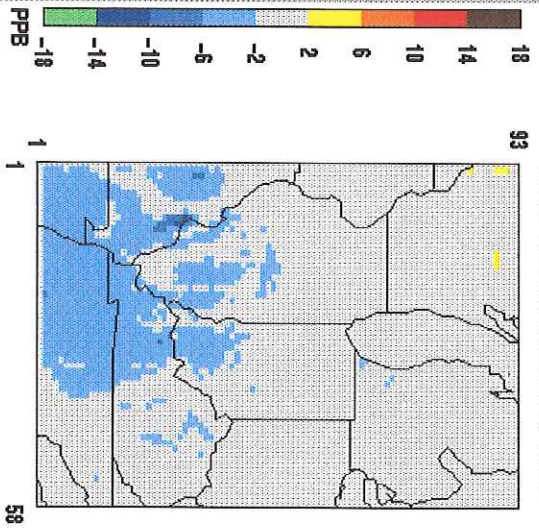
Ozone Difference Plot

UAMV 07sr611v2-07sr311v2 Grid-M 12km
Effect of 0.15EGU over 0.25EGU in SIP



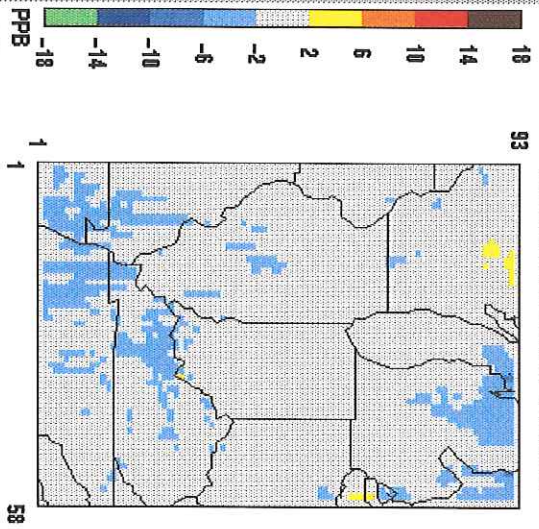
Ozone Difference Plot

UAMV 07sr611v2-07sr311v2 Grid-M 12km
Effect of 0.15EGU over 0.25EGU in SIP



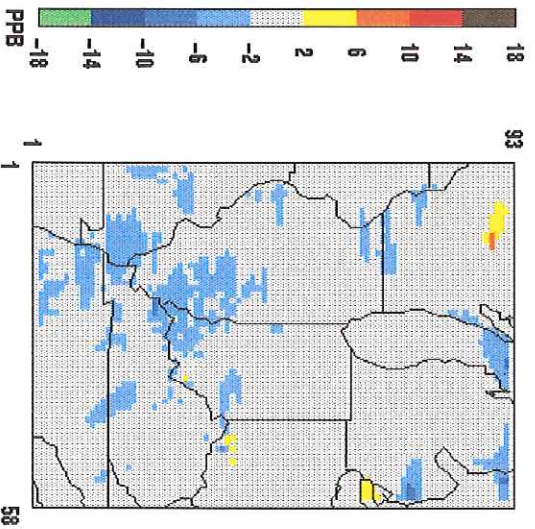
Ozone Difference Plot

UAMV 07sr611v2-07sr311v2 Grid-M 12km
Effect of 0.15EGU over 0.25EGU in SIP



Ozone Difference Plot

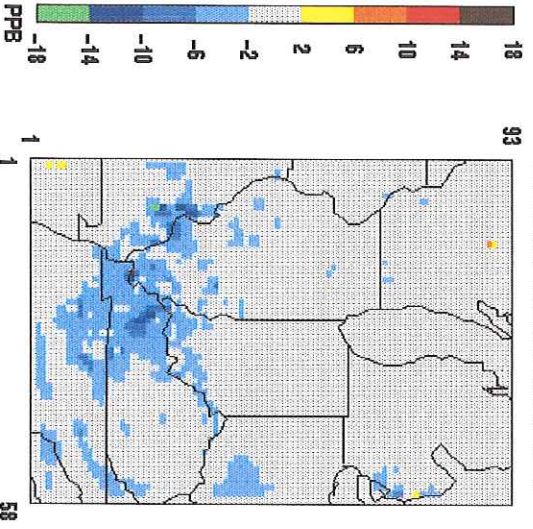
UAMV 07sr611v2-07sr311v2 Grid-M 12km
Effect of 0.15EGU over 0.25EGU in SIP



June 21, 1995 0:00:00
Min = -8 at (57,73), Max = 7 at (14,89)

Ozone Difference Plot

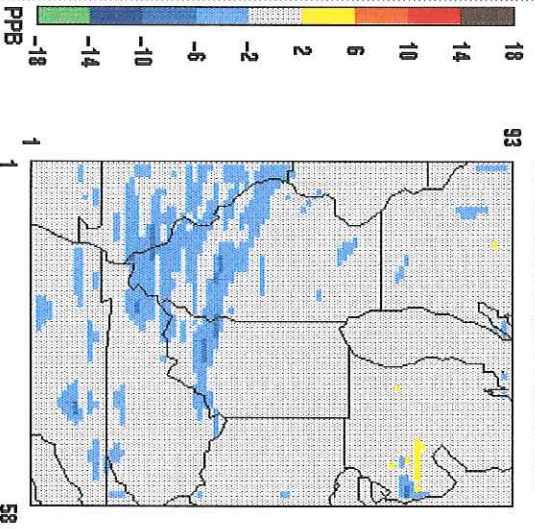
UAMV 07sr611v2-07sr311v2 Grid-M 12km
Effect of 0.15EGU over 0.25EGU in SIP



June 24, 1995 0:00:00
Min = -20 at (9,25), Max = 20 at (20,20)

Ozone Difference Plot

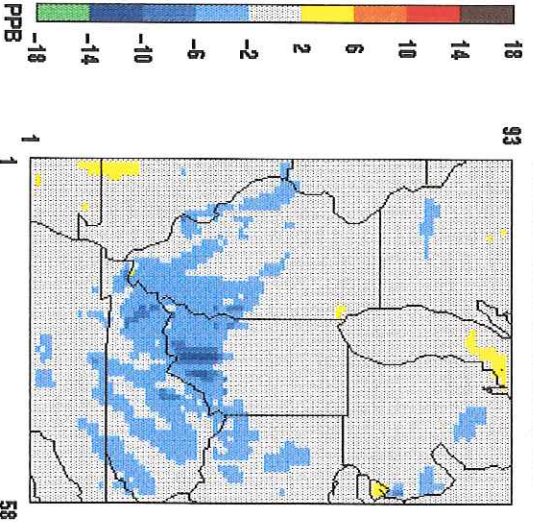
UAMV 07sr611v2-07sr311v2 Grid-M 12km
Effect of 0.15EGU over 0.25EGU in SIP



June 22, 1995 0:00:00
Min = -8 at (27,36), Max = 5 at (63,75)

Ozone Difference Plot

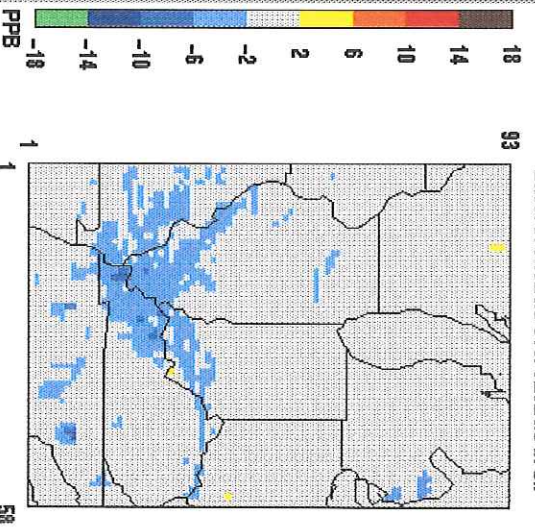
UAMV 07sr611v2-07sr311v2 Grid-M 12km
Effect of 0.15EGU over 0.25EGU in SIP



June 25, 1995 0:00:00
Min = -13 at (34,32), Max = 6 at (20,20)

Ozone Difference Plot

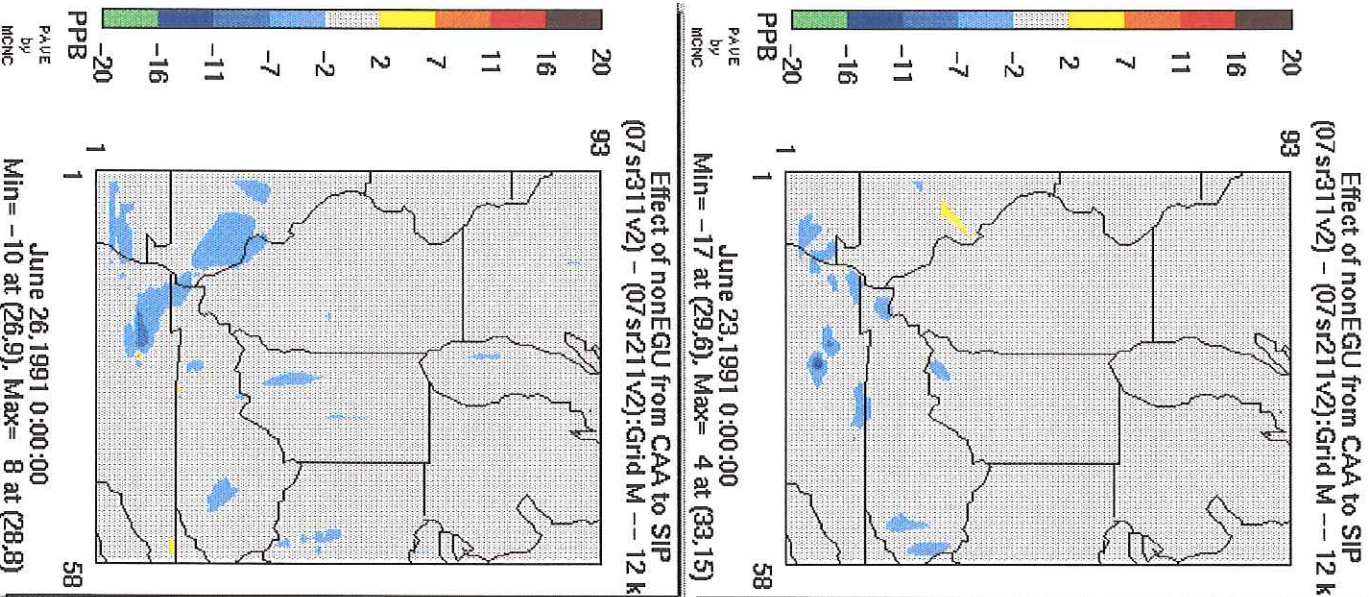
UAMV 07sr611v2-07sr311v2 Grid-M 12km
Effect of 0.15EGU over 0.25EGU in SIP



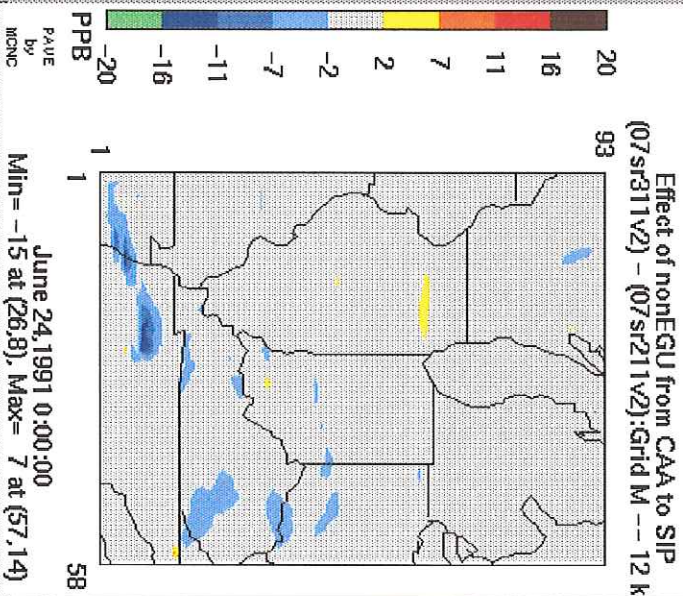
June 23, 1995 0:00:00
Min = -10 at (30,25), Max = 3 at (36,28)

Effect of SIP Call Non-EGU
SR3 - SR2 (-500 TPD NOx)

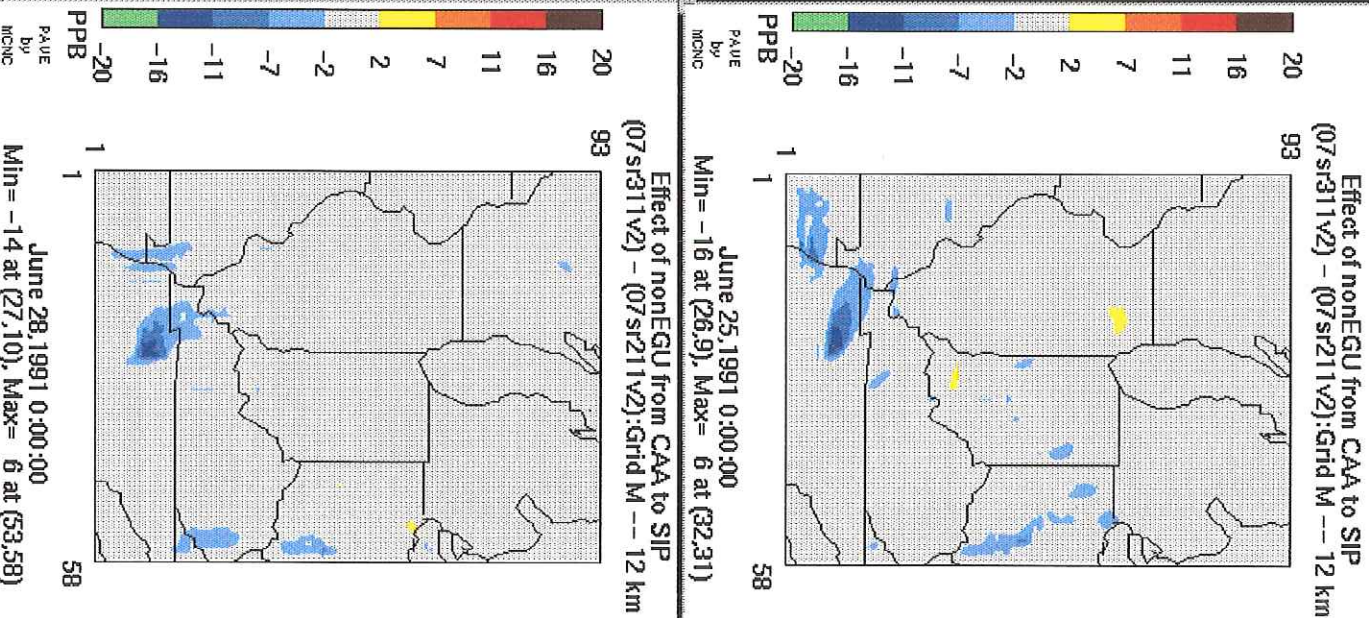
Ozone Difference Plot



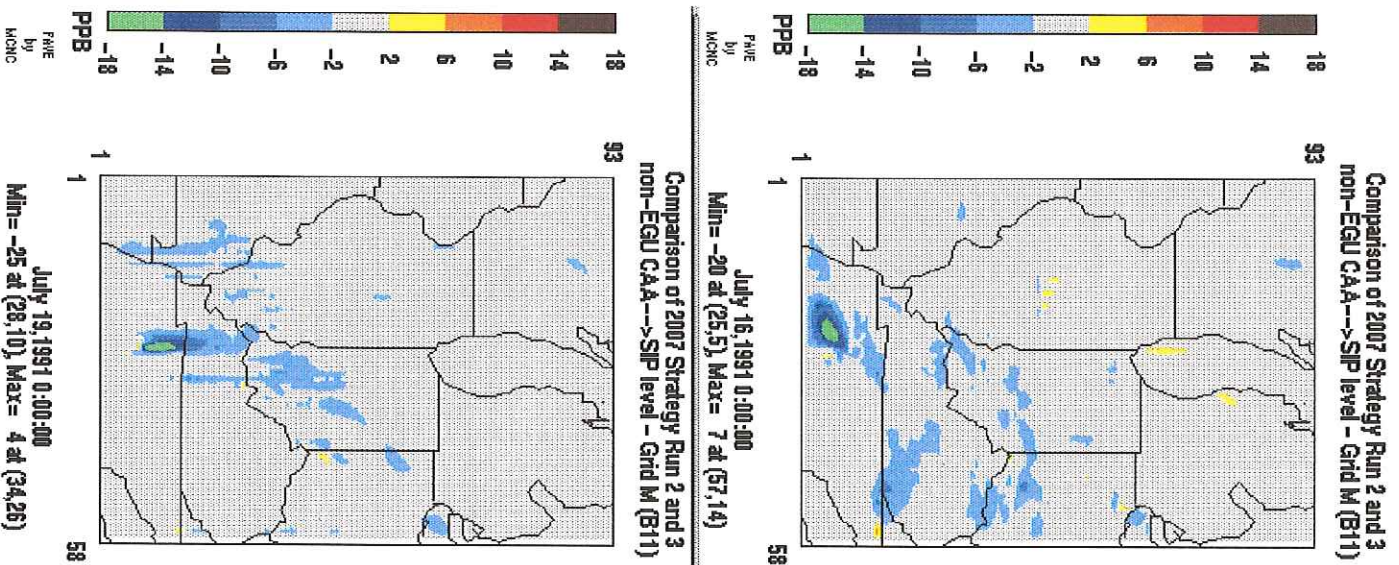
Ozone Difference Plot



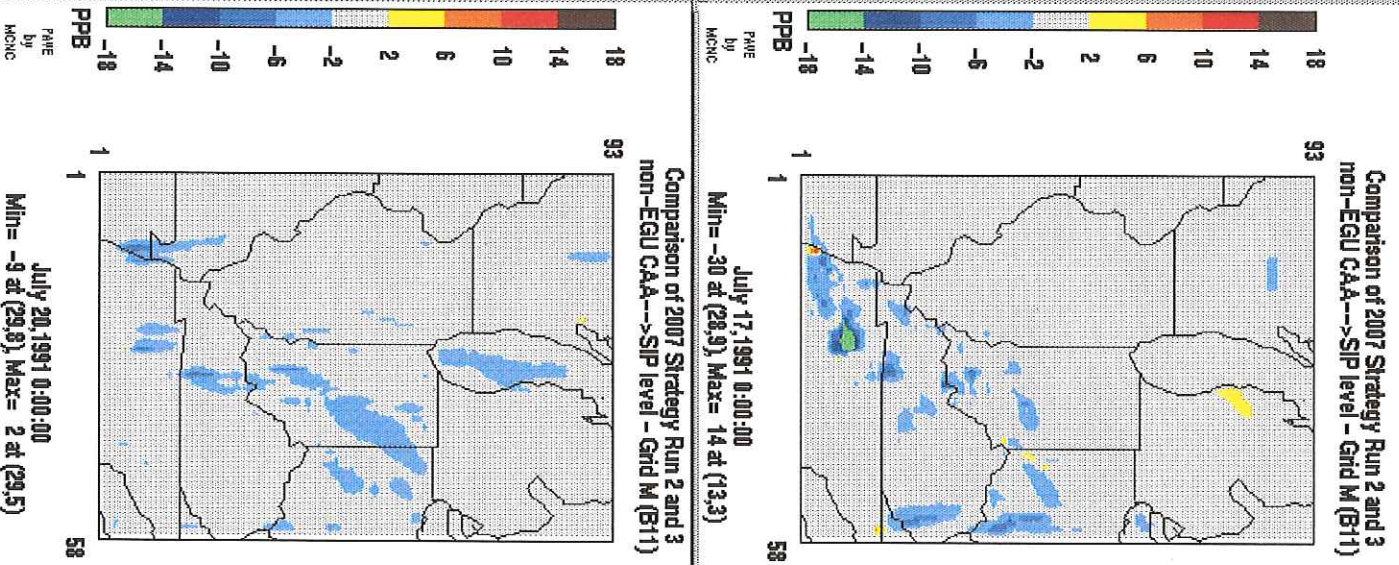
Ozone Difference Plot



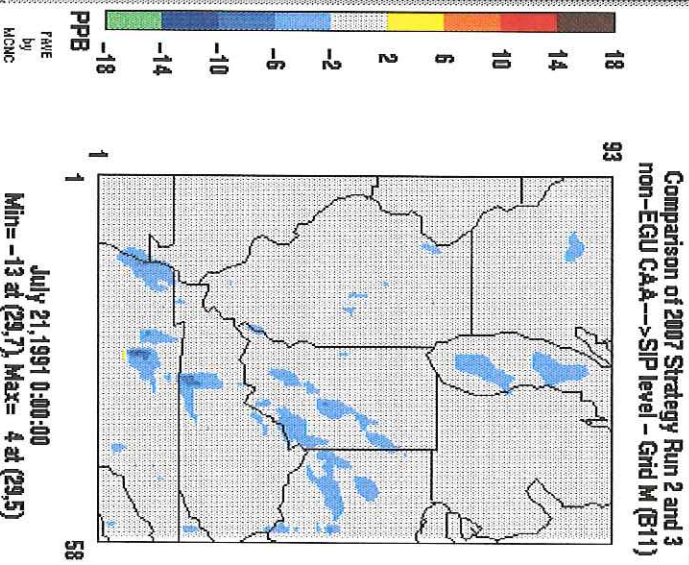
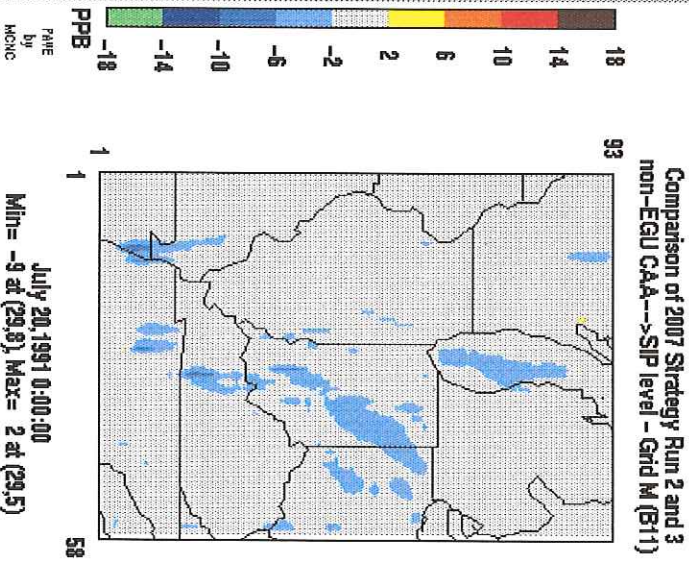
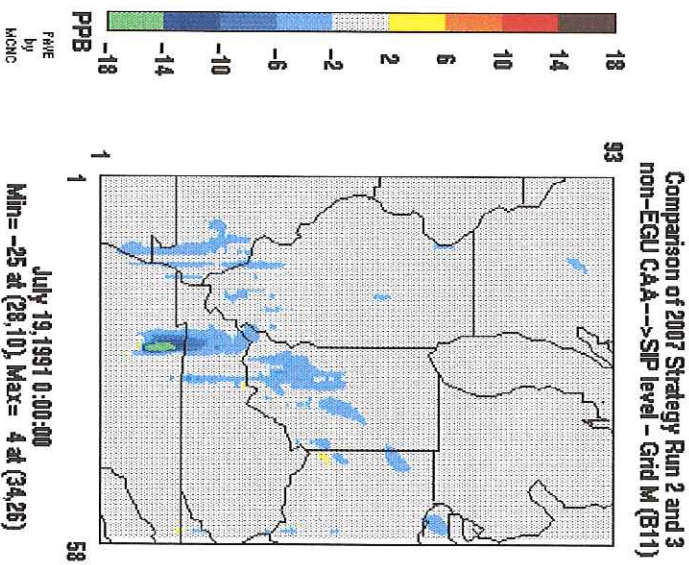
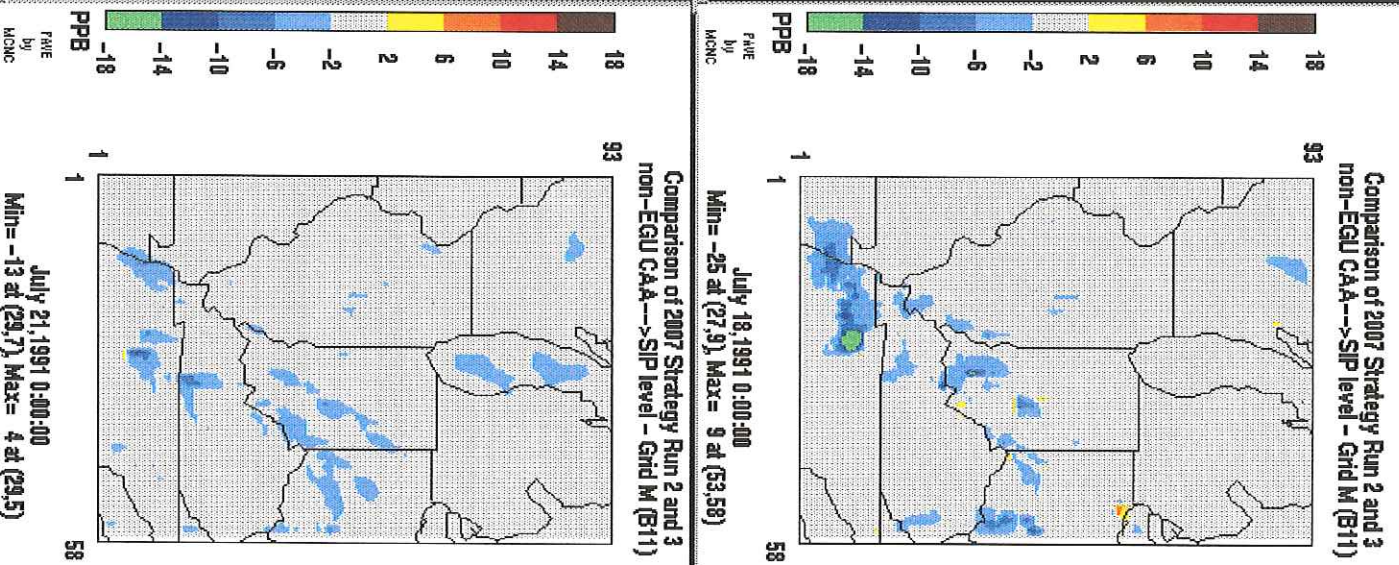
Peak 1-Hour Ozone Difference



Peak 1-Hour Ozone Difference

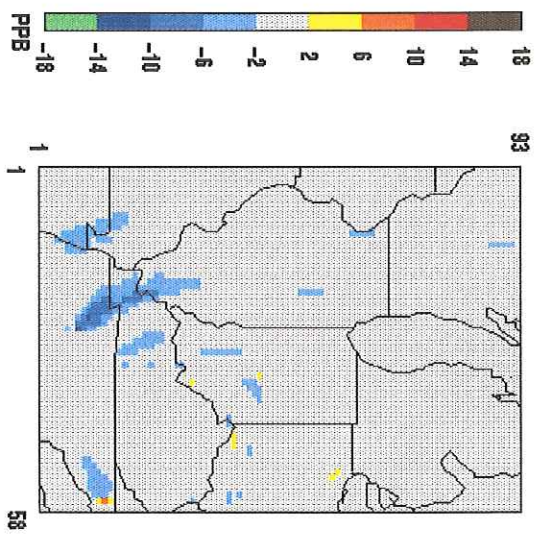


Peak 1-Hour Ozone Difference



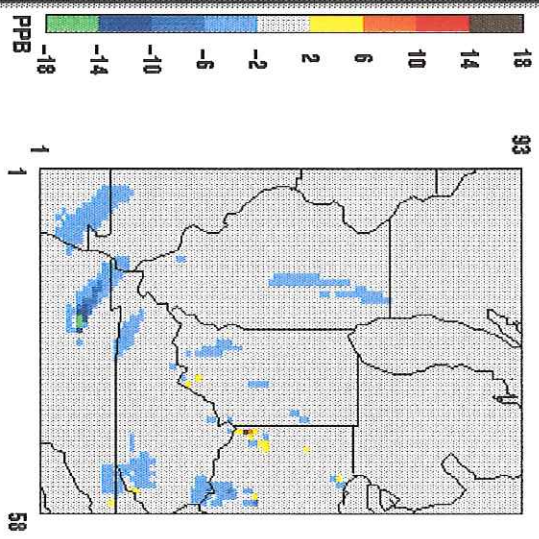
Ozone Difference Plot

UAMV 07sr311v2-07sr211v2 Grid-M 12km
SR3-SR2:



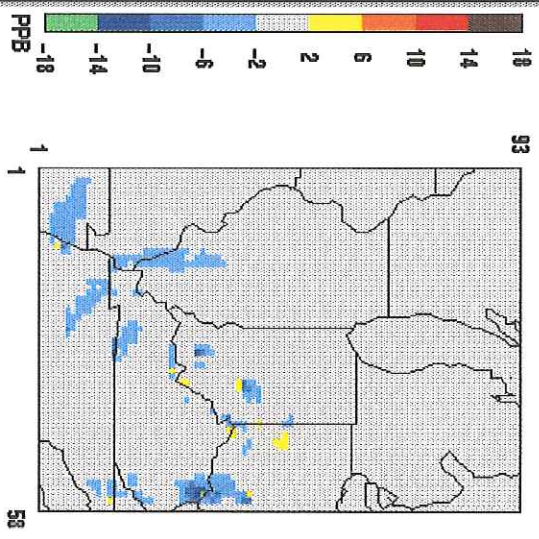
Ozone Difference Plot

UAMV 07sr311v2-07sr211v2 Grid-M 12km
SR3-SR2:



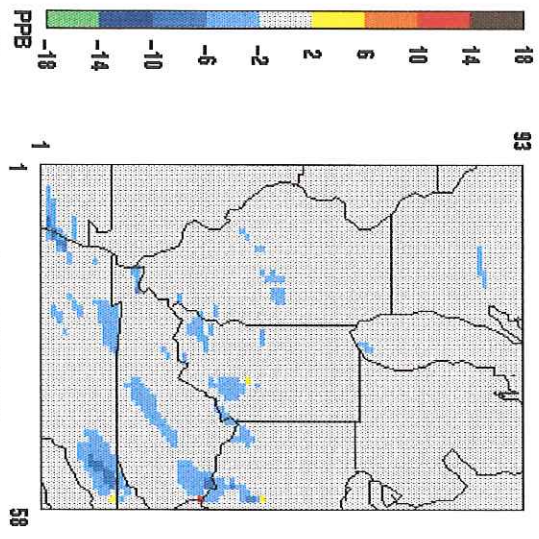
Ozone Difference Plot

UAMV 07sr311v2-07sr211v2 Grid-M 12km
SR3-SR2:



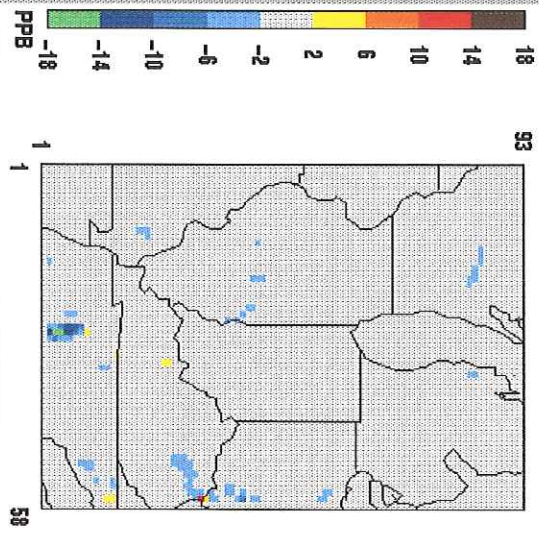
Ozone Difference Plot

UAMV 07sr311v2-07sr211v2 Grid-M 12km
SR3-SR2:



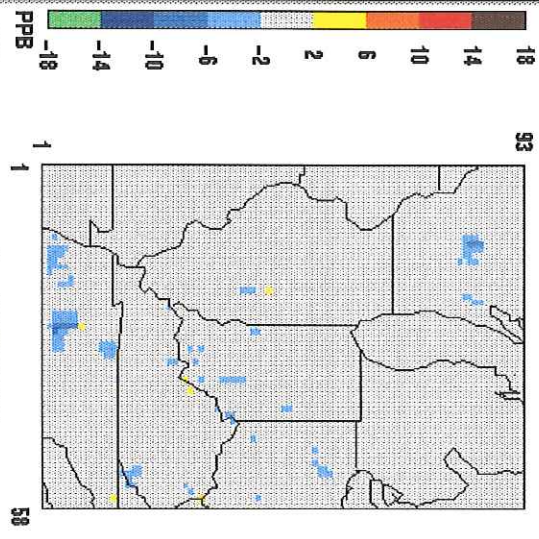
Ozone Difference Plot

UAMV 07sr311v2-07sr211v2 Grid-M 12km
SR3-SR2:



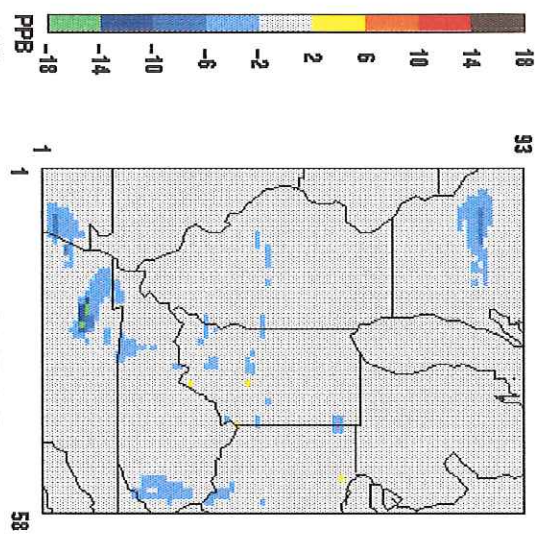
Ozone Difference Plot

UAMV 07sr311v2-07sr211v2 Grid-M 12km
SR3-SR2:



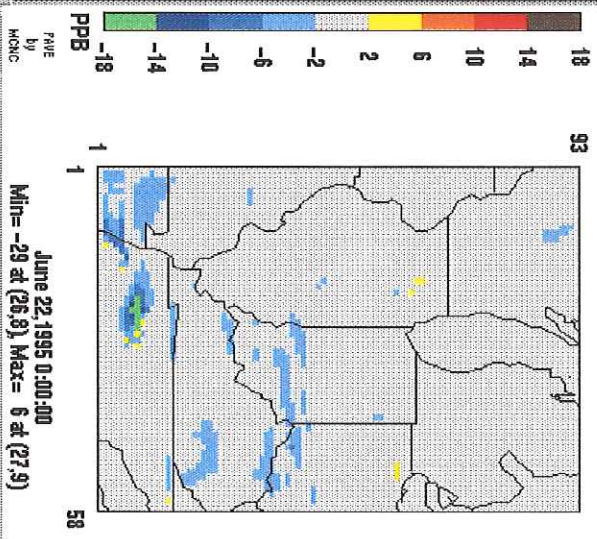
Ozone Difference Plot

UAMV 07sr311v2-07sr211v2 Grid-M 12km
SR3-SR2:



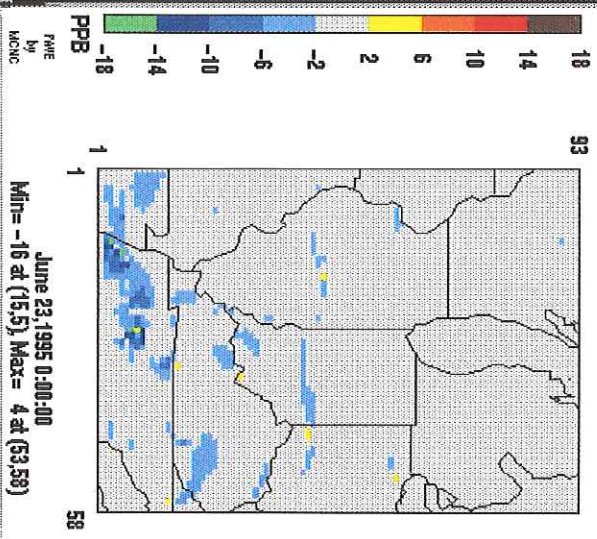
Ozone Difference Plot

UAMV 07sr311v2-07sr211v2 Grid-M 12km
SR3-SR2:



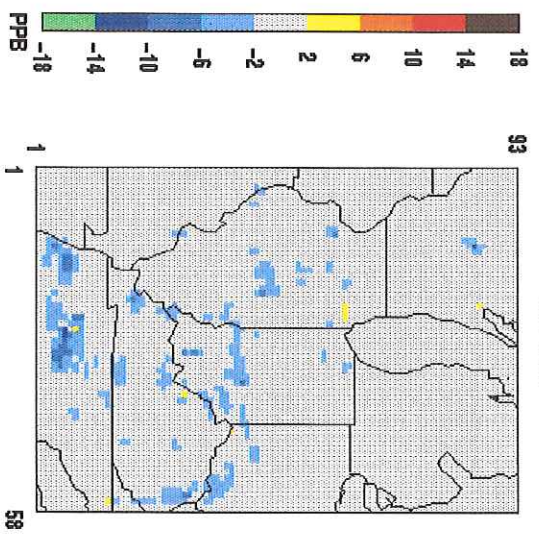
Ozone Difference Plot

UAMV 07sr311v2-07sr211v2 Grid-M 12km
SR3-SR2:



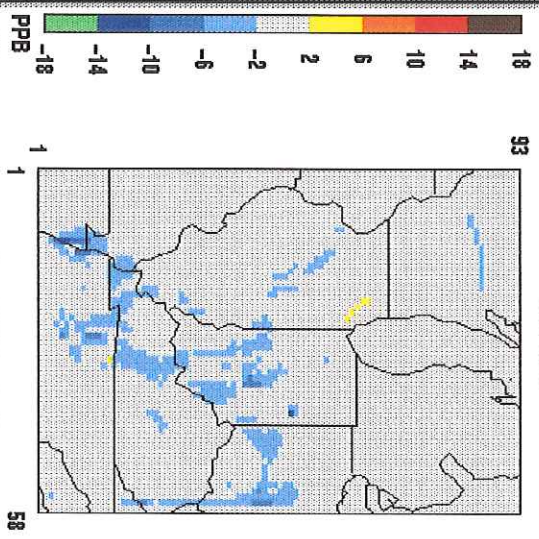
Ozone Difference Plot

UAMV 07sr311v2-07sr211v2 Grid-M 12km
SR3-SR2:

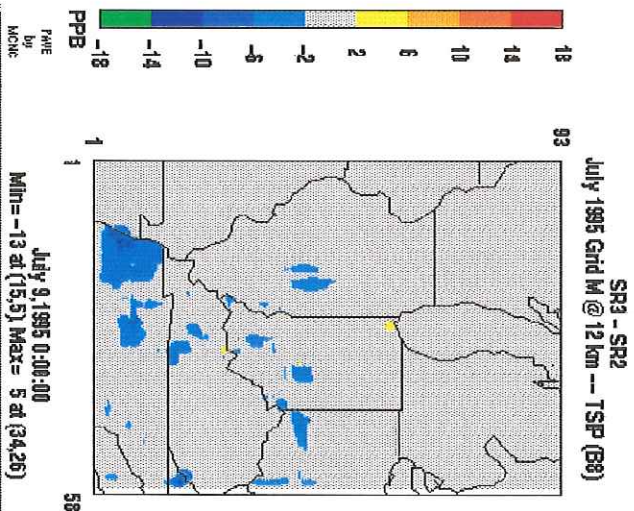


Ozone Difference Plot

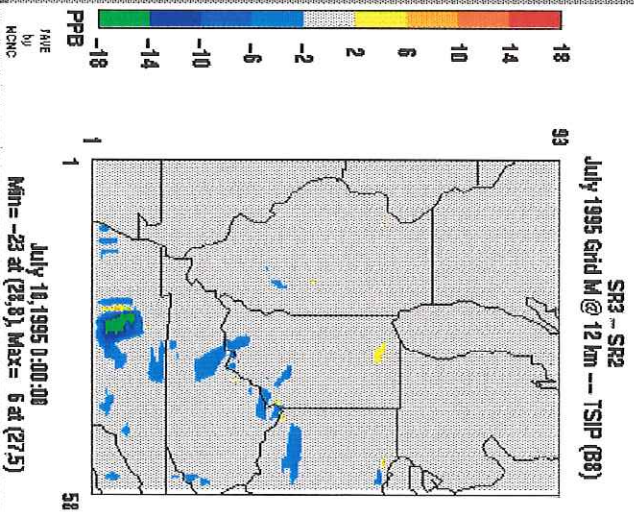
UAMV 07sr311v2-07sr211v2 Grid-M 12km
SR3-SR2:



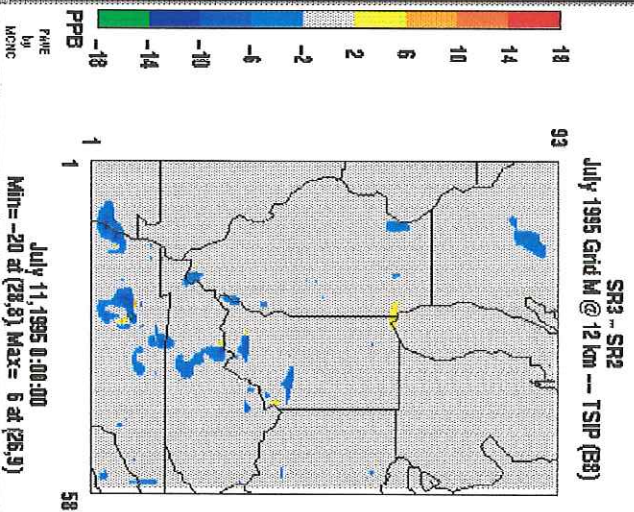
Max 1-Hour Ozone Difference



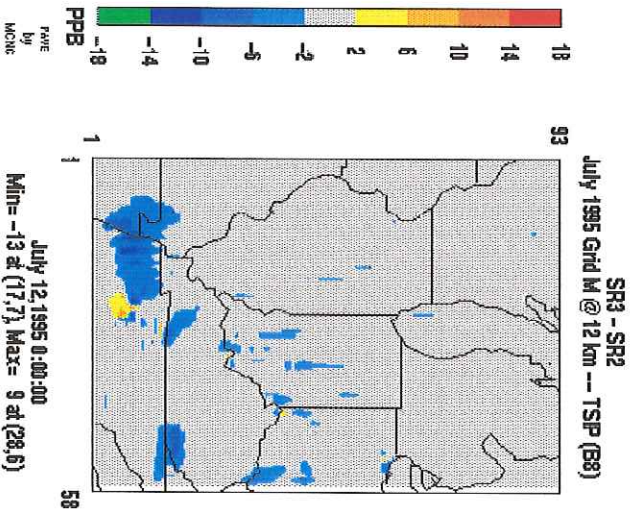
Max 1-Hour Ozone Difference



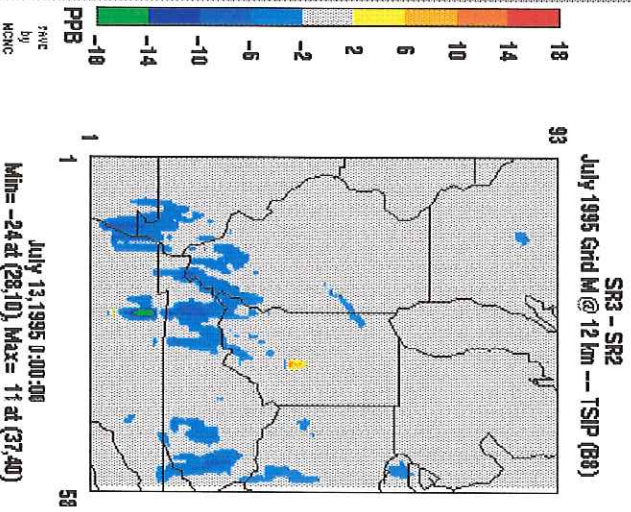
Max 1-Hour Ozone Difference



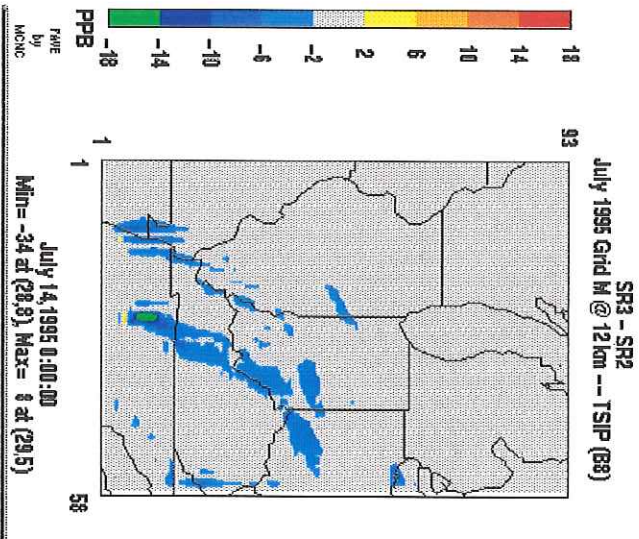
Max 1-Hour Ozone Difference



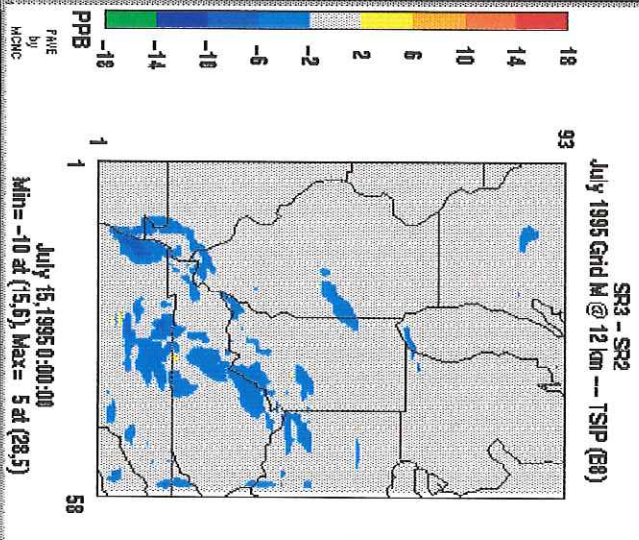
Max 1-Hour Ozone Difference



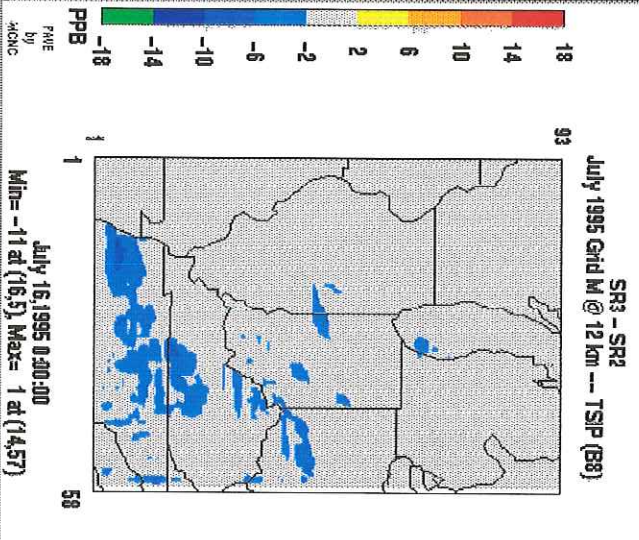
Max 1-Hour Ozone Difference



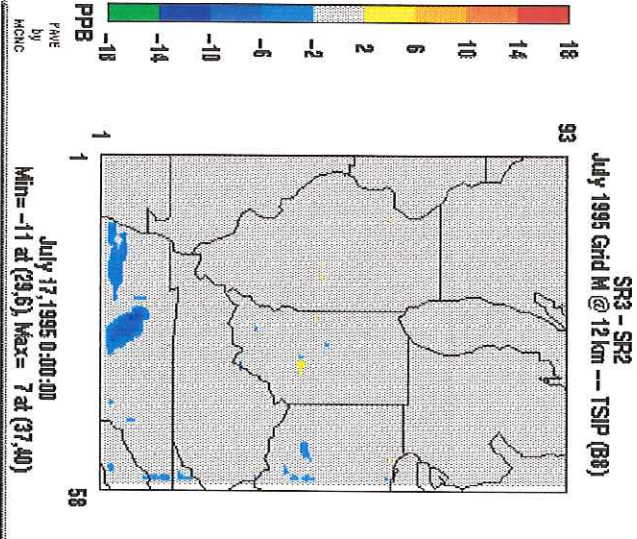
Max 1-Hour Ozone Difference



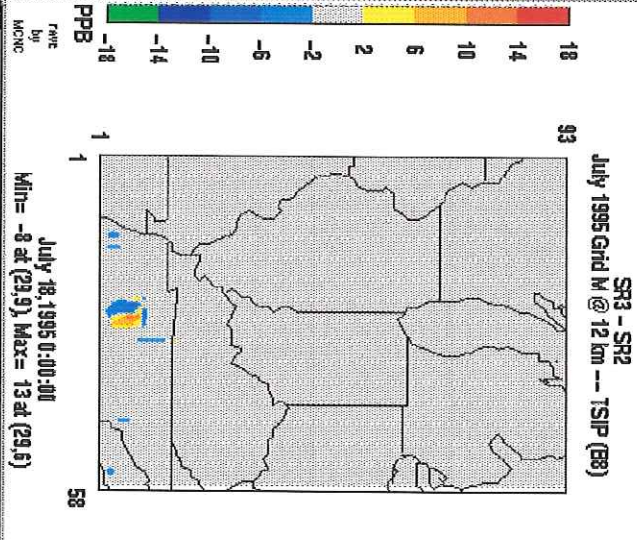
Max 1-Hour Ozone Difference



Max 1-Hour Ozone Difference



Max 1-Hour Ozone Difference



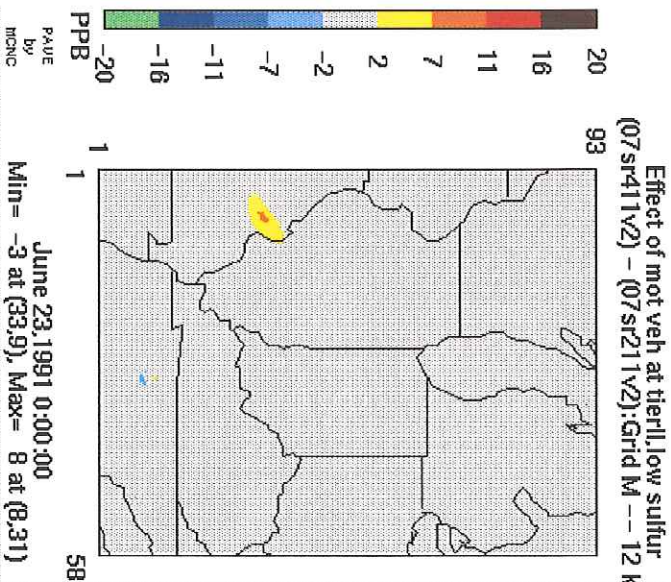
Effect of Tier III/Low S Program

SR4 - SR2

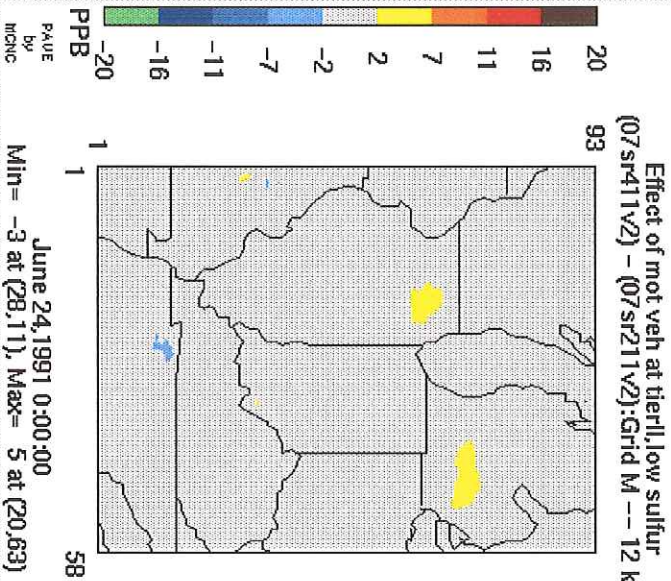
(- 100 TPD VOC

- 700 TPD NOX)

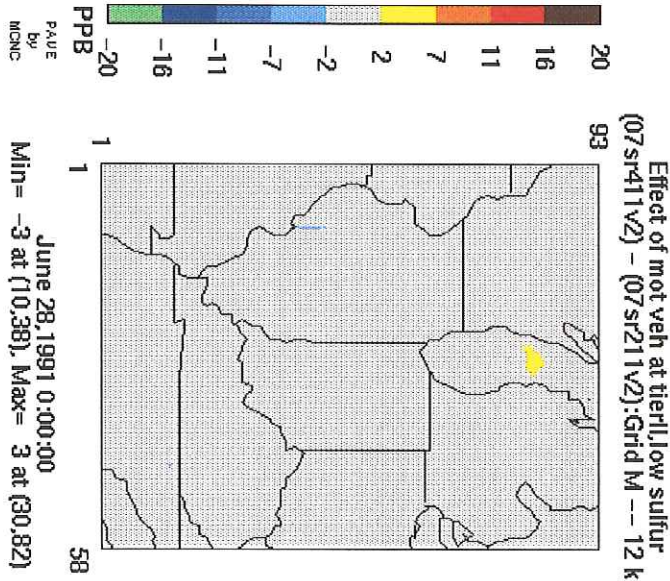
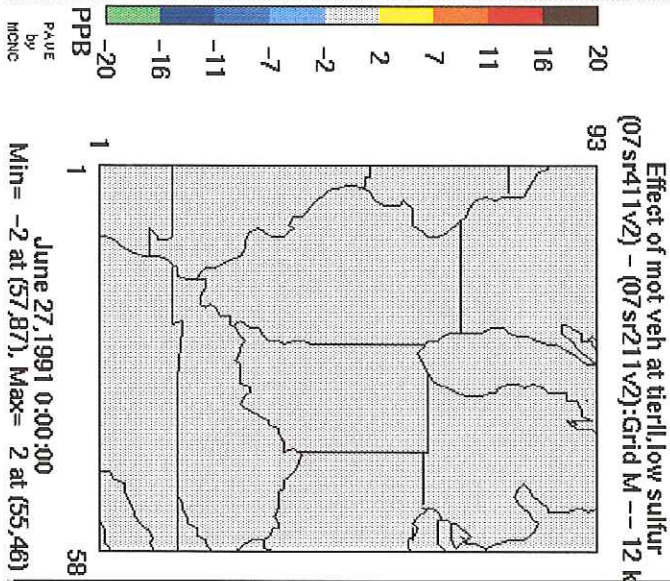
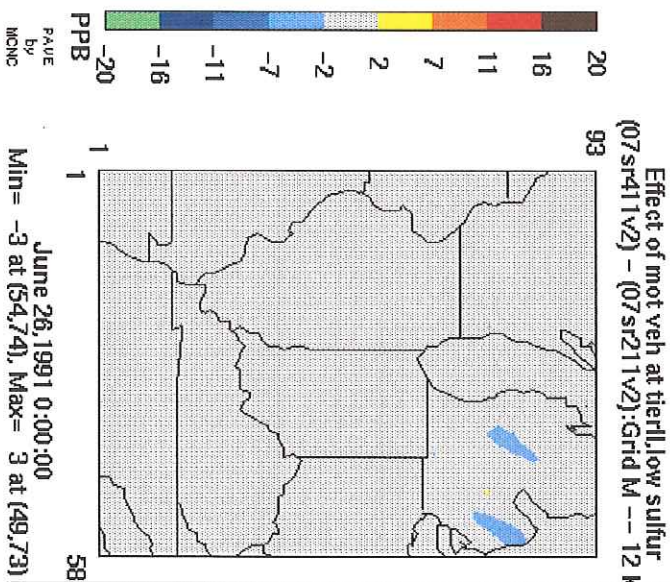
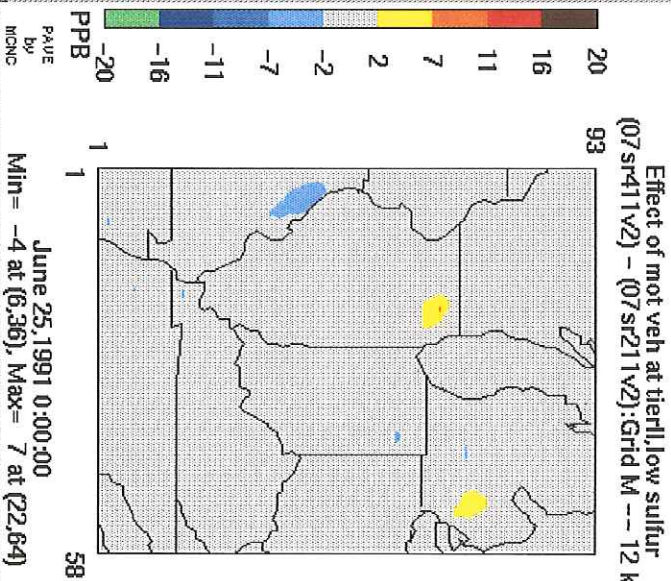
Ozone Difference Plot



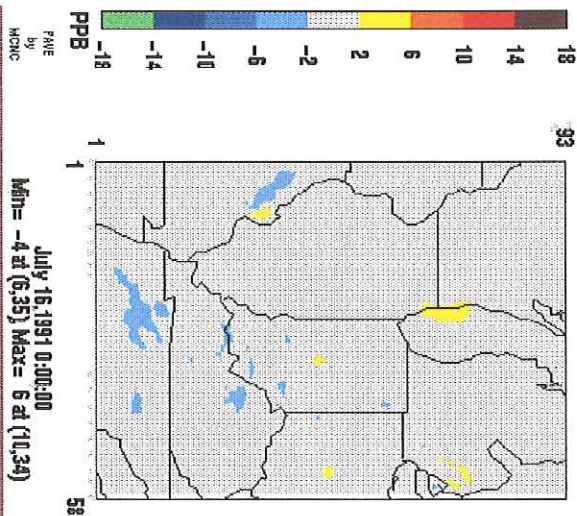
Ozone Difference Plot



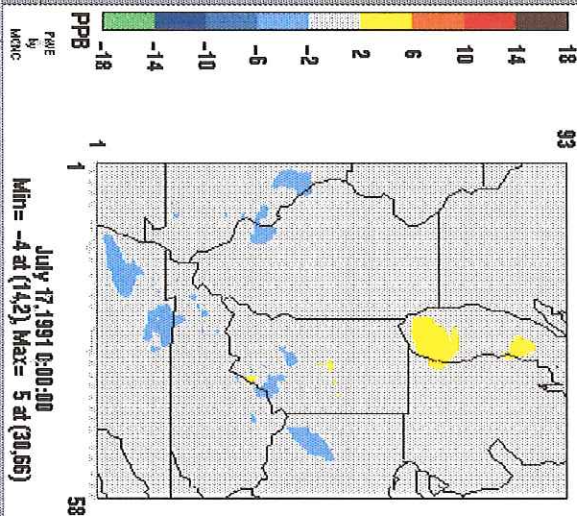
Ozone Difference Plot



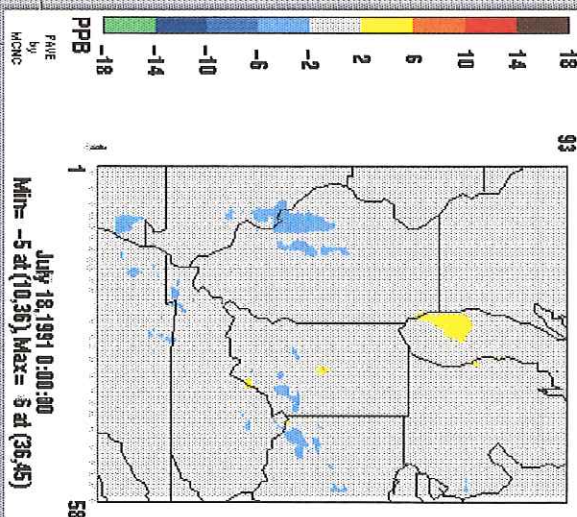
Peak 1-Hour Ozone Difference



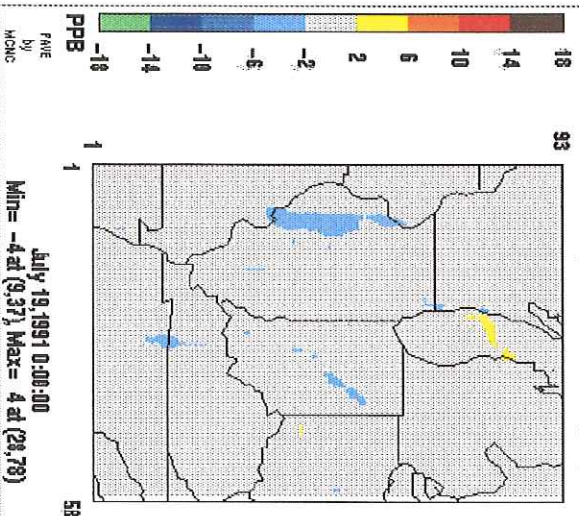
Peak 1-Hour Ozone Difference



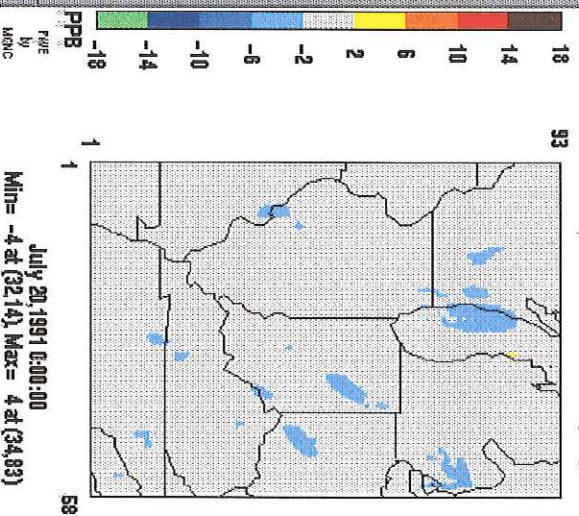
Peak 1-Hour Ozone Difference



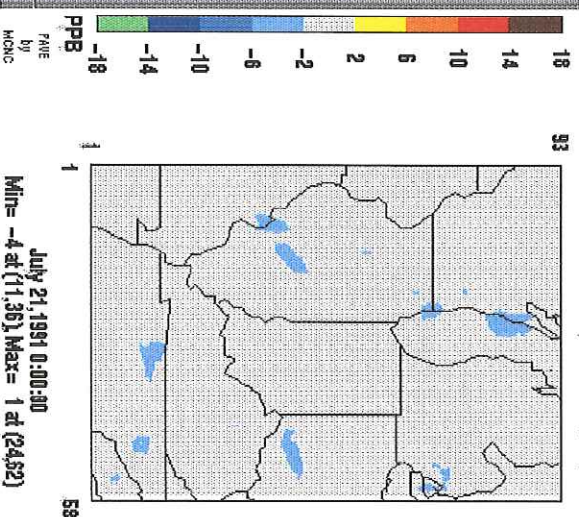
Peak 1-Hour Ozone Difference



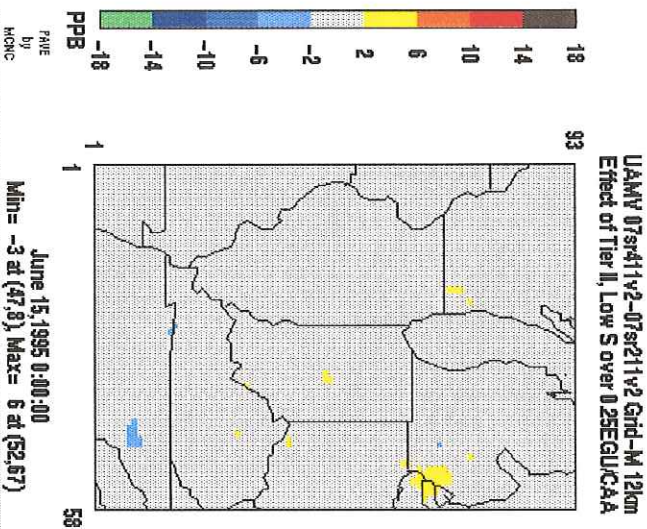
Peak 1-Hour Ozone Difference



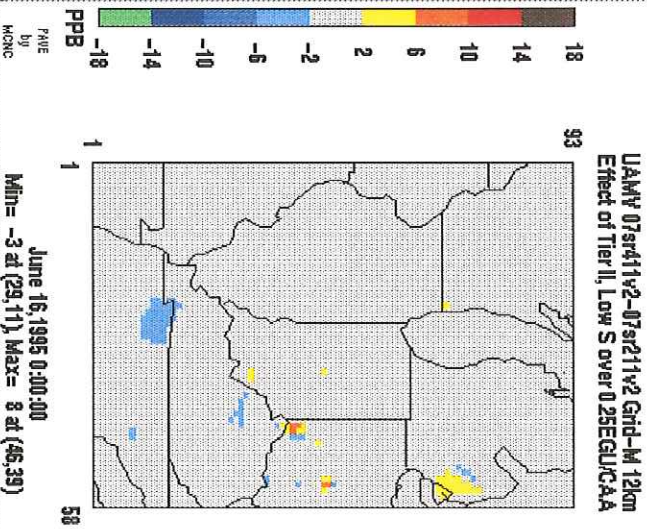
Peak 1-Hour Ozone Difference



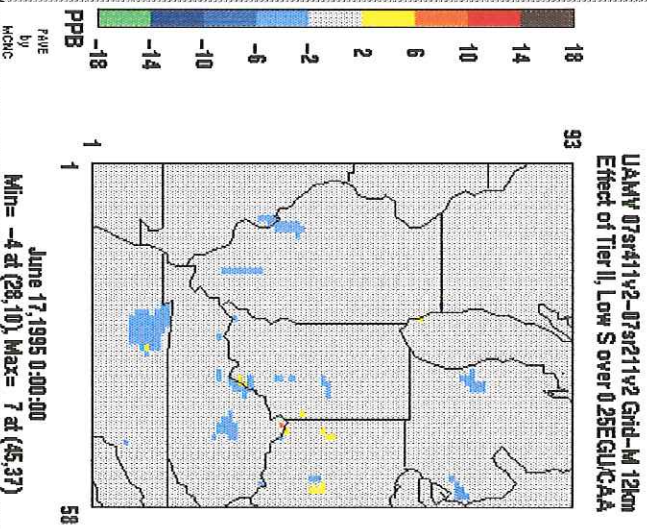
Ozone Difference Plot



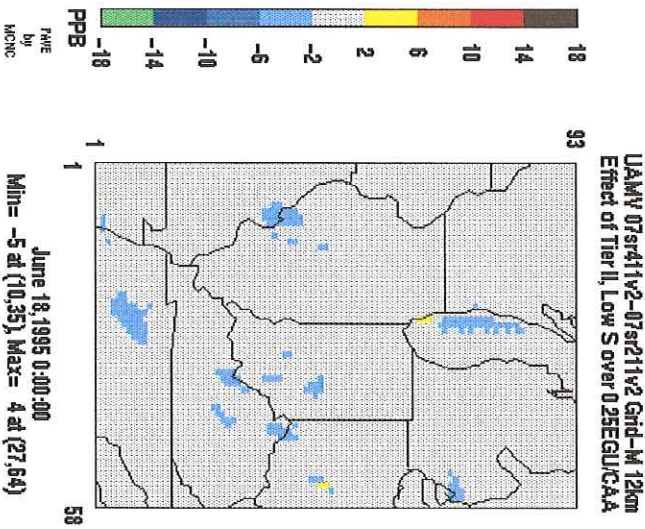
Ozone Difference Plot



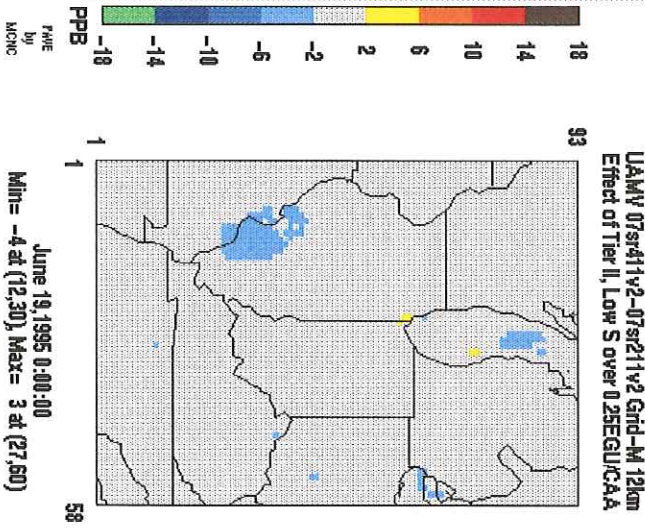
Ozone Difference Plot



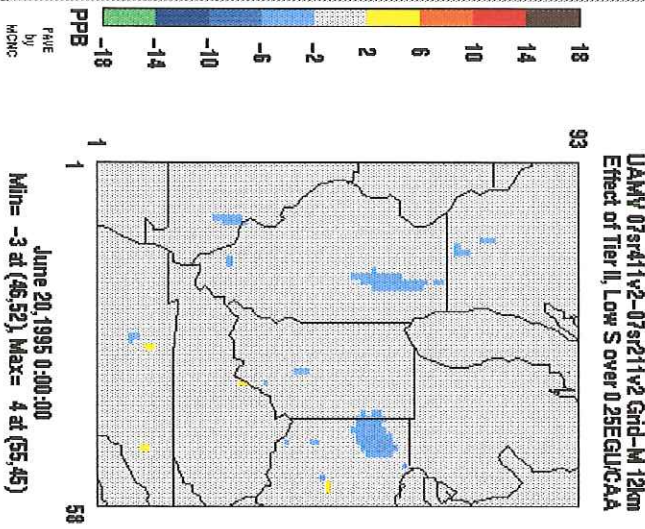
Ozone Difference Plot



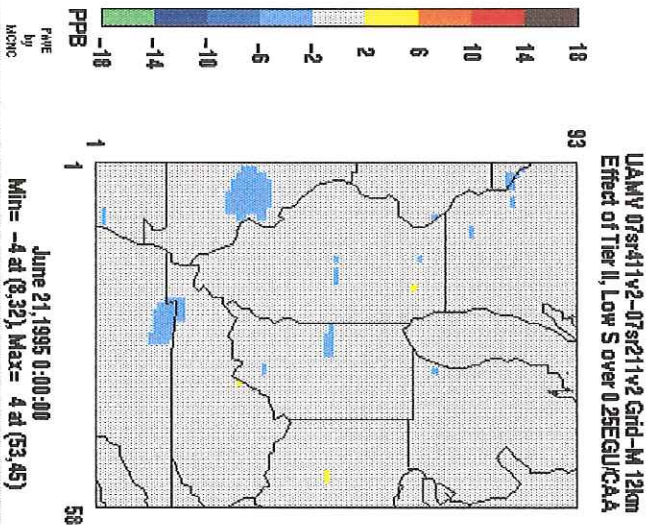
Ozone Difference Plot



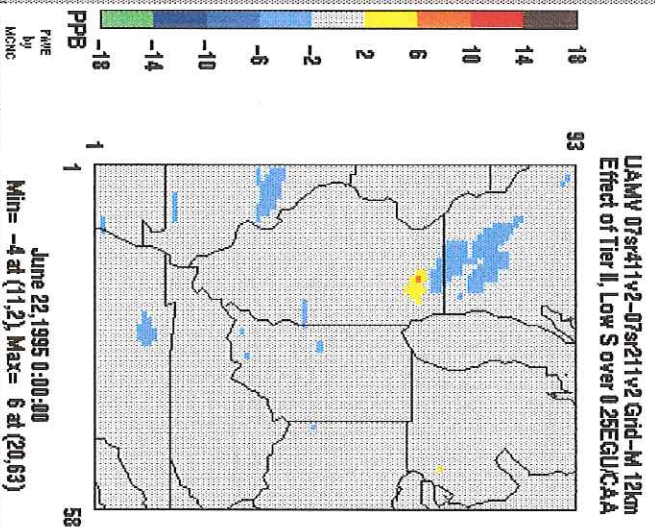
Ozone Difference Plot



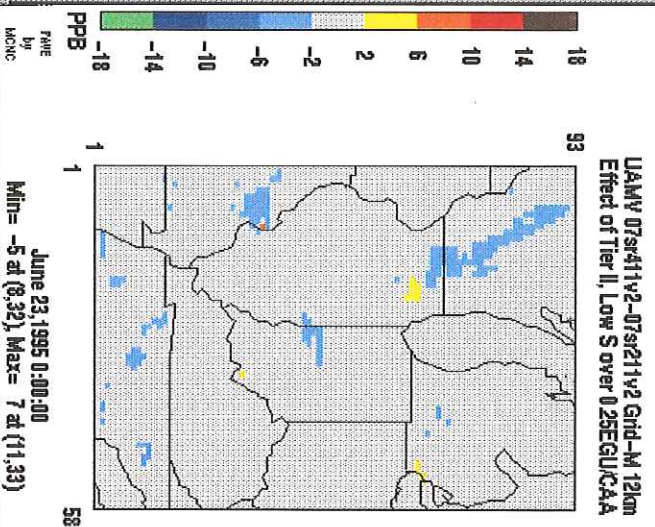
Ozone Difference Plot



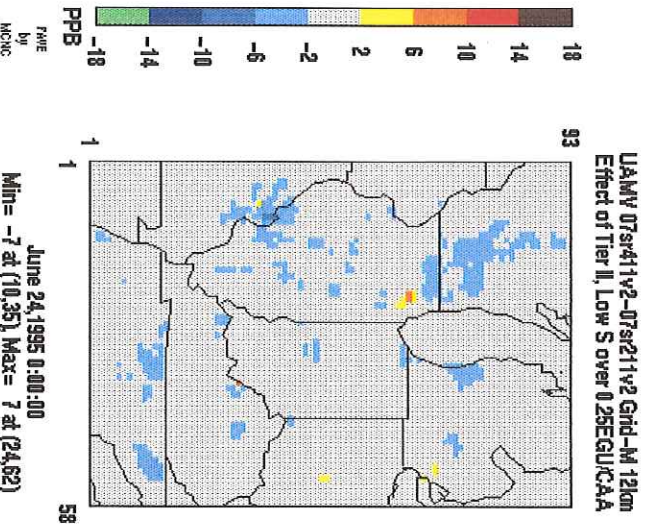
Ozone Difference Plot



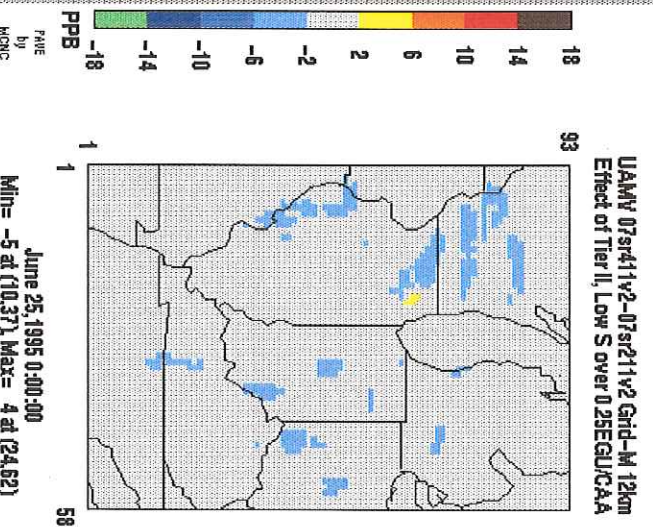
Ozone Difference Plot



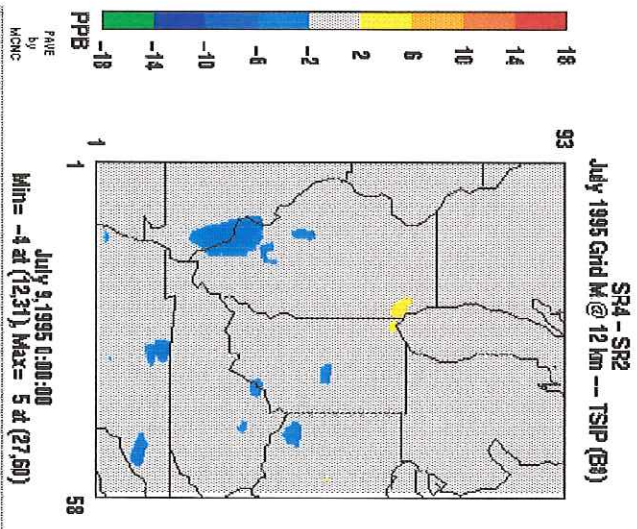
Ozone Difference Plot



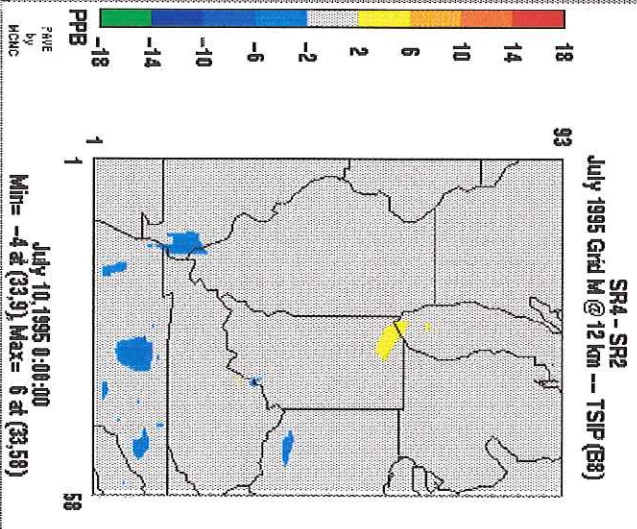
Ozone Difference Plot



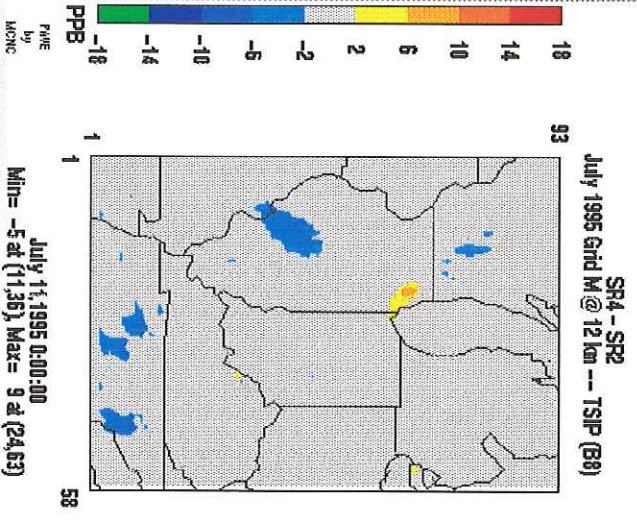
Max 1-Hour Ozone Difference



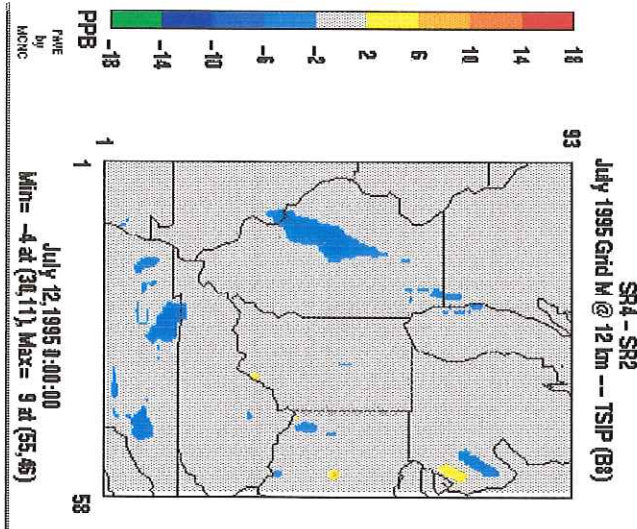
Max 1-Hour Ozone Difference



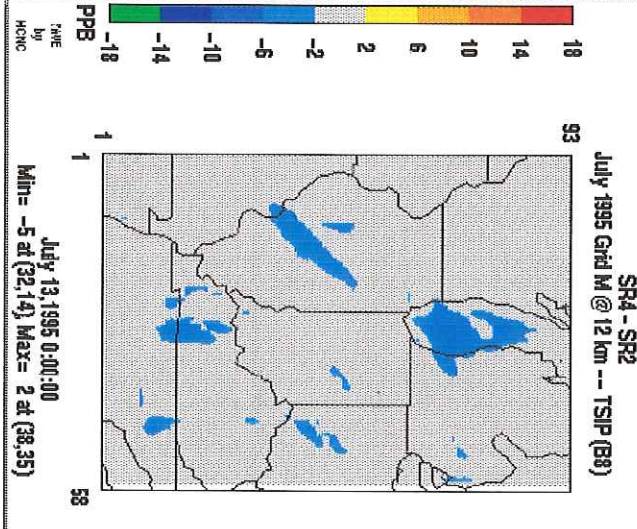
Max 1-Hour Ozone Difference



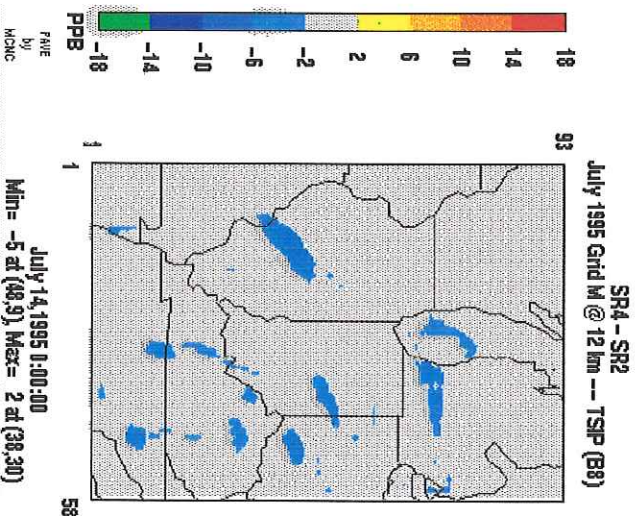
Max 1-Hour Ozone Difference



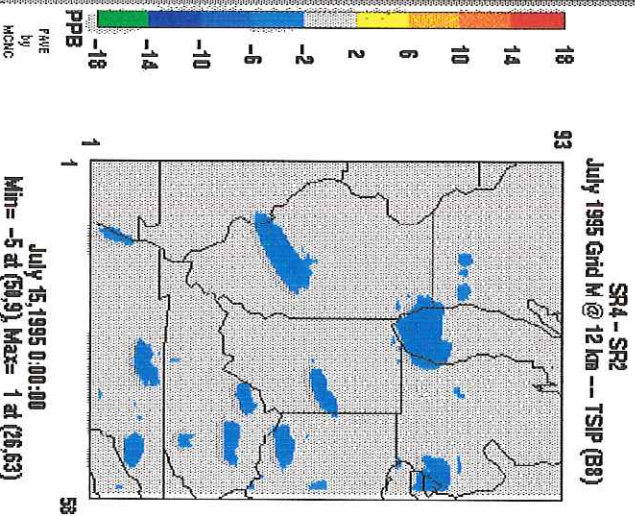
Max 1-Hour Ozone Difference



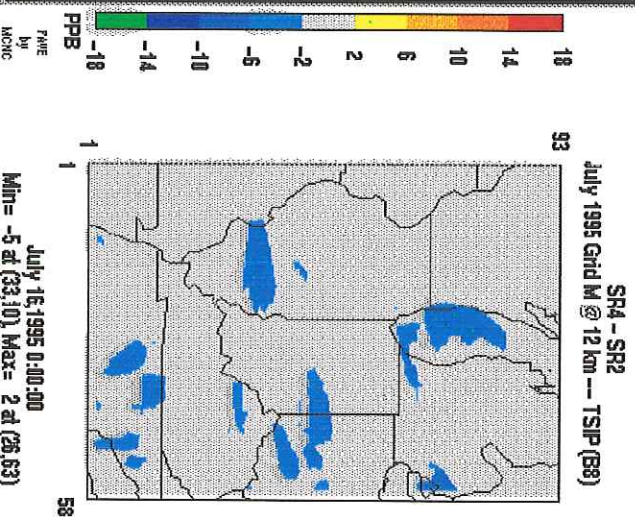
Max 1-Hour Ozone Difference



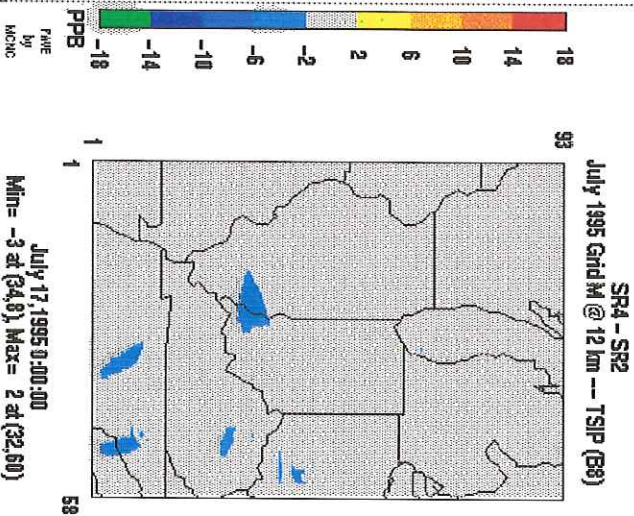
Max 1-Hour Ozone Difference



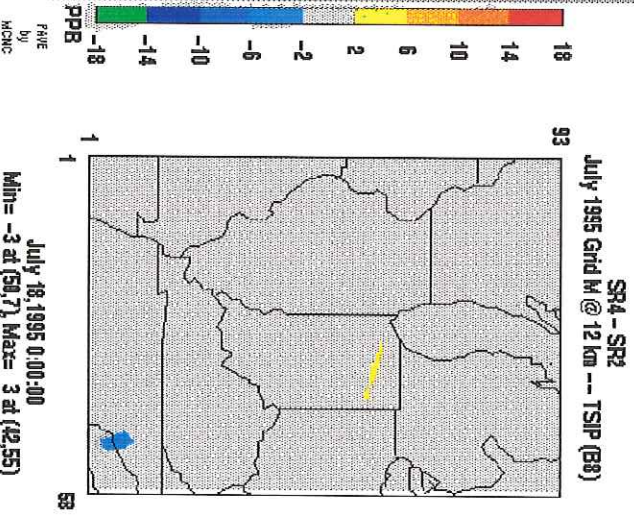
Max 1-Hour Ozone Difference



Max 1-Hour Ozone Difference



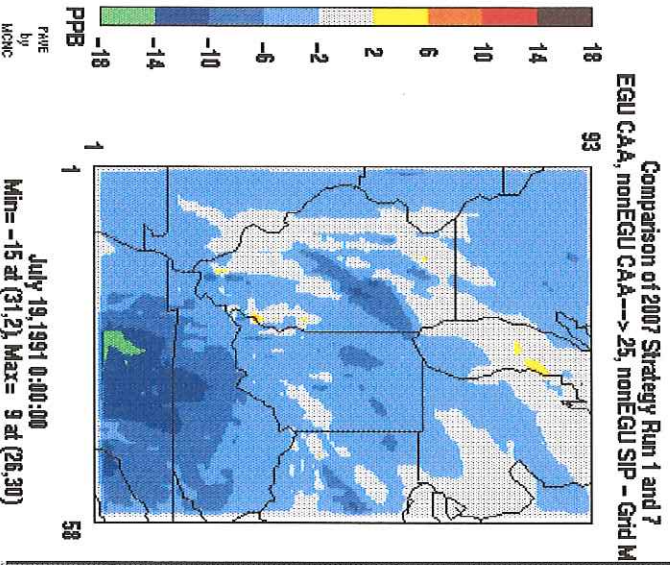
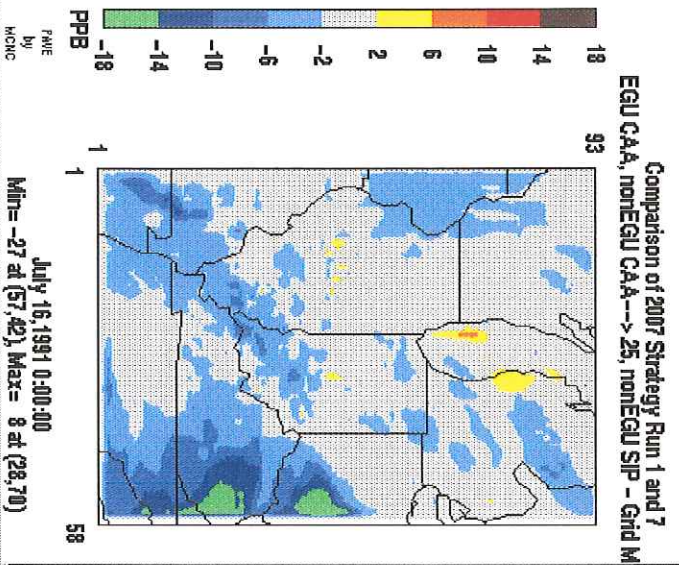
Max 1-Hour Ozone Difference



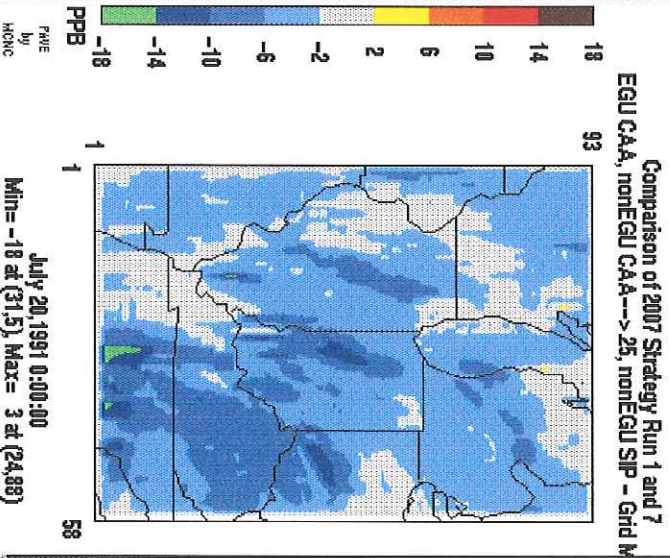
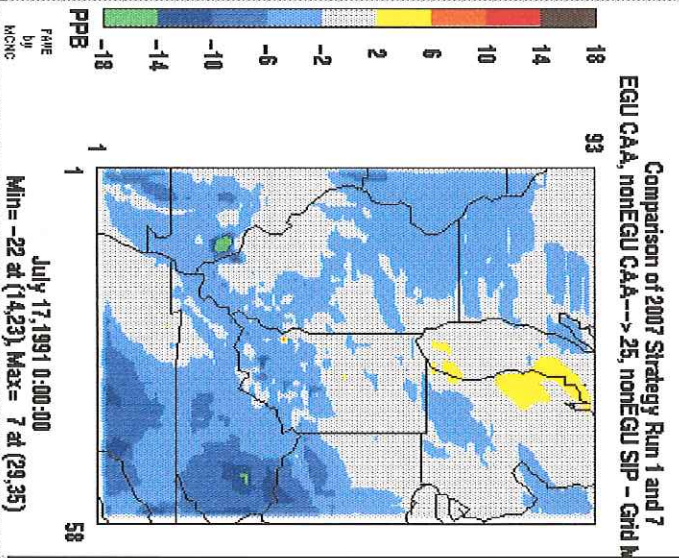
Effect of 0.25EGU and SIP Call Non-EGU in LADCO States

SR1 - SR7 (-1440 TPD NOx)

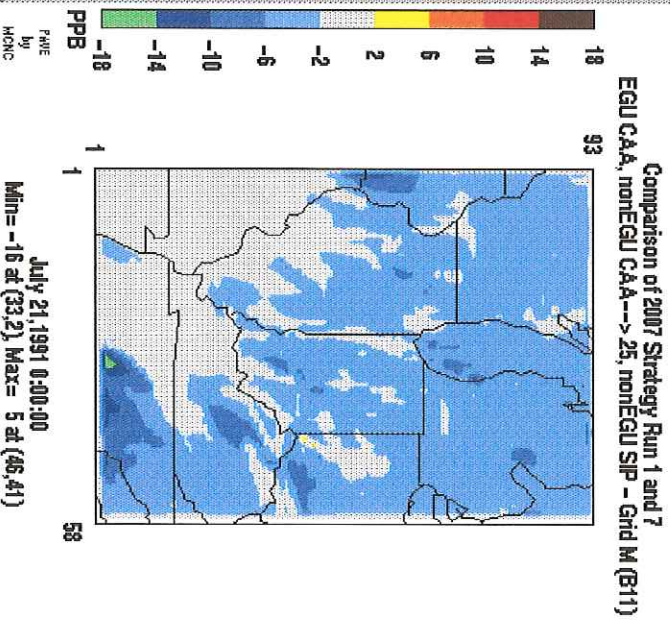
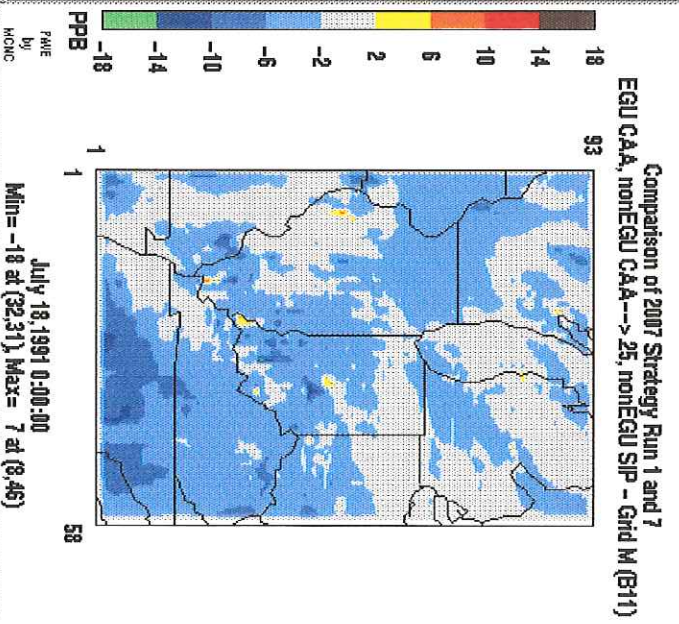
Peak 1-Hour Ozone Difference



Peak 1-Hour Ozone Difference

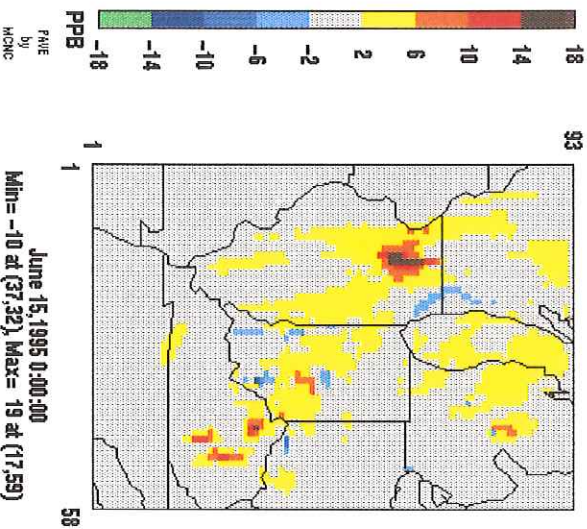


Peak 1-Hour Ozone Difference



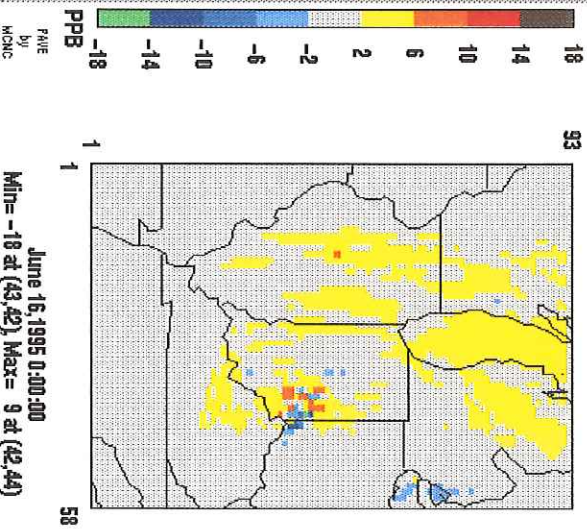
Ozone Difference Plot

UAMV 07caat1v2-07sr71v2 Grid-M 12km
Effect of 0.25 EGU in LM over CAA in GM



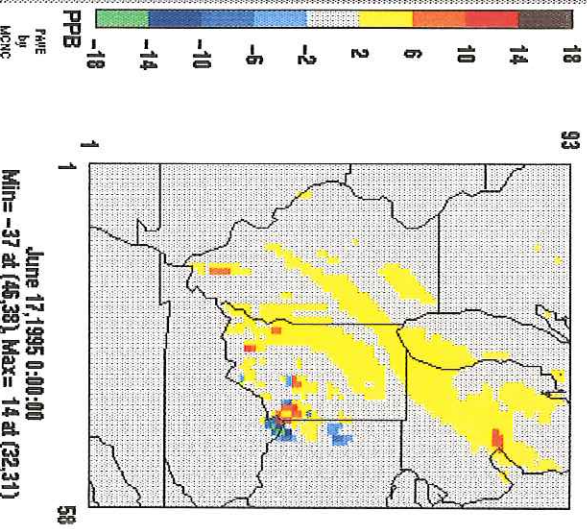
Ozone Difference Plot

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Effect of 0.25 EGU in LM over CAA in GM



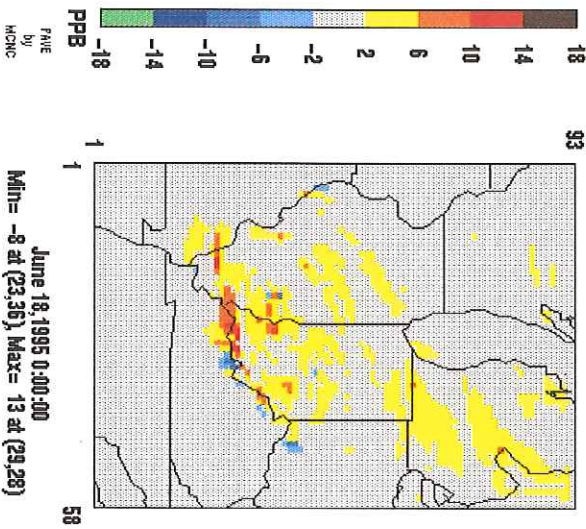
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Effect of 0.25 EGU in LM over CAA in GM



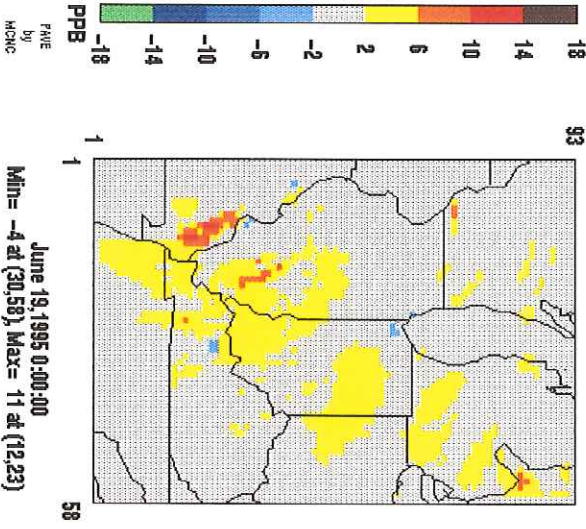
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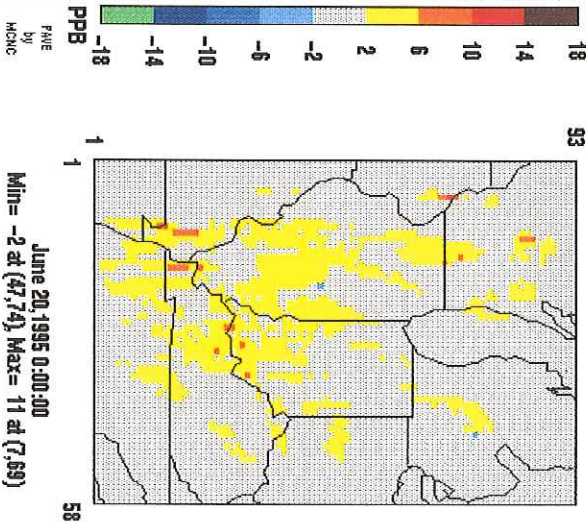
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Effect of 0.25 EGU in LM over CAA in GM

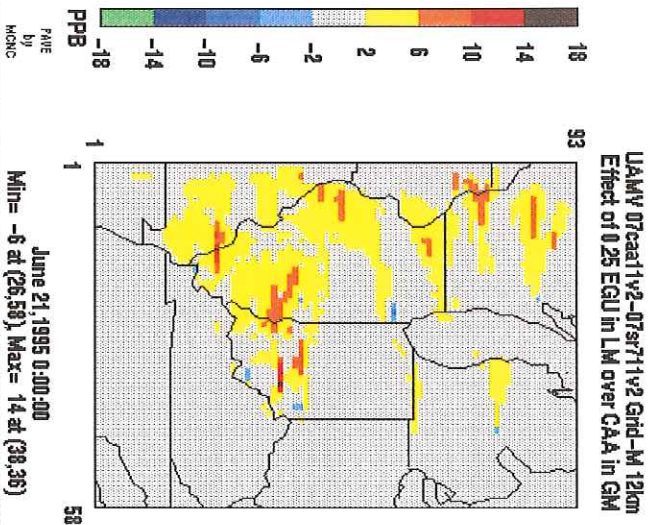


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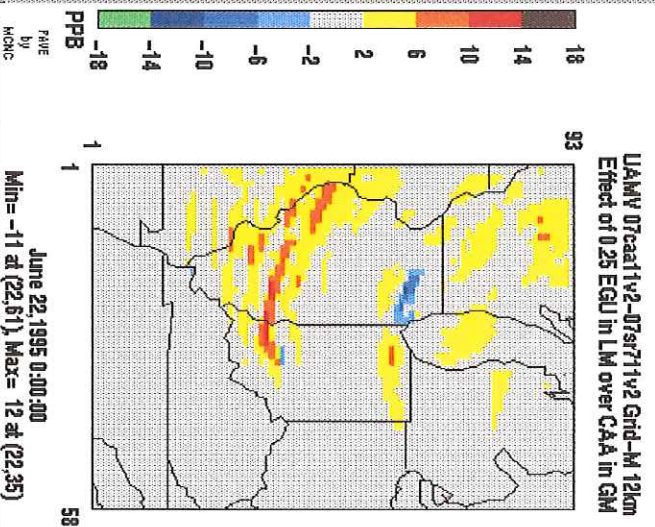
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Effect of 0.25 EGU in LM over CAA in GM



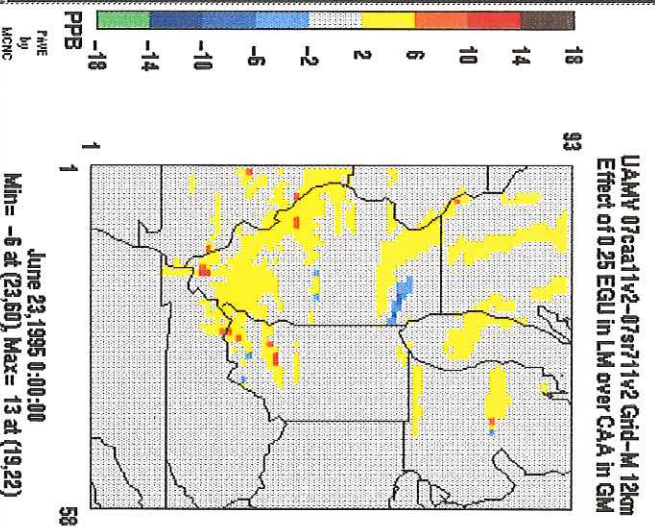
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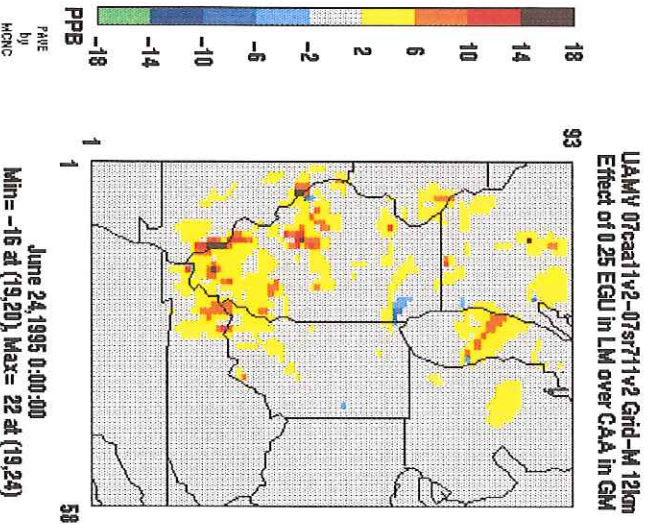
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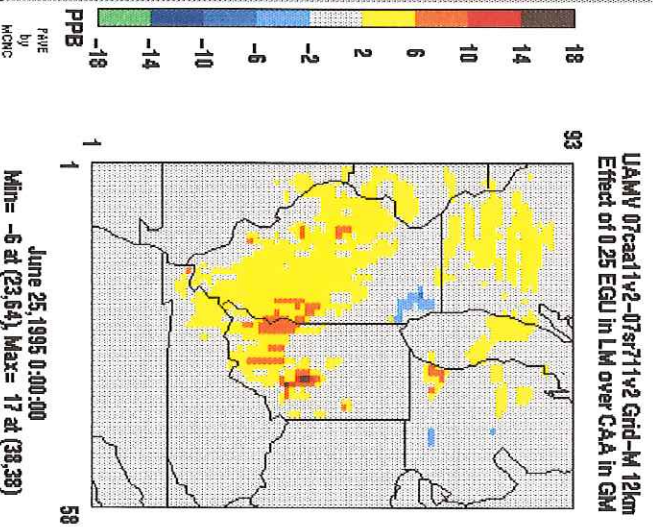
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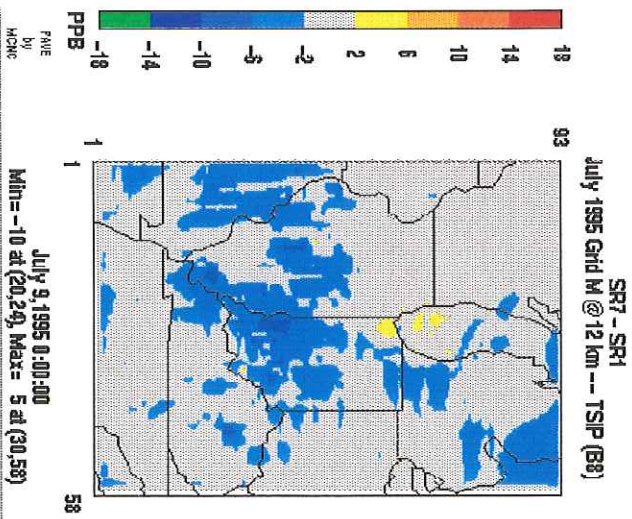
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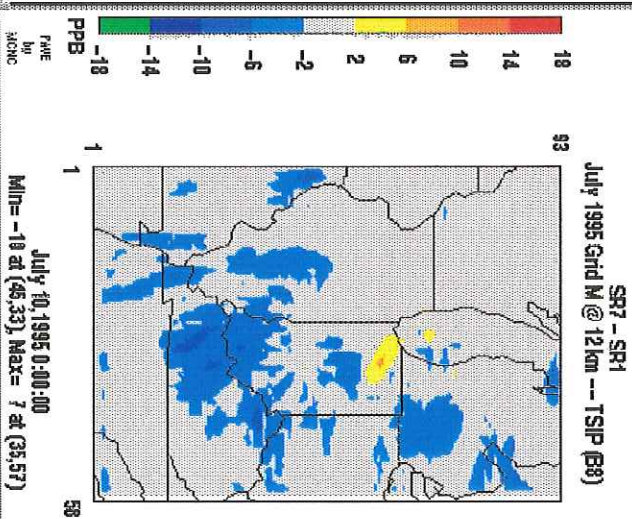
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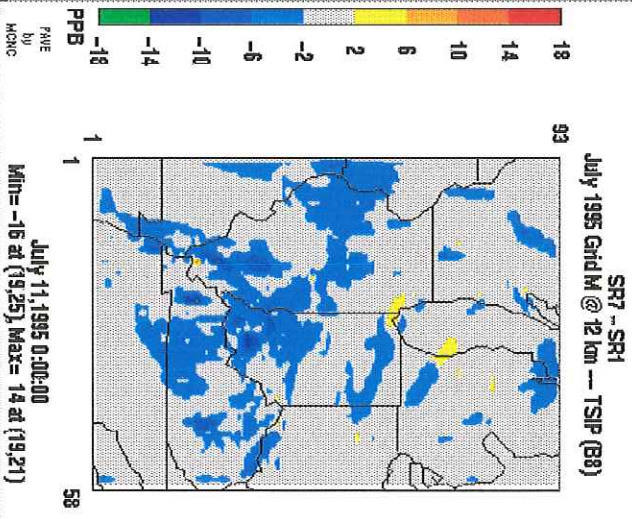
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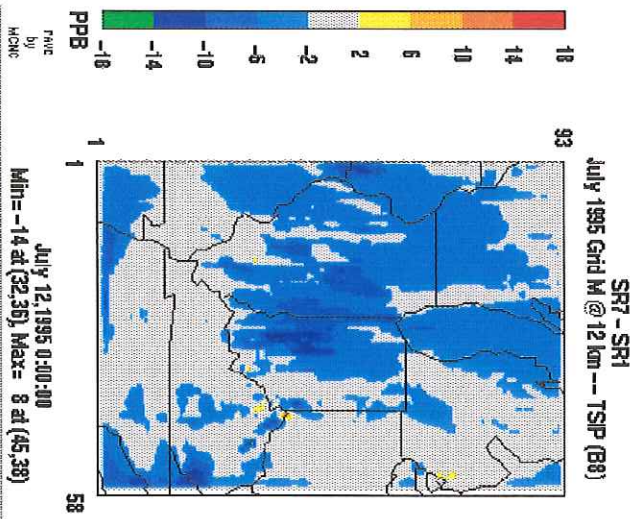
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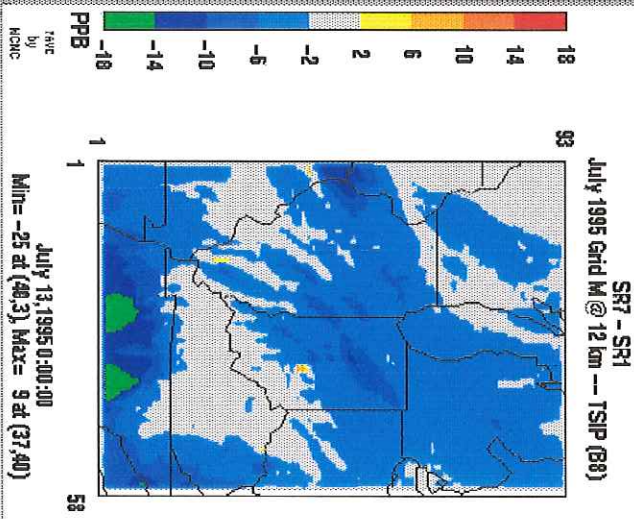
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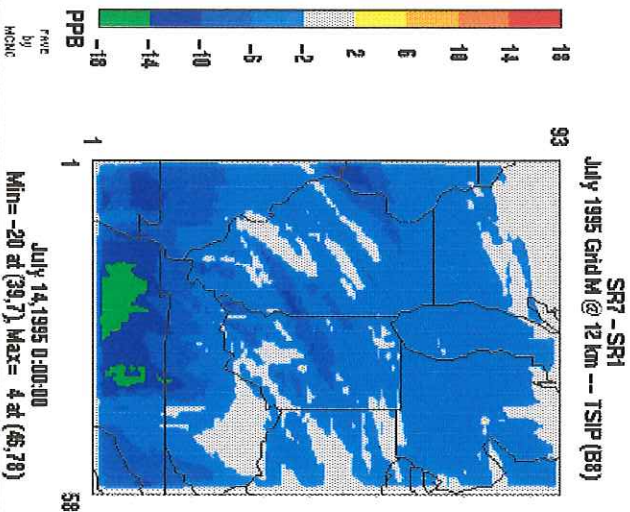
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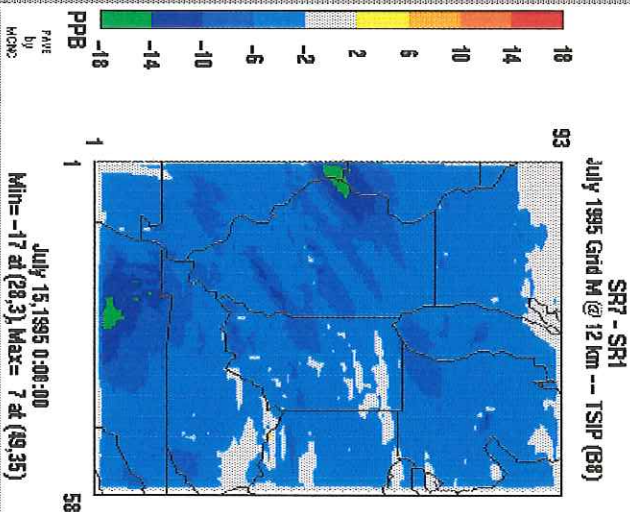
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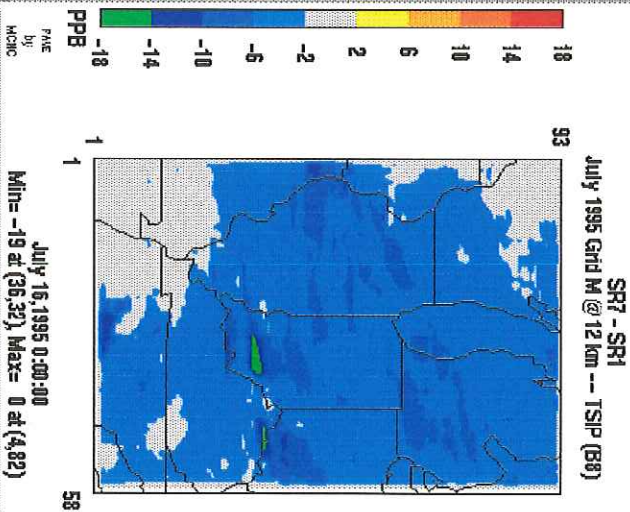
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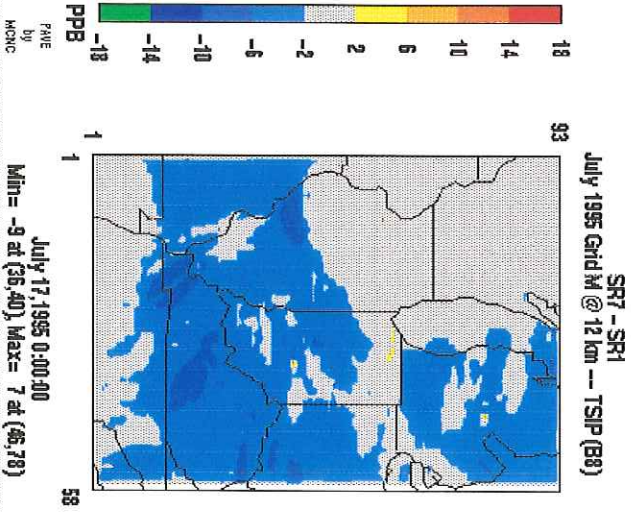
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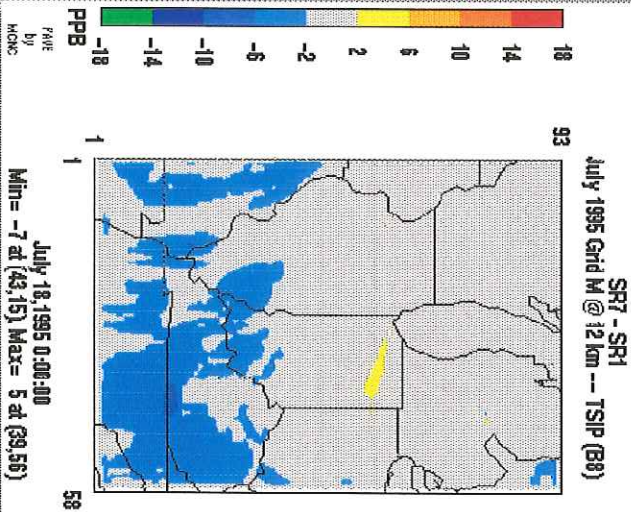
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Max 1-Hour Ozone Difference



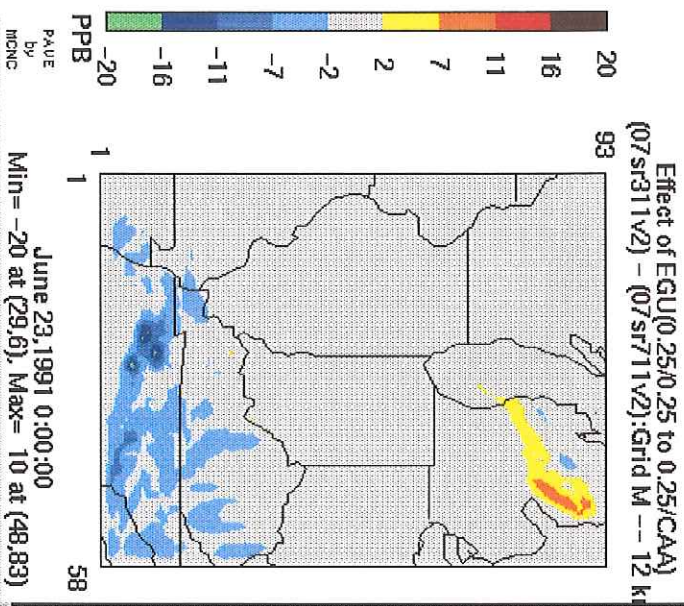
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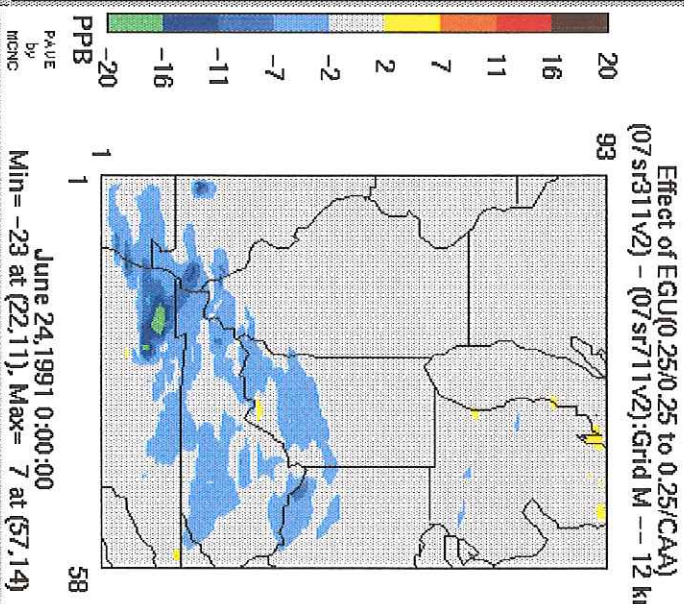
**Effect of 0.25EGU and SIP Call Non-
EGU Outside LADCO States**

SR3 - SR7 (-1240 TPD NOx)

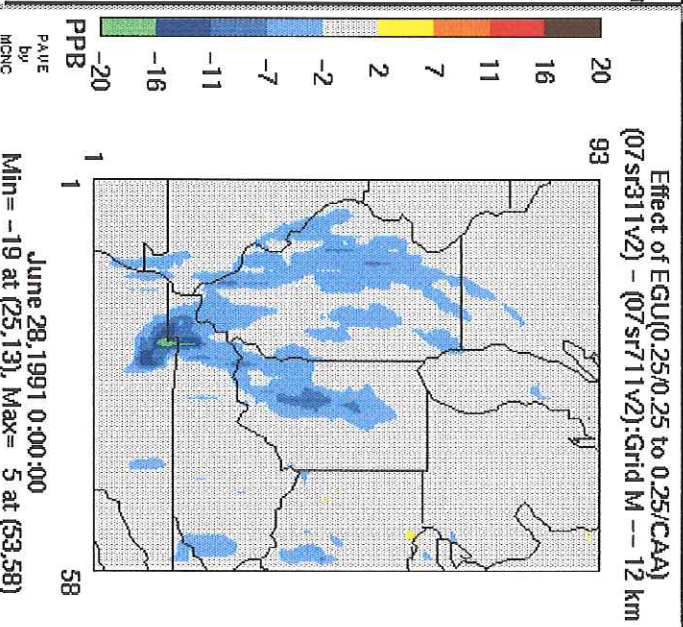
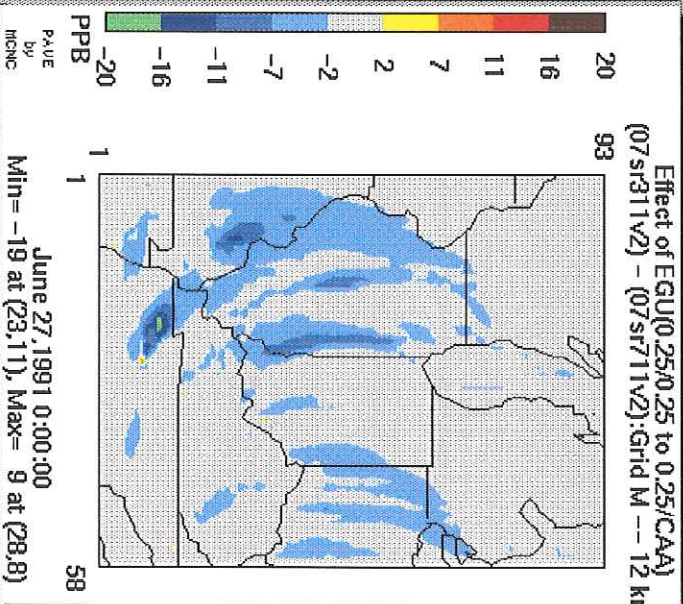
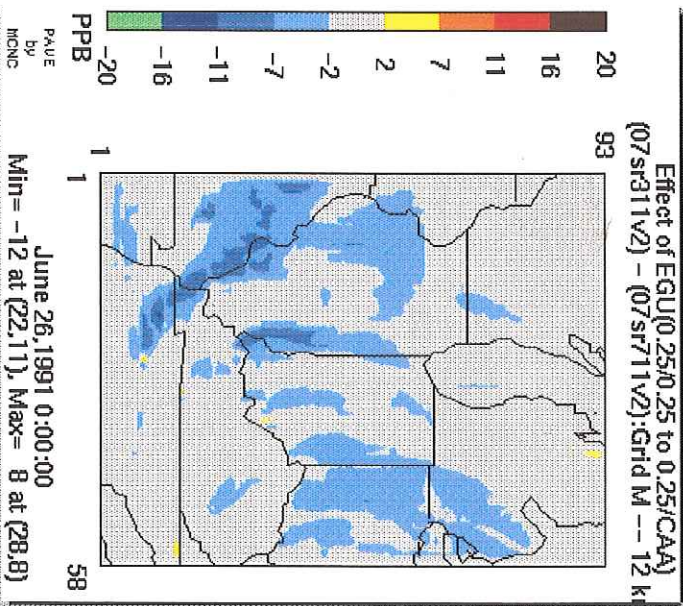
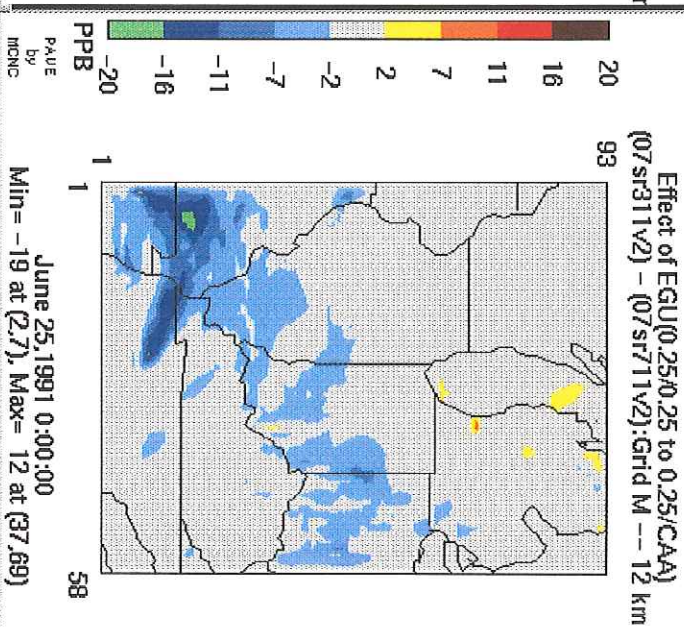
Ozone Difference Plot



Ozone Difference Plot

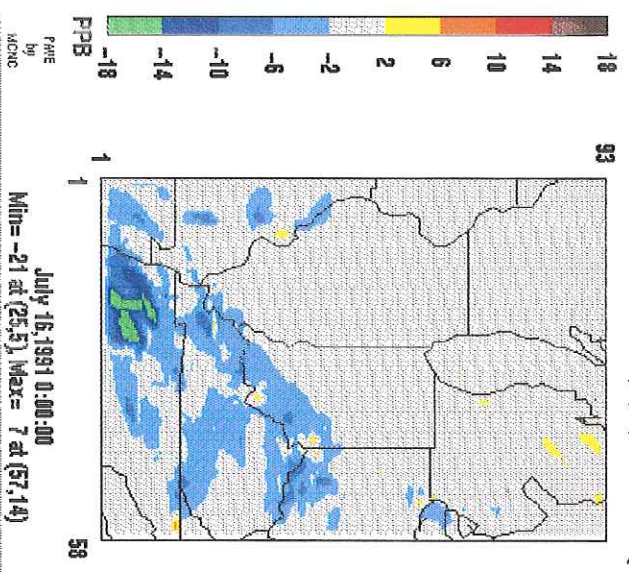


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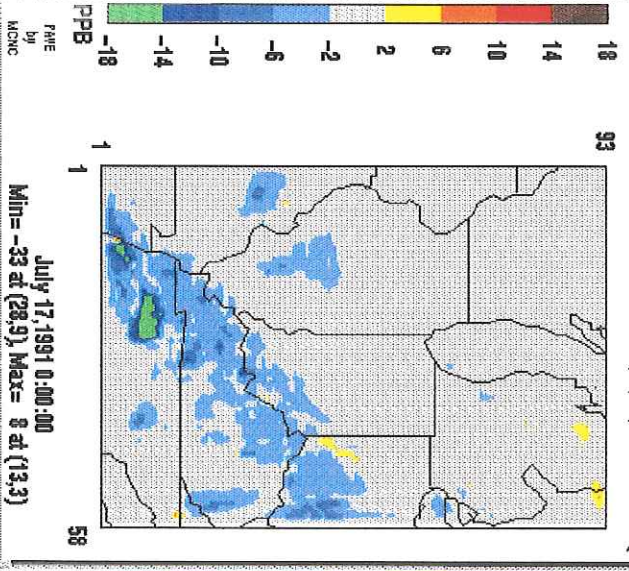
Peak 1-Hour Ozone Difference

Comparison of 2007 Strategy Run 3 and 7
EGU 25 Grid M-->EGU 25 IL,IN,WI, etc - Grid M (B



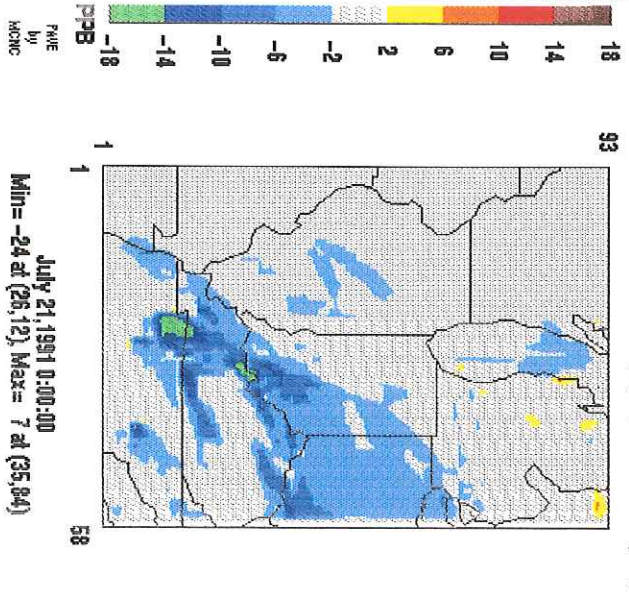
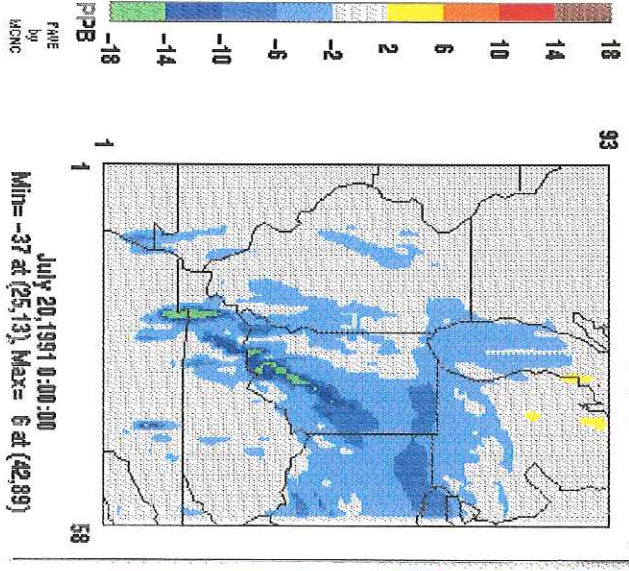
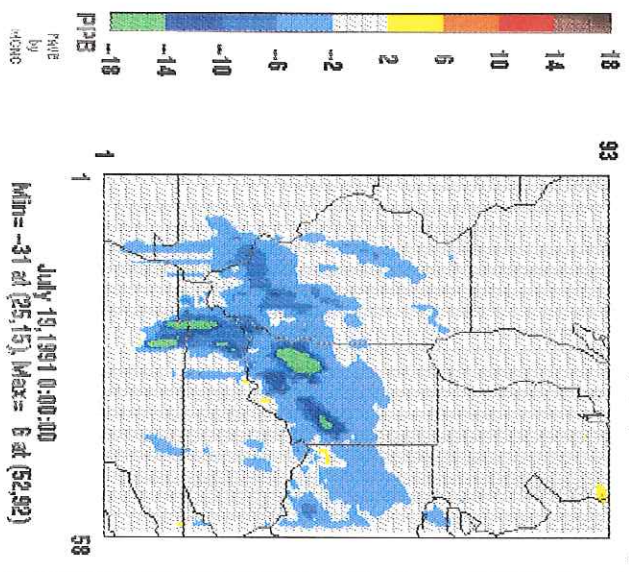
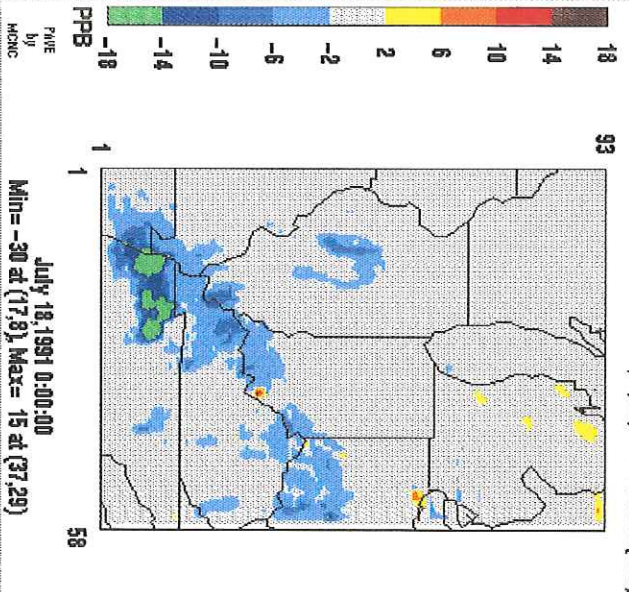
Peak 1-Hour Ozone Difference

Comparison of 2007 Strategy Run 3 and 7
EGU 25 Grid M-->EGU 25 IL,IN,WI, etc - Grid M (B



Peak 1-Hour Ozone Difference

Comparison of 2007 Strategy Run 3 and 7
EGU 25 Grid M-->EGU 25 IL,IN,WI, etc - Grid M (B11)



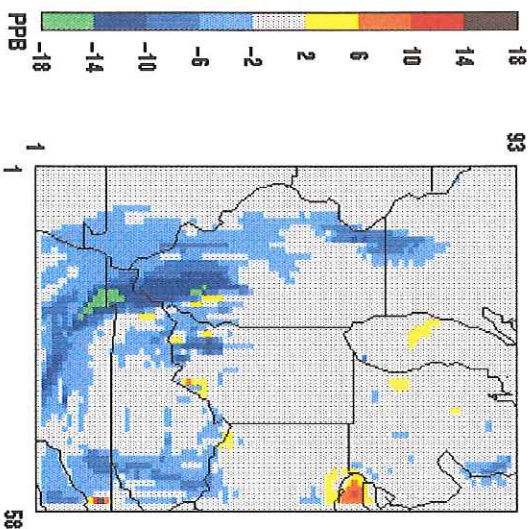
Comparison of 2007 Strategy Run 3 and 7
EGU 25 Grid M-->EGU 25 IL,IN,WI, etc - Grid M (B

Comparison of 2007 Strategy Run 3 and 7
EGU 25 Grid M-->EGU 25 IL,IN,WI, etc - Grid M (B

Comparison of 2007 Strategy Run 3 and 7
EGU 25 Grid M-->EGU 25 IL,IN,WI, etc - Grid M (B11)

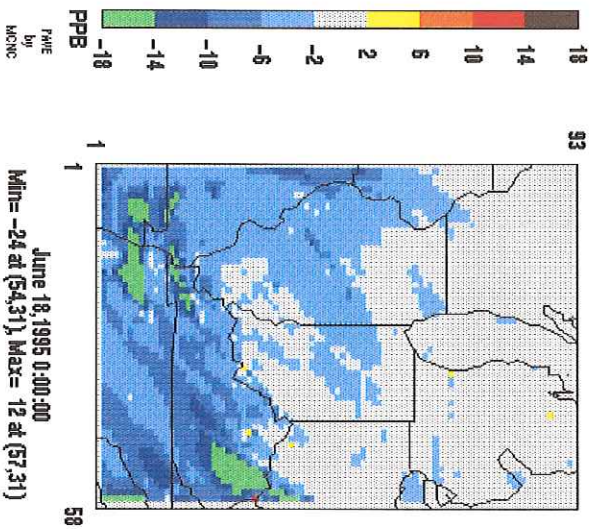
Ozone Difference Plot

UAMV 07sr311v2-07sr711v2 Grid-M 12km
SR3-SR7



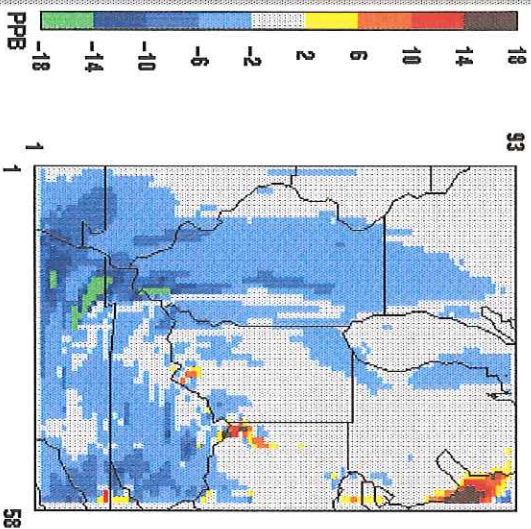
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SR3-SR7



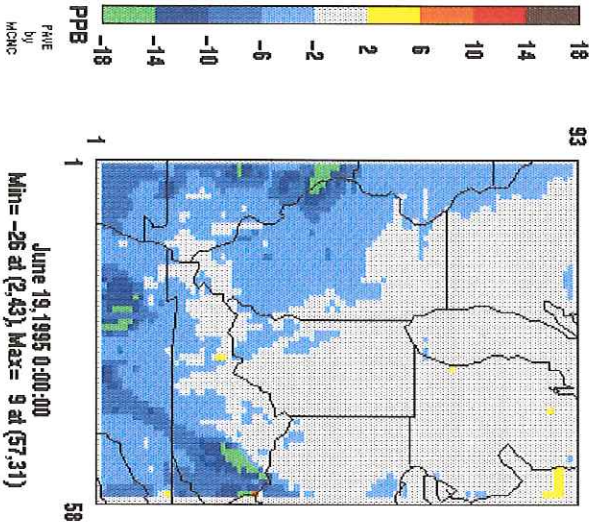
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SR3-SR7



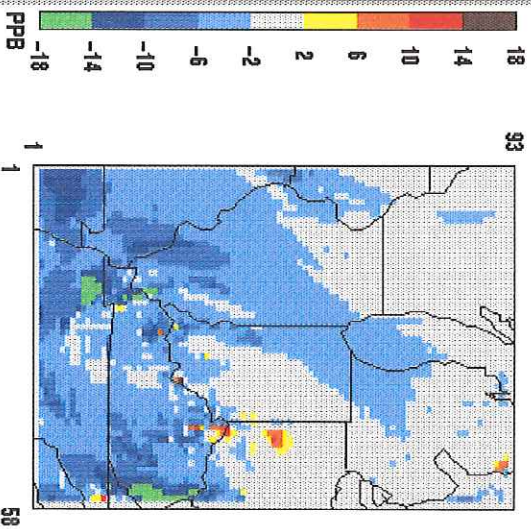
Ozone Difference Plot

UAMV 07sr311v2-07sr711v2 Grid-M 12km
SR3-SR7



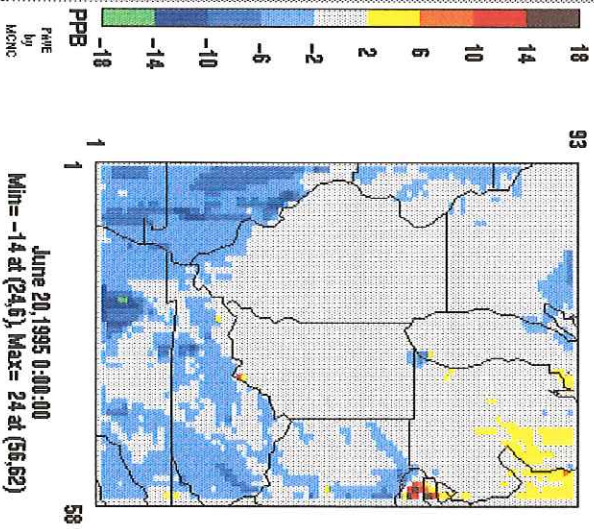
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SR3-SR7



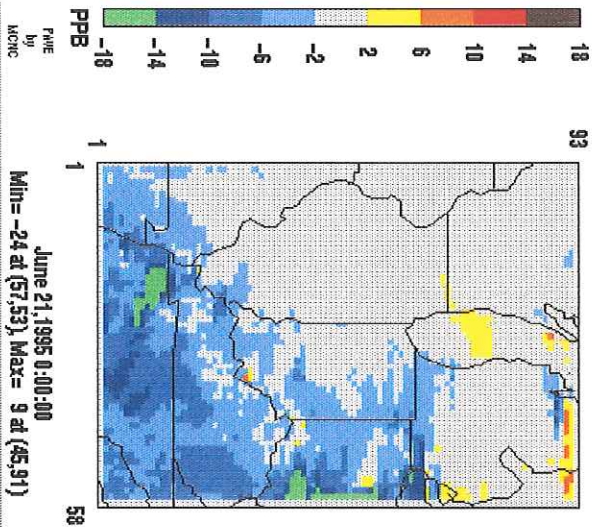
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SR3-SR7



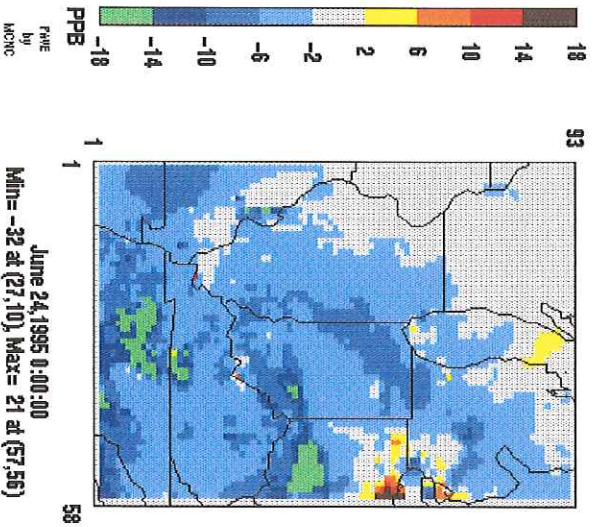
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SR3-SR7



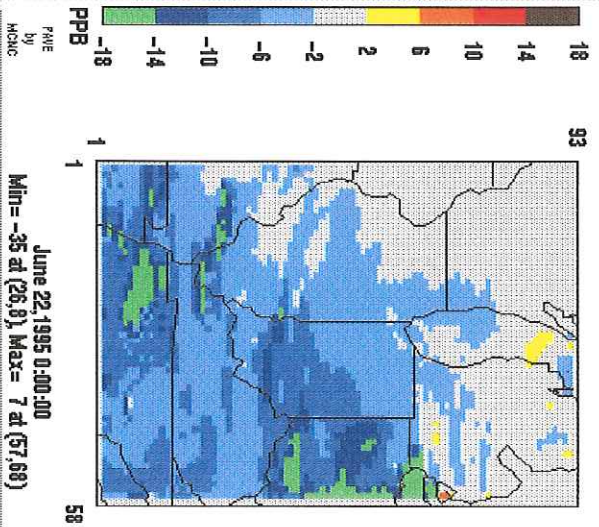
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SR3-SR7



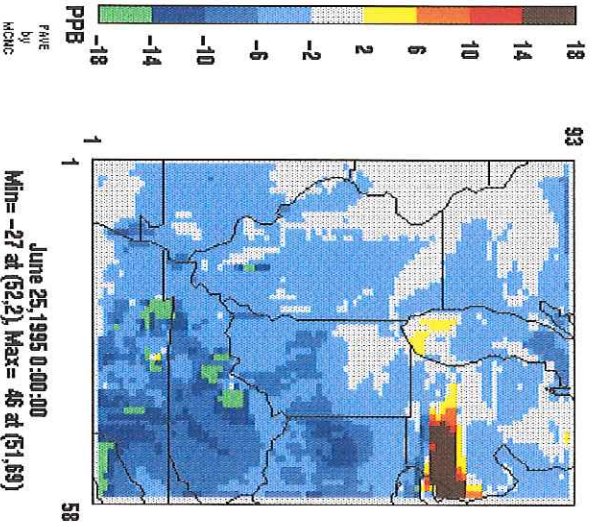
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SR3-SR7



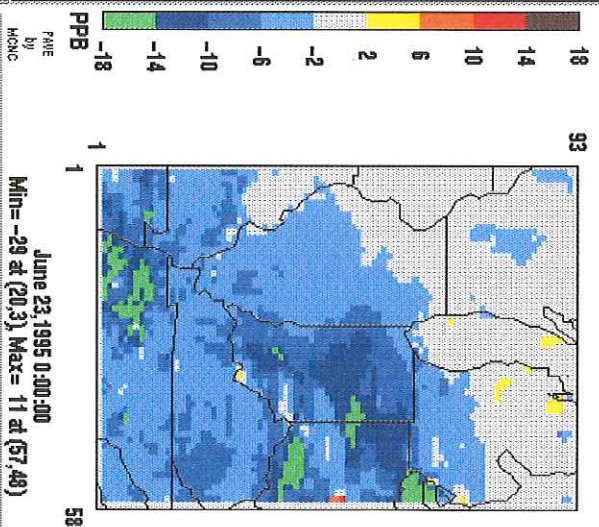
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SR3-SR7

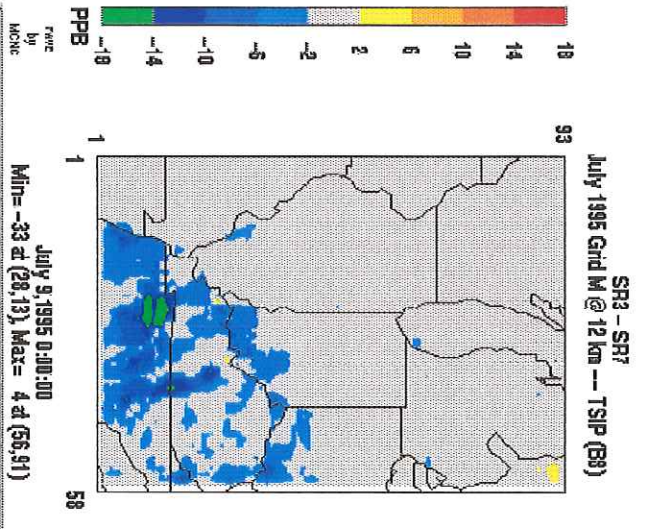


Ozone Difference Plot

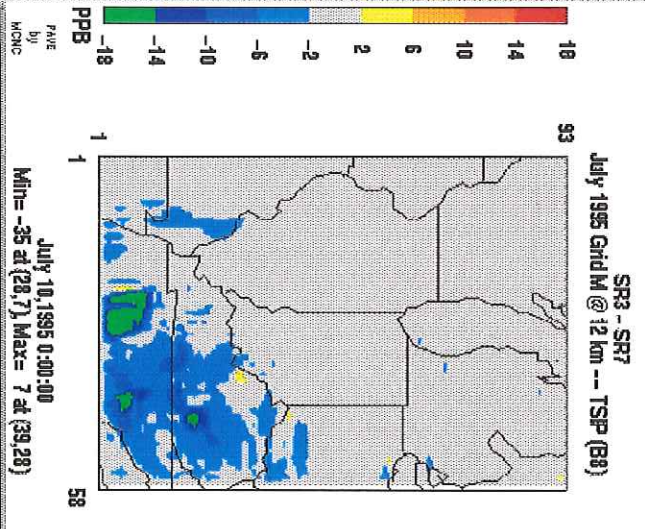
UAMV 07sr311v2-07sr711v2 Grid-M 12km
SR3-SR7



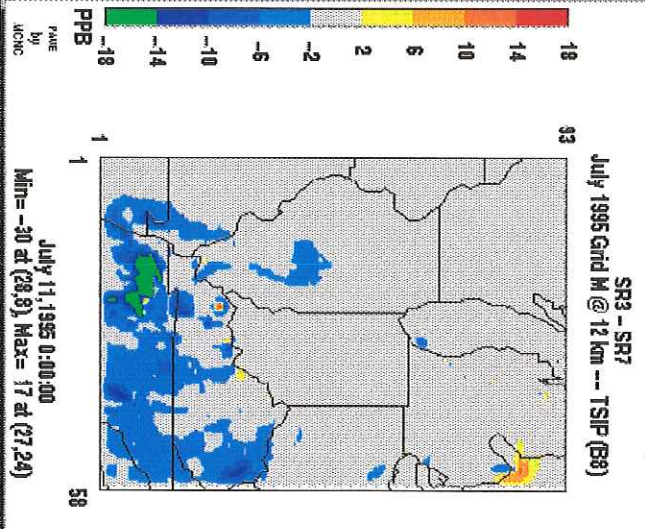
Max 1-Hour Ozone Difference



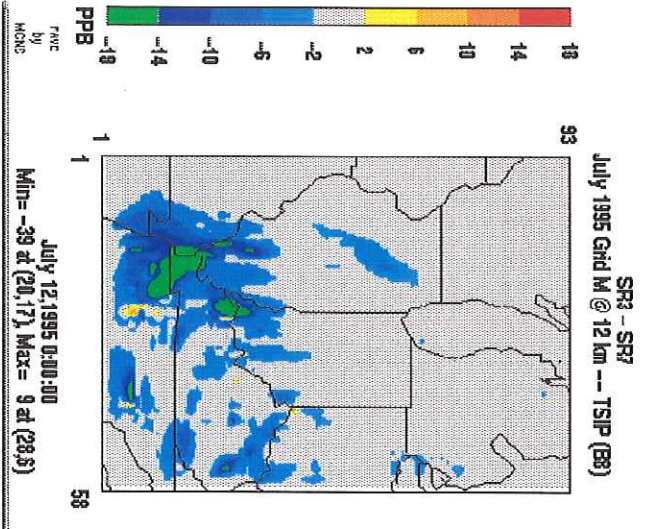
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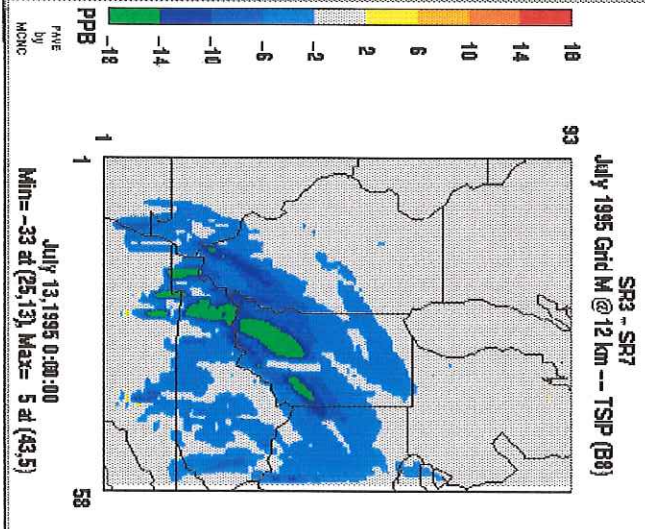
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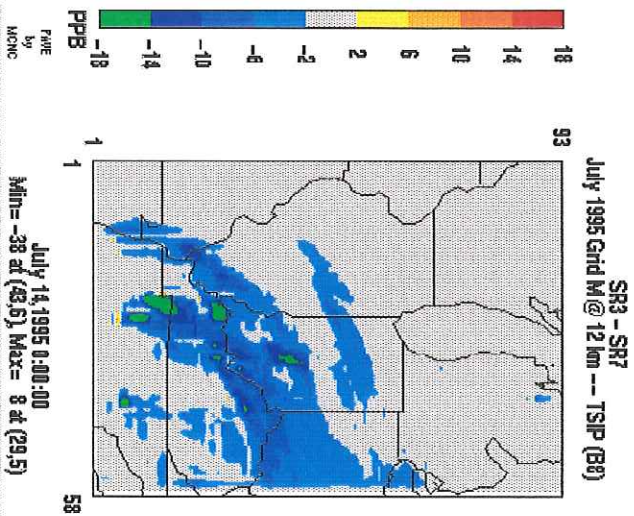
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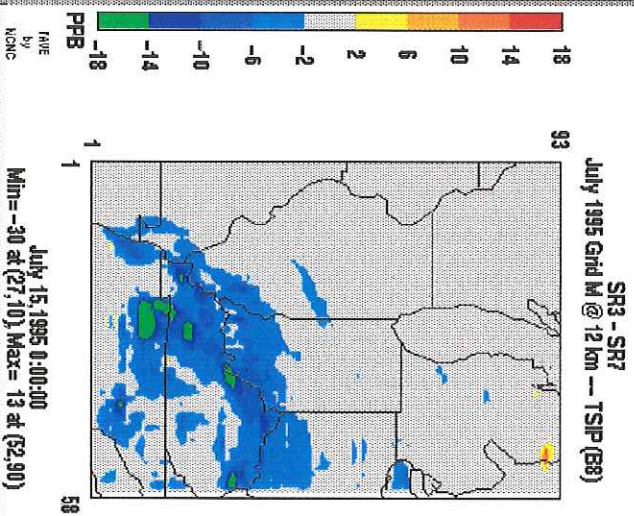
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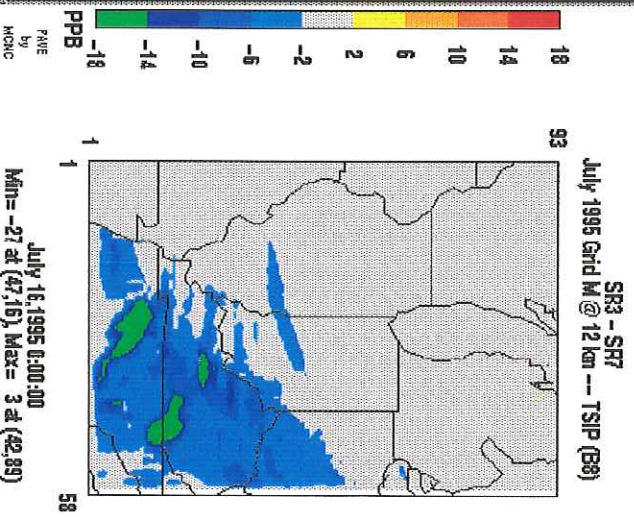
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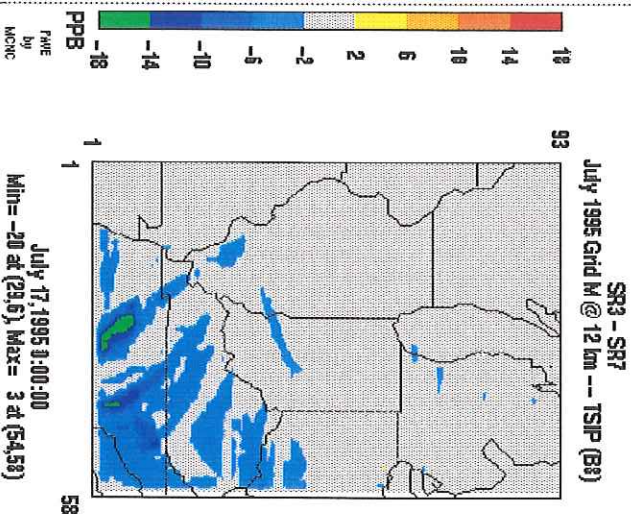
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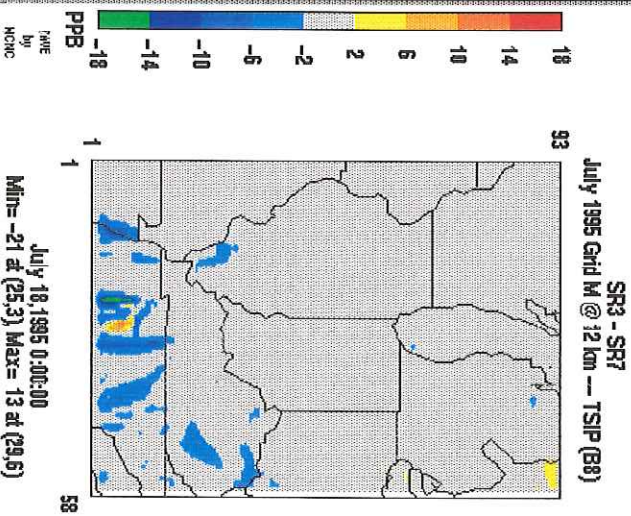
Max 1-Hour Ozone Difference



Max 1-Hour Ozone Difference



Max 1-Hour Ozone Difference



**MIDWEST SUBREGIONAL MODELING:
Modeled Attainment Tests**

The Lake Michigan Air Directors Consortium (LADCO) performed subregional modeling to support an updated 1-hour ozone attainment demonstration for the Lake Michigan area. The modeled attainment tests in USEPA's draft May 1999 guidance¹ and June 1996 guidance² were both used in the modeling analysis.

The May 1999 test uses monitored design values in concert with model-generated data. The model results are used in a "relative" rather than "absolute" sense. The June 1996 test allows two approaches: a deterministic approach (which consists of a deterministic test and, if necessary, a weight of evidence determination) and a statistical approach (which consists of a statistical test and, if necessary, a weight of evidence determination). The weight of evidence determination consists of additional, corroborative information.

The results of applying the attainment tests for the latest strategy modeling runs are summarized below. (Note, pursuant to the May 1999 guidance, the relative test was also used to address the 8-hour NAAQS.)

Relative Test (May 1999 Guidance)

The relative test consists of four steps:

- (1) Compute the site-specific observed design value for each monitor (i.e., the higher of the 1995-1997 period [3-year period straddling the inventory base year] and the 1997-1999 period [most recent 3-year period]);
- (2) Compute the "relative reduction factor" using modeling data (i.e., the ratio of future to current year daily peak ozone concentrations in the vicinity of each monitor);
- (3) Multiply the site-specific design value by the corresponding relative reduction factor for each monitor; and
- (4) Compare the adjusted design value to the NAAQS. If the adjusted design values are less than the NAAQS at all monitoring sites, then attainment is demonstrated. If the adjusted design values are equal to or greater than the NAAQS at any monitoring sites, then additional information (e.g.,

¹ Draft Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS, May 1999

² Guidance on Use of Modeled Results to Demonstrate Attainment of the Ozone NAAQS, June 1996

weight-of-evidence determination) or additional emission reductions are needed to demonstrate attainment.

There are only 11 monitoring sites with design values equal to or greater than the 1-hour NAAQS (i.e., 125 ppb). Table 1 presents the observed base year design values and the adjusted future year design values for these sites. This table shows:

- CAA controls (SR1) are sufficient to provide for 1-hour attainment at many, but not all sites, in the Lake Michigan area.
- Additional incremental controls (e.g., 0.25 EGU control, SIP call non-EGU control, and Tier II/Low S program) provide additional incremental air quality benefits. The more control, the more benefit.

- The effect of 0.25 EGU control (in IL, IN, WI) and MI State rule controls, in addition to CAA controls, provide further reductions in future year design values, but there are still a few sites above the 1-hour NAAQS.

- The effect of 0.25 EGU control (in IL, IN, WI, and other SIP call States); MI State rule controls; and the Tier II/Low S program, in addition to CAA controls, appear to be sufficient to reduce future year design values to below the 1-hour NAAQS at almost all sites in the Lake Michigan area.

There are 47 monitoring sites with design values equal to or greater than the 8-hour NAAQS (i.e., 85 ppb). Table 2 presents the observed base year design values and the adjusted design values for these sites. This table shows:

- CAA controls (SR1) are not sufficient to provide attainment; there are still 30 sites above the 8-hour NAAQS.
- Additional incremental controls provide additional incremental air quality benefits. The more control, the more benefit.
- The maximum control scenario considered (SR6) is also not sufficient to provide for attainment of the 8-hour NAAQS; there are still 22 sites above the 8-hour NAAQS.

Deterministic Approach (June 1996 Guidance)

The deterministic approach requires every grid to be below the NAAQS for every hour (i.e., daily maximum 1-hour concentration < 125 ppb). This is the approach that has been used in the past to demonstrate attainment of the 1-hour NAAQS. If there are only a few modeled exceedances (e.g., 2 - 3 grid cells \geq 125 ppb), then this approach may still be used to demonstrate attainment by including a weight of evidence determination.

The domainwide peak ozone concentrations for the 95base and each strategy scenario are presented in Table 3. As can be seen, the deterministic test is not passed for SR1 - SR7. There are several days with peak modeled concentrations equal to or greater than 125 ppb (i.e., 10 days for SR1, 8 days for SR7, and 7 days each for SR2 - SR6). It should be noted that of the 7 modeled exceedance days (for SR2 - SR6), the model overpredicts on four days by 10 - 20%, and three other days are considered "severe" based on the meteorological ozone forming potential. Although these factors can be considered in this test as part of a weight-of-evidence determination, they are dealt with more directly in the statistical test below.

Statistical Approach (June 1996 Guidance)

The statistical approach permits occasional exceedances and reflects an approach comparable to the form of the 1-hour NAAQS. This flexibility is important given uncertainties in the modeling and the severity of some episode days. The statistical approach includes three benchmarks related to the frequency and magnitude of allowed exceedances and the minimum level of improvement. The statistical test is passed if all three benchmarks are met, or if one or more benchmarks is not met, then a weight of evidence determination is provided. The benchmarks are addressed below.

Benchmark 1. Limits on Number of Modeled Exceedance Days

The number of days with modeled exceedances in each subregion must be less than 3 or "N - 1", whichever is less ("N" is number of severe days)³

3

USEPA guidance assumes a day is "severe" if its "meteorological ozone forming potential" (based on the Cox/Chu ranking scheme) is expected to be exceeded less than twice per year (i.e., EXEX value > 2). For the 43-year period 1953 - 1995, the days with a Cox/Chu ranking of 87 or less are considered severe. According to this scheme, the following modeling days are severe:

Jul 18, 1991 (#9 Milw)	Jun 19, 1995 (#49 Milw)	Jul 12, 1995 (#31 Milw, #62 Musk, #59 Chi)
Jul 19, 1991 (#67 Chi)	Jun 22, 1995 (#32 Chi)	Jul 13, 1995 (#19 Milw, #12 Musk)
Jun 24, 1995 (#10 Chi)	Jul 14, 1995 (#48 Milw, #5 Musk)	Jul 15, 1995 (#16 Chi)

The number of severe days in each subregion is as follows:

Chicago (NE IL/NW IN): 5	Jul 19, 1991; Jun 22, 1995; Jun 24, 1995; Jul 12, 1995; Jul 15, 1995
Milwaukee (E WI): 5	Jul 18, 1991; Jun 19, 1995; Jul 12 - 14, 1995
Muskegon (W MI): 3	Jul 12 - 14, 1995

Thus, the number of allowed modeled exceedance days is 3 in Chicago and Milwaukee CMSAs, and 2 in Muskegon MSA.

The number of exceedance days in each subregion is as follows:

	IL/IN	WI	MI
Allowed	3	3	2
95bas ⁴	4	8	7
SR1	4	4	5
SR7	4	2	3
SR2-SR6	4	1	2

This benchmark is not met for SR1 or SR7, but is almost met for SR2 - SR6. In view of the following "weight of evidence" factors, the benchmark can be considered to be met for SR2 - SR6:

(1)

Confidence in Model Results: In general, the modeling results comply with USEPA's performance criteria. For 3 of the 4 exceedance days in the IL/IN subregion, however, the model overestimates the peak observed concentration by at least 7 ppb and the normalized bias ranges from +10 to +20% (7-21-91, 6-25-95, 7-15-95) - see Table 4. This degree of overprediction is greater than the degree of exceedance on each of these 3 days.

Confidence in Underlying Data Bases: Ambient data based on intensive field program (June, July 1991), and enhanced ozone/ozone precursor monitoring network and special aircraft measurements (June, July 1995).

Corroborative Modeling Results: 1-hour attainment demonstrated using relative test (see discussion above)

(2)

Severity of Modeled Episodes: Large number of modeled days; Variety of meteorological conditions included

Magnitude of Observed Peaks: Although only 7 days were classified as "severe" based on the Cox/Chu methodology, the observed peak ozone on 2 other days (6-26-91 and 7-19-91) were greater than the corresponding design value. Also, there are modeled peaks at or above area-wide and site-specific design values, and high modeled values in more than one subregion on some days.

Benchmark 2. Limits on Value of Allowed Exceedances

The maximum modeled concentration shall not exceed 130 ppb on days with an EXEX rate between 0.5 - 2.0/year (i.e., ranking of 22 - 87) and a slightly higher value (see Table 4.2 of the June 1996 guidance) on days with an EXEX rate less than 0.5/year (i.e., ranking less than 22). The allowable exceedance values for each modeled exceedance day are as follows:

Date	Rank	Exc. Value	SR1	SR7	SR2-SR6
6-26-91		(124)	127	123	120-122
6-27-91		(124)	119	116	113-114
7-20-91		(124)	143	141	138-140
7-21-91		(124)	133	131	129-131
6-17-95		(124)	122	121	116-119
6-18-95		(124)	120	120	119
6-22-95	32	130	131	125	122-124
6-23-95		(124)	126	120	118-120
6-24-95	10	138	133	134	131-132
6-25-95		(124)	126	127	125-126
7-13-95	12	137	138	134	132-136
7-14-95	5	145	132	129	129
7-15-95	16	133	141	136	134-137
7-16-95		(124)	122	116	114-117

This benchmark is not met for SR1, but is almost met for SR2 - SR7. In view of the "weight-of-evidence" factors cited above, the benchmark can be considered met for SR2 - SR7.

Benchmark 3. Required Minimum Level of Improvement

The number of grid cells > 120 ppb must be reduced by 80% on each day with allowed exceedances. The degree of improvement on the Cox/Chu severe days, the other days with observed daily peaks greater than the corresponding design value, and the two days with modeled exceedances in each subregion is as follows (see Table 5):

5 Of particular note is that on all four of the remaining modeled exceedance days, the model overestimates the observed peak by at least 7 ppb and the normalized bias ranges from +10 to +20% (7-20-91, 7-21-91, 6-25-95, 7-15-95). This degree of overprediction is greater than the amount of allowed exceedance on each of these days.

Date	SR1	SR7	SR2-SR6
6-26-91	74	92	91 - 99
6-27-91	100	100	100
7-20-91	44	60	64 - 76
7-21-91	73	87	86 - 92
6-17-95	25	38	100
6-18-95	98	96	100
6-22-95	8	64	80 - 88
6-23-95	40	100	100
6-24-95	32	35	53 - 59
6-25-95	56	56	67 - 89
7-13-95	41	54	53 - 63
7-14-95	55	70	69 - 76
7-15-95	43	71	70 - 79
7-16-95	96	100	100

This benchmark is not met for SR1 or SR7, but is almost met for SR2 - SR6. In view of the "weight-of-evidence" factors cited above, the benchmark can be considered met for SR2 - SR6.

TABLE I

1-HOUR DESIGN VALUES

SITE	Base	SR1	SR7	SR2	SR3	SR4	SR5	SR6
Pleasant Prairie	129	123	121	120	120	119	120	120
S. Milwaukee	126	118	116	115	115	113	115	115
Milwaukee-Bayside	129	123	120	119	119	117	119	119
Grafton	128	122	119	118	118	116	118	116
Harrington Beach	134	129	126	125	123	123	125	123
Sheboygan	132	125	123	121	121	120	121	121
Manitowoc	128	120	118	116	116	114	116	115
Newport Beach	127	118	117	116	116	114	114	114
Michigan City	128	119	116	116	115	115	115	114
Holland	137	130	126	126	125	125	125	123
Muskegon	136	129	126	125	125	124	125	124

TABLE 2

SITE	Base	SRI	SRI	SRI	SRI	SRI	SRI	SRI	SRI
Pleasant Prairie	97	94	93	93	93	93	92	92	92
Kenosha	86	83	83	82	82	82	81	82	82
Racine	92	88	87	86	86	86	86	86	86
S. Milwaukee	93	89	87	86	86	86	86	86	86
Milwaukee-Alverno	88	84	83	82	82	82	81	82	81
Milwaukee-UWMN	88	84	83	82	82	82	81	82	82
Milwaukee-Bayside	93	89	87	86	86	86	86	86	86
Grafton	92	89	87	86	86	86	85	86	86
Harrington Beach	93	90	87	86	86	86	86	86	86
Sheboygan	93	90	87	86	86	86	86	86	86
Manitowoc	97	92	90	89	89	88	88	89	88
Kewanee	94	90	88	87	86	86	86	86	86
Newport Beach	97	93	91	89	89	88	88	89	88
Beloit	87	81	78	77	77	77	75	77	76
Jefferson	85	81	80	79	78	78	77	78	78
Zion	85	82	82	82	82	82	81	82	81
Waukegan	88	85	85	84	84	84	83	84	83
Northbrook	86	84	83	82	82	82	82	82	82
Cary	85	84	83	82	82	82	82	82	82
Elgin	85	84	83	82	82	82	82	82	82
Des Plaines	87	90	88	88	88	88	89	88	88
Evanston	91	90	89	89	89	89	81	89	88
Univ. of Chicago	85	82	82	81	81	81	81	81	80
Chicago-SWFP	89	86	85	85	85	85	84	85	84
Chicago-Jardine	89	86	85	85	85	85	84	85	84
Hammond	96	92	91	90	90	90	89	90	89
Gary-IITRI	94	89	88	87	87	87	86	87	86
Ogden Dunes	97	92	91	90	90	90	89	90	89
National Lakeshore	96	92	90	89	89	89	88	89	88
Michigan City	104	99	98	97	97	97	96	97	96
Laporte	88								
Lowell	89								
Valparaiso	87								
Potato Creek	91	88	86	84	83	83	83	83	82
South Bend	89	86	84	82	81	81	81	82	80
Granger	92	88	86	85	84	84	83	84	83
Bristol	90	87	86	83	82	82	81	82	81
Frankfort	88	84	83	82	82	82	82	82	81
Scottville	96	92	90	90	89	89	89	89	89
Muskegon	99	94	92	92	91	91	90	91	91
Holland	98	94	92	91	91	91	90	91	90
Jenison	85	81	79	78	78	77	77	78	78
Grand Rapids	86	83	81	80	80	80	79	80	79
Evans	88	85	84	83	83	83	82	83	82
Coloma	98	94	92	91	90	90	89	90	90
Cassopolis	94	90	88	86	86	86	85	86	85
Kalamazoo	87	84	82	80	80	80	79	80	79

8-HOUR DESIGN VALUES

TABLE 3

UAM-V Strategy Peak Values (ppb)

Station	Jun24	Jun25	Jun26	Jun27	Jun28	Jul16	Jul17	Jul18	Jul19	Jul20	Jul21	Jun15	Jun16	Jun17	Jun18	Jun19	Jun20	Jun21	Jun22	Jun23	Jun24	Jun25	Jul9	Jul10	Jul11	Jul12	Jul13	Jul14	Jul15	Jul16	Jul17	Jul18
obs	92	104	175	118	138	130	137	170	111	108	101	125	106	145	131	122	130	112	119	123	166	108	122	106	118	178	150	154	92	88	68	
95bas	99	124	137	129	102	111	91	108	90	108	144	84	80	130	129	122	118	123	131	129	136	131	82	95	89	140	140	161	137	91	56	
SR1	94	117	127	119	100	106	90	107	91	107	133	80	77	122	120	112	111	121	131	126	133	126	79	88	90	138	132	141	122	82	54	
SR7	93	114	123	116	99	105	91	107	105	118	131	77	77	121	120	110	111	121	134	134	134	127	78	88	90	134	129	136	116	80	53	
SR2	93	114	122	114	97	106	92	106	106	117	131	78	78	119	120	119	111	119	124	131	131	125	79	88	90	136	129	137	117	80	53	
SR3	93	114	121	114	97	105	92	107	105	140	130	78	78	117	119	110	119	123	131	131	125	78	88	88	134	129	136	116	80	53		
SR4	93	114	121	114	98	105	92	109	105	138	129	77	77	117	118	109	118	122	132	132	125	78	88	88	132	129	134	114	78	53		
SR5	93	114	122	114	97	105	92	106	105	139	131	78	78	117	119	111	119	124	131	131	125	78	86	86	134	129	137	116	80	53		
SR6	92	114	120	113	96	104	93	107	104	116	130	77	77	116	119	110	119	124	132	132	126	77	82	82	134	129	136	115	80	53		

TABLE 4

Model Performance Statistics - Lake Michigan Area (12 km)

	Peak Value				Mean Value				Normalized Bias				Normalized Gross Error			
	obs	uamv	uamv	camx	obs	uamv	uamv	camx	uamv	uamv	uamv	camx	uamv	uamv	camx	
Jun24	92	(bas10) 104	(bas1v2) 99	(bas1v2) 88	69	(bas10) 57	(bas1v2) 54	(bas1v2) 57	(bas10) -17.6	(bas1v2) -22.1	(bas1v2) -17.7	(bas10) 19.7	(bas1v2) 23.2	(bas1v2) 19.2		
Jun25	104	128	124	115	76	66	60	62	-13.2	-19.9	-17.5	25.4	23.6	22.0		
Jun26	175	142	137	129	80	86	78	80	9.2	-0.1	1.6	25.4	23.5	24.0		
Jun27	118	140	129	126	73	80	75	81	11.6	3.8	12.0	21.2	17.5	20.2		
Jun28	138	120	102	107	75	68	63	69	-7.0	-14.5	-5.3	17.6	14.5	17.1		
Jul16	130	125	111	101	75	66	60	61	-13.4	-20.9	-17.6	17.5	22.3	19.4		
Jul17	137	106	92	88	74	62	56	59	-15.9	-22.9	-19.2	19.8	24.9	23.1		
Jul18	170	138	109	103	78	78	71	74	0.6	-6.2	-2.4	16.9	16.4	16.4		
Jul19	170	143	117	111	80	74	68	70	-6.2	-12.5	-9.5	21.9	22.1	21.5		
Jul20	139	171	162	146	75	91	83	85	21.2	11.7	15.3	27.5	22.0	24.9		
Jul21	101	152	145	138	70	89	82	86	28.5	19.7	24.5	34.5	30.9	32.2		
Jun15	125	82	84	82	74	52	50	52	-30.1	-32.5	-30.1	30.4	32.8	30.6		
Jun16	124	89	97	90	81	56	56	58	-31.3	-31.3	-28.9	31.4	31.5	29.1		
Jun17	145	128	130	114	81	61	61	63	-25.4	-26.0	-23.0	25.8	26.4	23.6		
Jun18	131	128	129	125	75	63	62	67	-16.9	-17.2	-10.2	18.2	18.8	14.6		
Jun19	118	115	118	107	74	62	61	66	-15.9	-16.9	-10.9	17.9	18.9	14.9		
Jun20	97	123	122	117	70	59	57	61	-14.7	-18.1	-11.3	20.2	21.1	17.2		
Jun21	112	122	123	119	73	61	58	64	-19.1	-22.5	-14.1	22.0	25.3	19.0		
Jun22	119	131	131	125	78	81	79	80	5.5	2.9	4.2	16.7	16.2	14.6		
Jun23	123	131	129	125	84	80	77	77	-2.6	-6.2	-6.2	16.9	17.7	18.4		
Jun24	166	144	136	138	83	87	82	84	4.9	-0.1	2.2	16.2	16.7	18.6		
Jun25	108	132	131	131	73	82	79	83	14.2	10.0	15.9	18.8	17.2	22.8		
Jul9	122	86	82	79	75	55	51	54	-26.0	-30.1	-26.7	26.0	30.2	26.9		
Jul10	106	93	98	85	70	52	49	54	-25.9	-29.2	-22.9	26.2	29.2	23.0		
Jul11	118	101	89	90	74	57	53	55	-22.1	-28.3	-24.7	24.8	28.7	25.4		
Jul12	146	122	121	118	86	76	73	76	-9.6	-12.8	-9.9	18.1	19.2	15.9		
Jul13	178	157	155	151	87	78	76	83	-8.7	-11.6	-3.6	16.8	17.8	15.4		
Jul14	150	141	140	145	83	81	79	88	-1.7	-3.4	7.3	15.0	14.6	16.8		
Jul15	154	150	161	160	74	86	86	94	16.9	17.2	28.5	22.4	23.9	31.7		
Jul16	92	129	137	132	69	87	86	89	25.6	24.5	29.7	27.6	27.2	31.5		
Jul17	88	91	91	89	66	47	45	50	-29.6	-32.0	-24.9	30.0	32.2	26.6		
Jul18	68	52	56	58	63	41	38	41	-35.1	-40.3	-34.6	35.1	40.3	34.6		

