



2019 Modeling Platform Updates

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Today's Presentation

- Modeling Platform Set-up
- Emission Data and Planned Updates
- Model Performance Evaluation
- Preliminary Future Design Values
- Ozone Sensitivities
- Modeling Resources

Modeling Platform Set-up

- Episode: April 1 – October 31
- Modeling years: 2019, 2023, 2026
- Emission processing: EPS3
- Meteorological modeling: WRF v. 4.1.5
 - Hybrid Vertical Coordinate,
 - Noah Land-surface model (LSM)
 - Yonsei University (YSU) PBL scheme
 - WRF Double-Moment 6-Class Microphysics
- Air quality modeling: CAMx version 7.10
 - CB6r5 chemical mechanism
 - K-theory for vertical diffusion
 - Wesely89 dry deposition scheme



Emission Data and Planned Updates

Sector	Sector/Geographic area	Datasets/Model
Point	EGU	2019 Air Market Program Data (AMPD)
	Non-EGU TX	2019 State of Texas Air Reporting System (STARS)
	Non-EGU Non-TX	EPA 2016v1 Modeling Platform
Non-Point	Oil & Gas TX	2019 Railroad Commission of Texas (RRC)
	Oil & Gas Non-TX	EPA 2017 Modeling Platform
	Off-shore	2017 Bureau of Ocean Energy Management (BOEM)
Mobile	On-Road	TX NAA: MOVES3 - link based ; outside NAA: MOVES3 - county based
	Non-Road	TexN2.2 (TX); MOVES3 (non-TX)
	Off-road Shipping	4km: 2019 Automatic Identification System (AIS); vessel characteristic IHS 2020 MARINER v1; 12km: version 1 of the 2016 EPA modeling platform
	Off-road Airports	TX NAA: TTI 2020 data; Other: EPA 2016 platform
	Off-road Locomotives	TX NAA: TTI 2019 data, Other: EPA 2016 platform
Area	Area TX	2020 Air Emissions Reporting Requirements (AERR)
	Area Non-TX	EPA 2017 Modeling Platform
Natural	Biogenic	Biogenic Emissions Land-use Database (BELD5); BEIS v3.7 and SMOKEv4.8
	Fires	2019 MODIS and VIIRS; FINN v2.2
Other	International Els	2019 Community Emission Data System (CEDs); SMOKEv4.7_CEDs

Statistic Benchmarks for Model Performance Evaluation (MPE)

Recommended
by Emery et al. (2017)

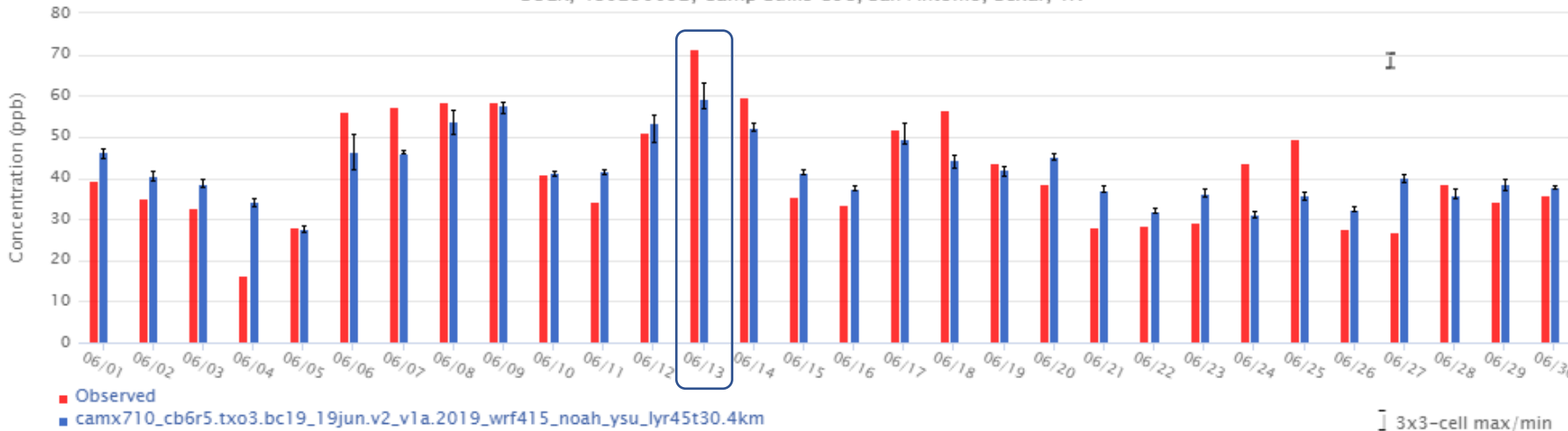
	NMB	NME
Goal	$< \pm 5\%$	$< 15\%$
Criteria	$< \pm 15\%$	$< 25\%$

- Goal
 - statistical values met by about a third of top performing past applications
 - considered as the best a model can be expected to achieve
- Criteria
 - statistical values met by about two thirds of past applications
 - viewed as what majority of models have achieved
 - one third of past applications that do not meet criteria are considered poor performers

MPE: High Ozone Days June 8 and 13

O3 Daily Maximum 8-Hour Concentration (2x2 bi-linear interpolated value)
BOER, 480290052, Camp Bullis C58, San Antonio, Bexar, TX

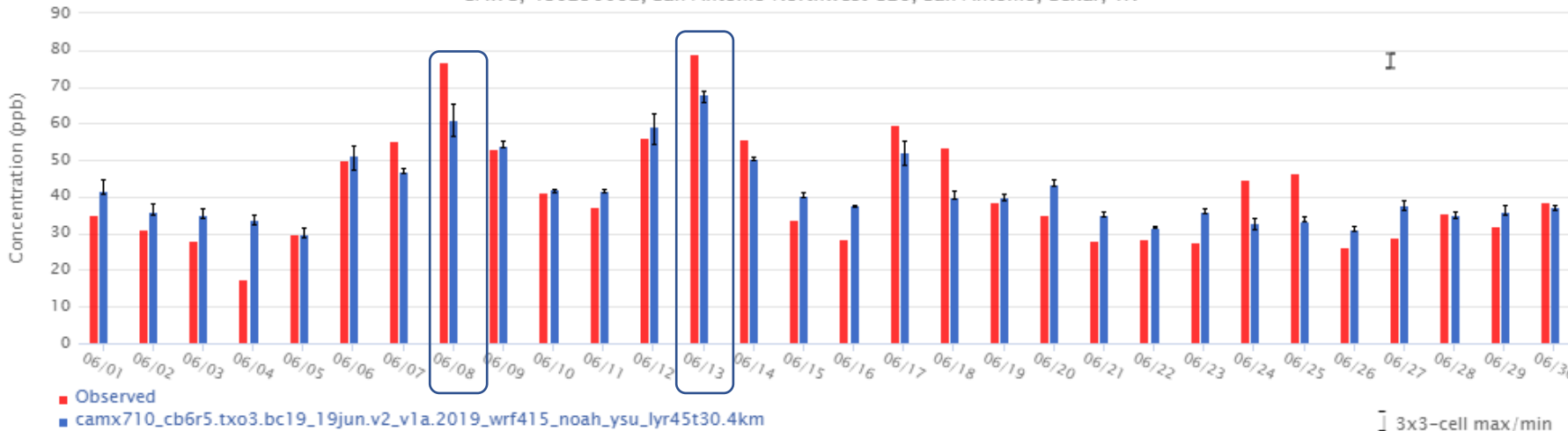
Camp Bullis



Underprediction on highest ozone days

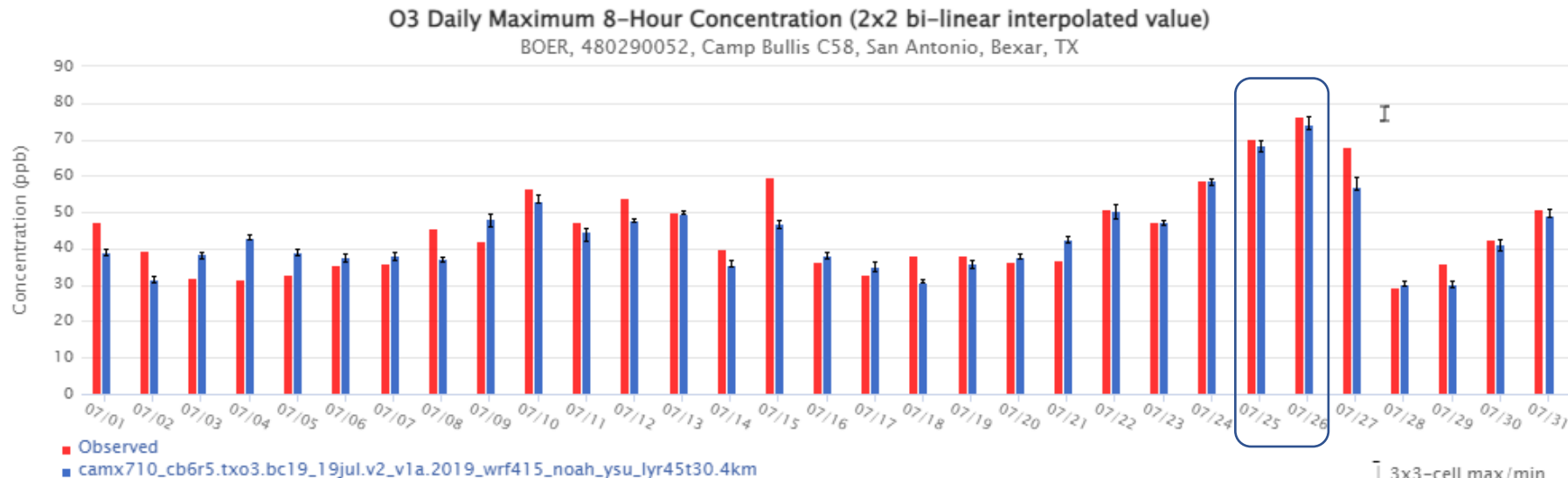
O3 Daily Maximum 8-Hour Concentration (2x2 bi-linear interpolated value)
SAWC, 480290032, San Antonio Northwest C23, San Antonio, Bexar, TX

San Antonio Northwest

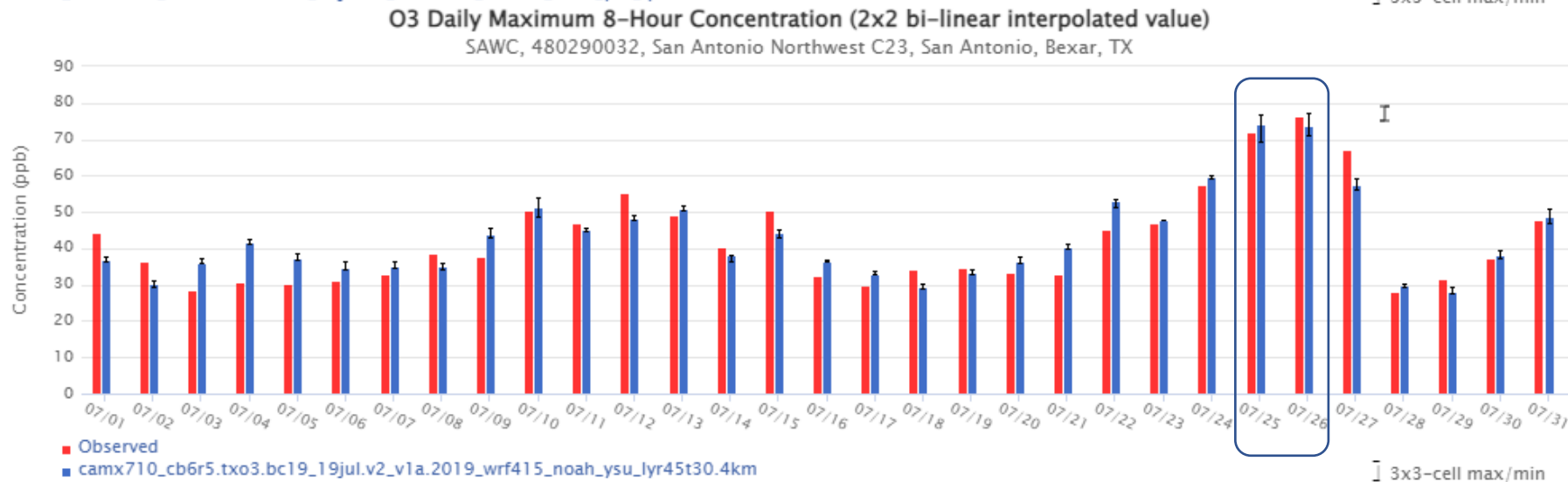


MPE: High Ozone Days July 25 and 26

Camp Bullis

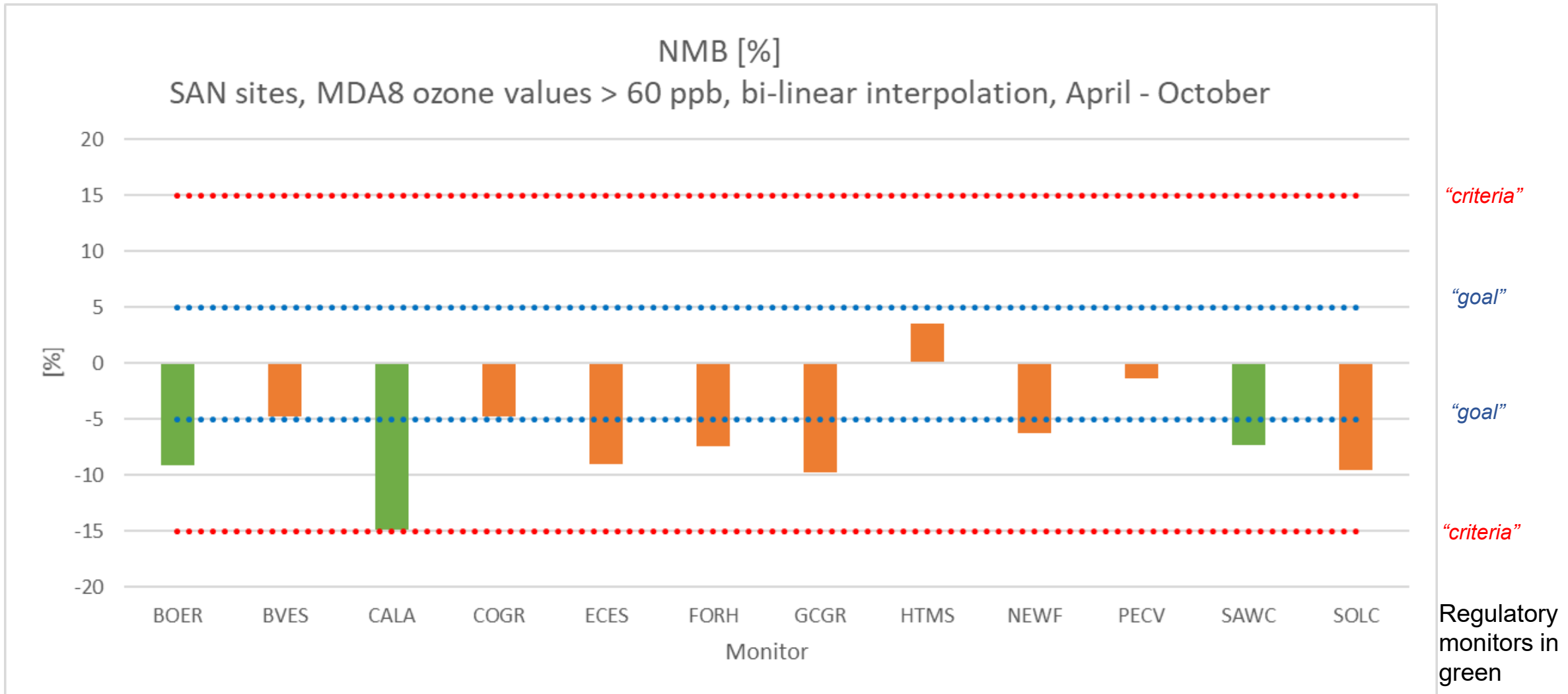


San Antonio Northwest

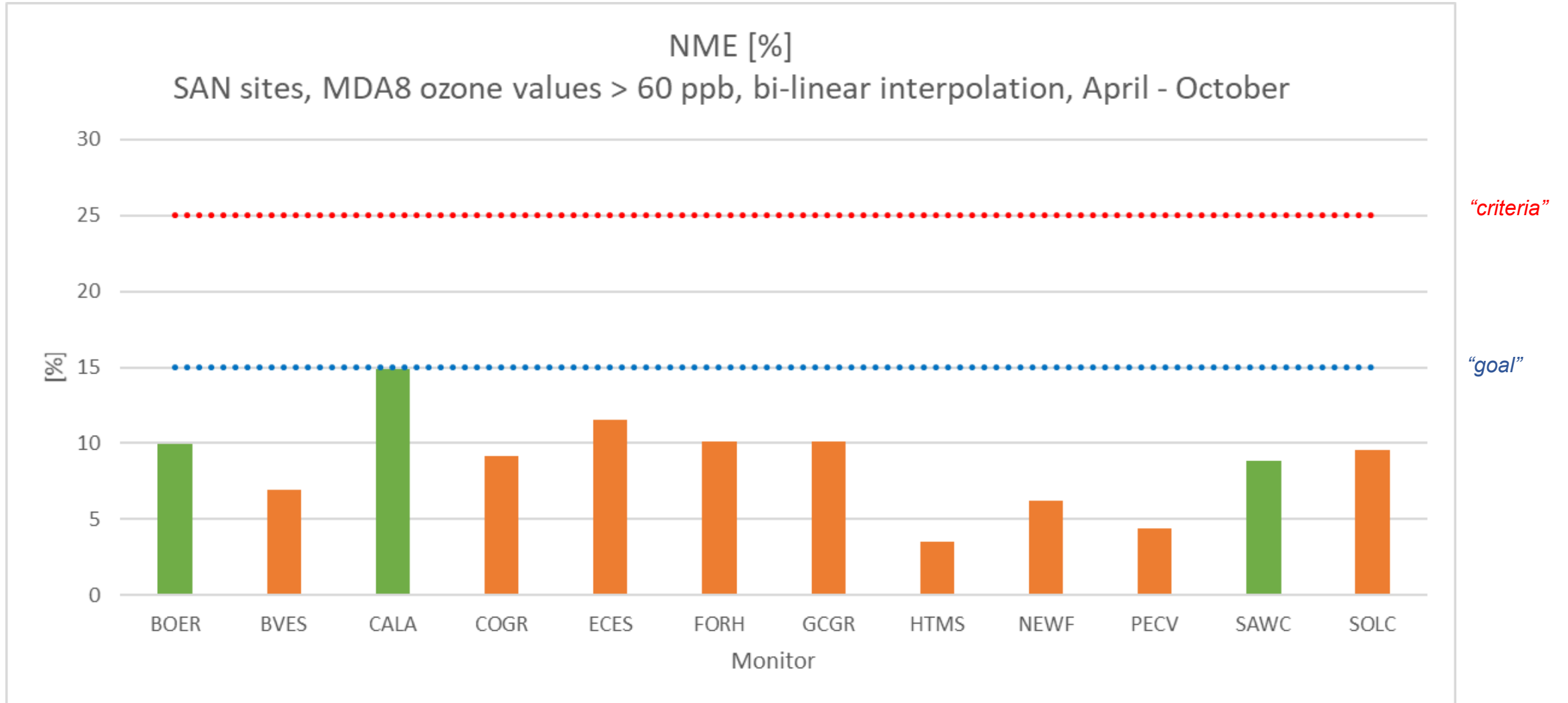


Less underprediction on highest ozone days than June

Normalized Mean Bias for MDA8 Ozone

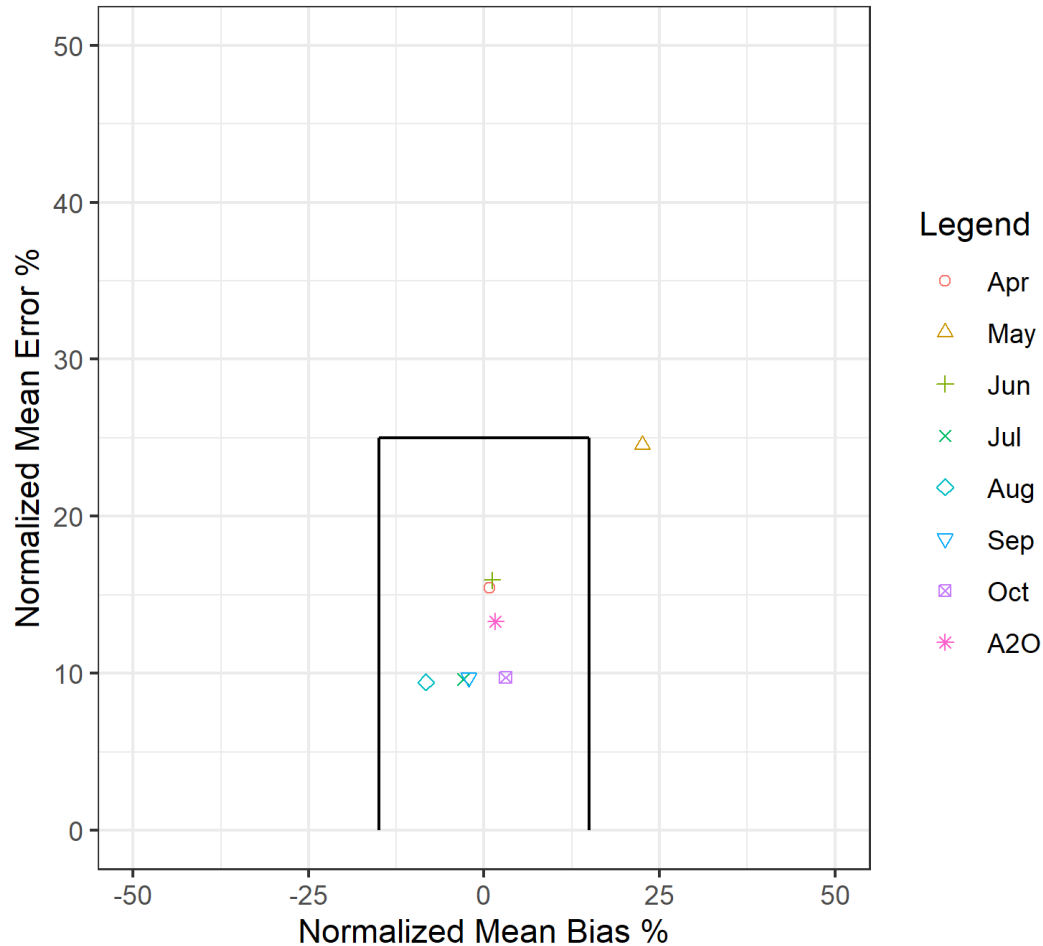


Normalized Mean Error for MDA8 Ozone

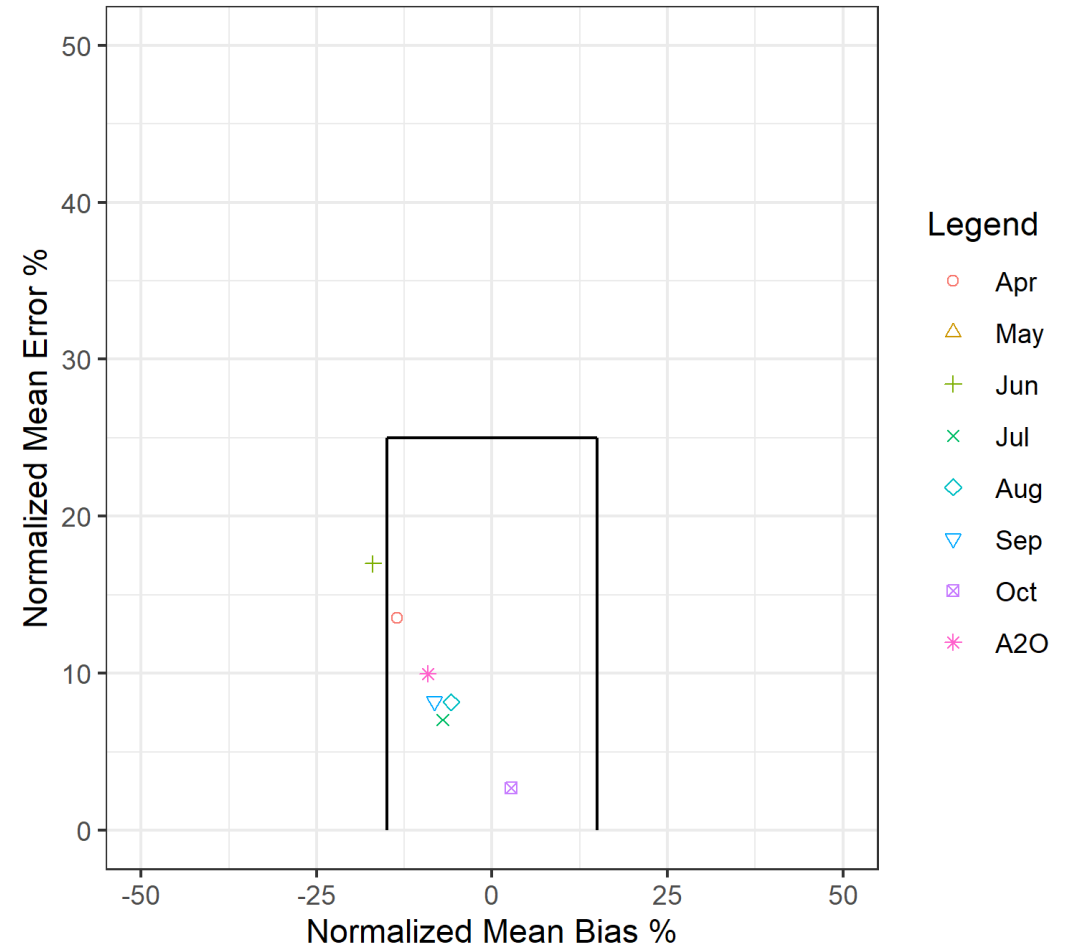


Soccer Plots for Camp Bullis

Soccer Plot: Site Daily Max 8h
Camp Bullis C58 (BOER)

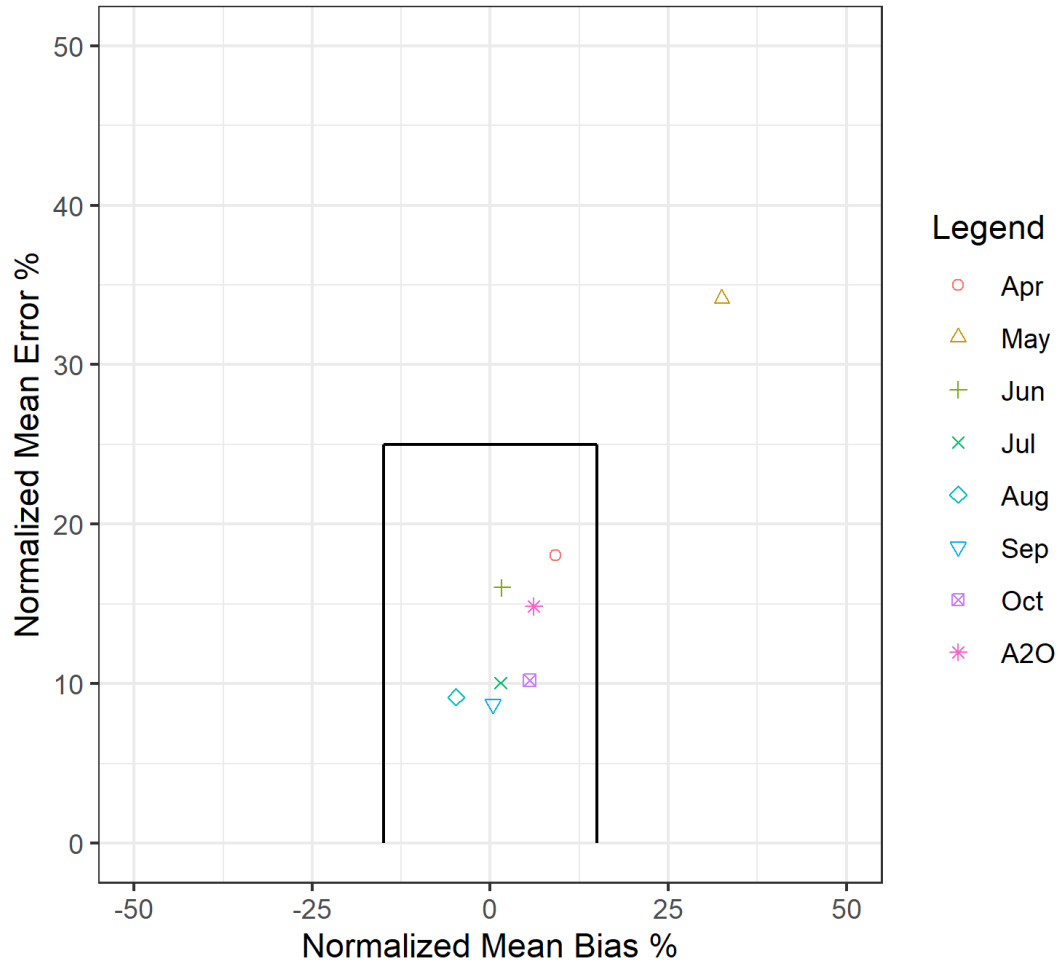


Soccer Plot: Daily Max, Observed \geq 60 ppb 8h
Camp Bullis C58 (BOER)

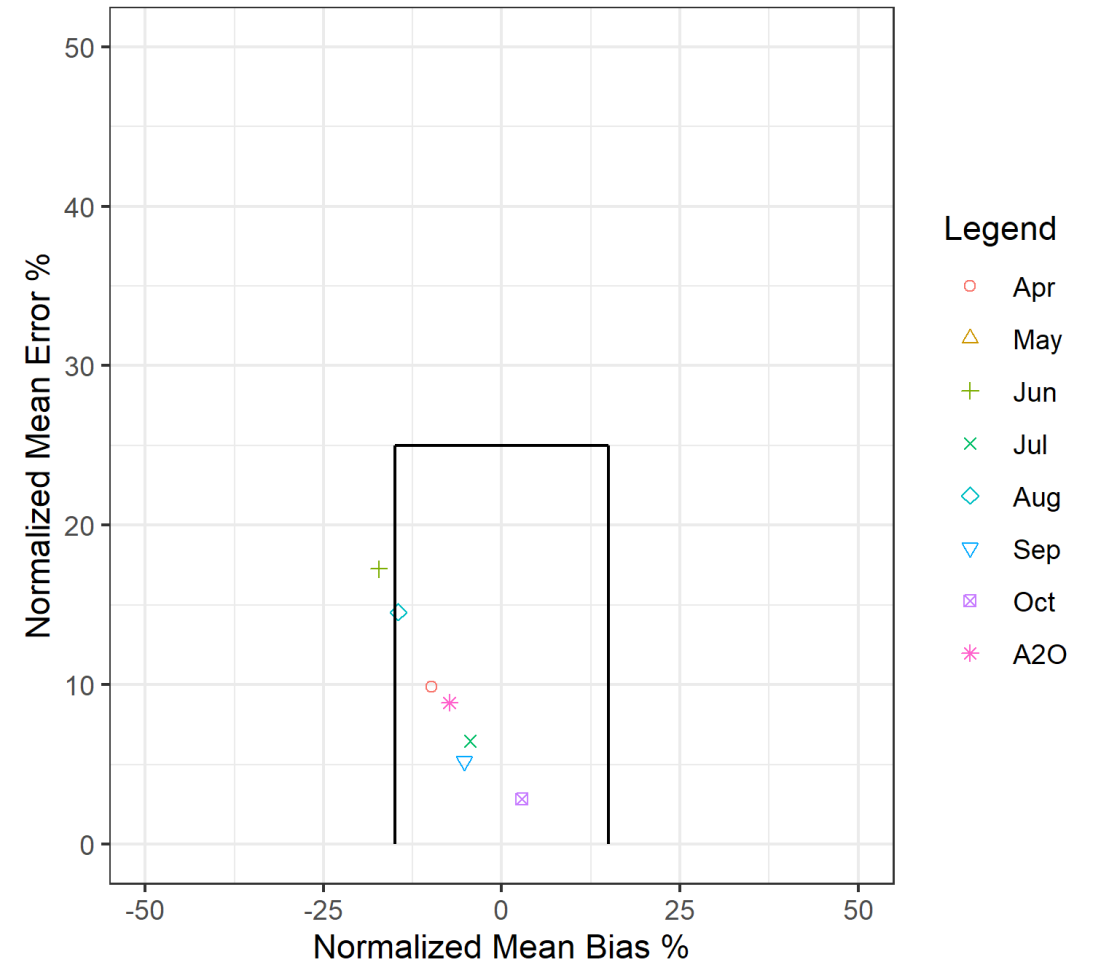


Soccer Plots for SA Northwest

Soccer Plot: Site Daily Max 8h
San Antonio Northwest C23 (SAWC)



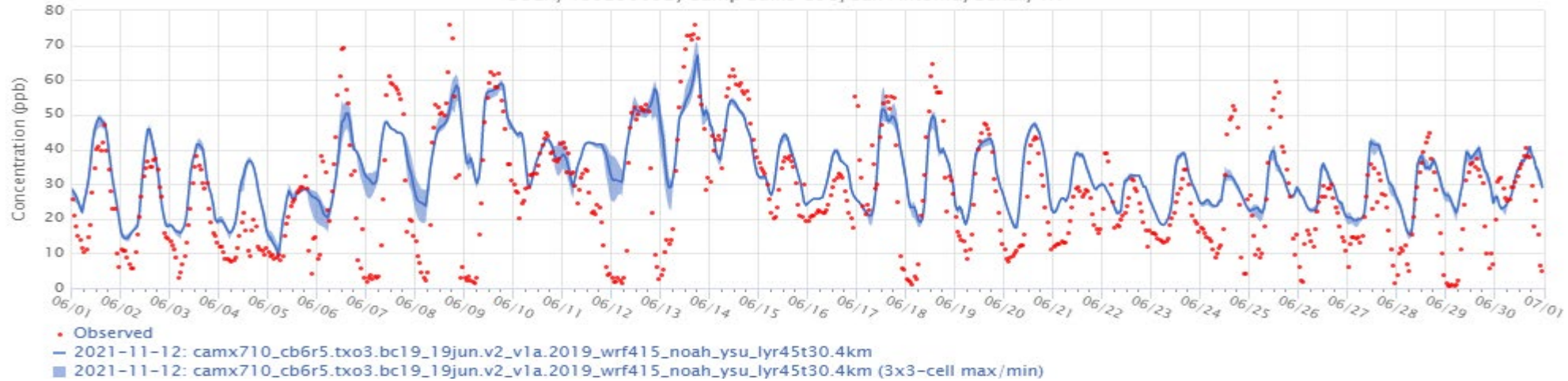
Soccer Plot: Daily Max, Observed ≥ 60 ppb 8h
San Antonio Northwest C23 (SAWC)



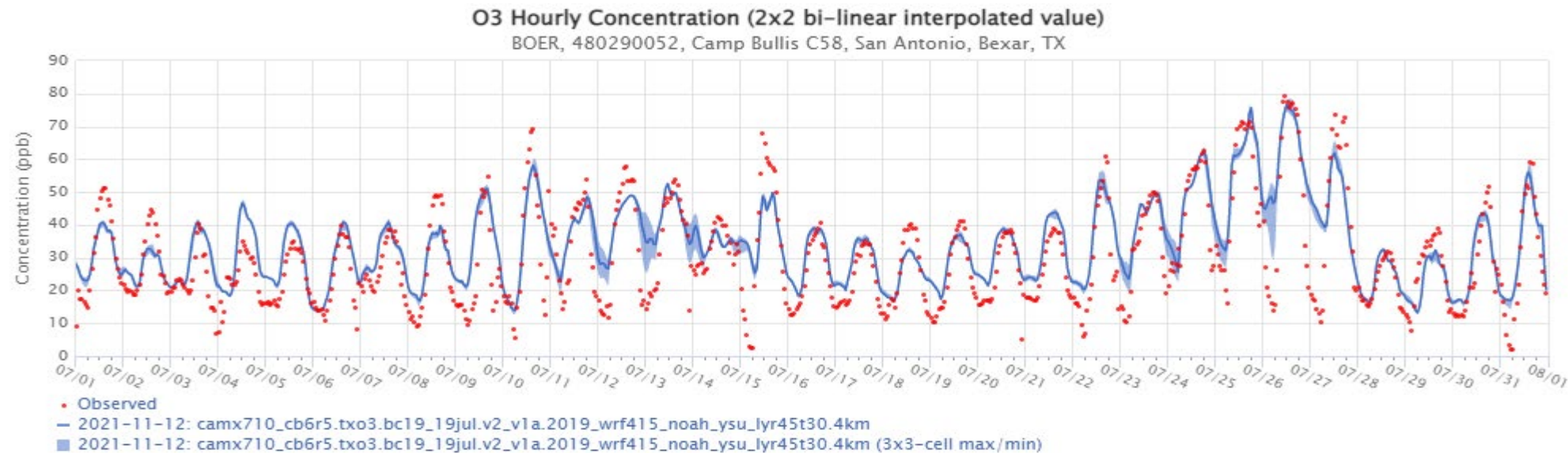
Daily 1-hr Averaged Ozone for Camp Bullis

O3 Hourly Concentration (2x2 bi-linear interpolated value)
BOER, 480290052, Camp Bullis C58, San Antonio, Bexar, TX

June

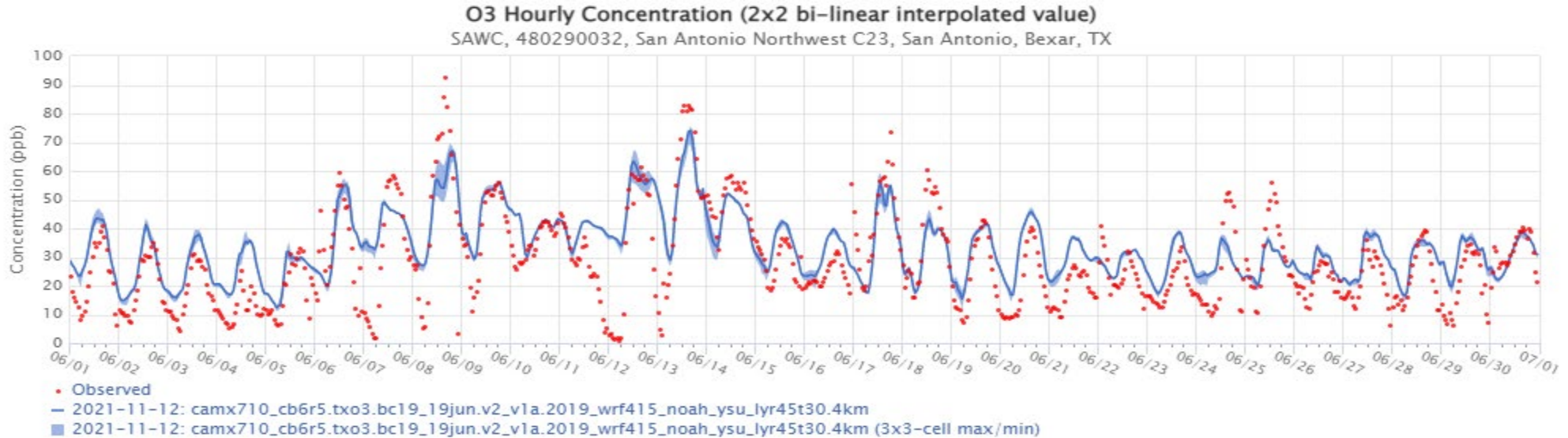


July

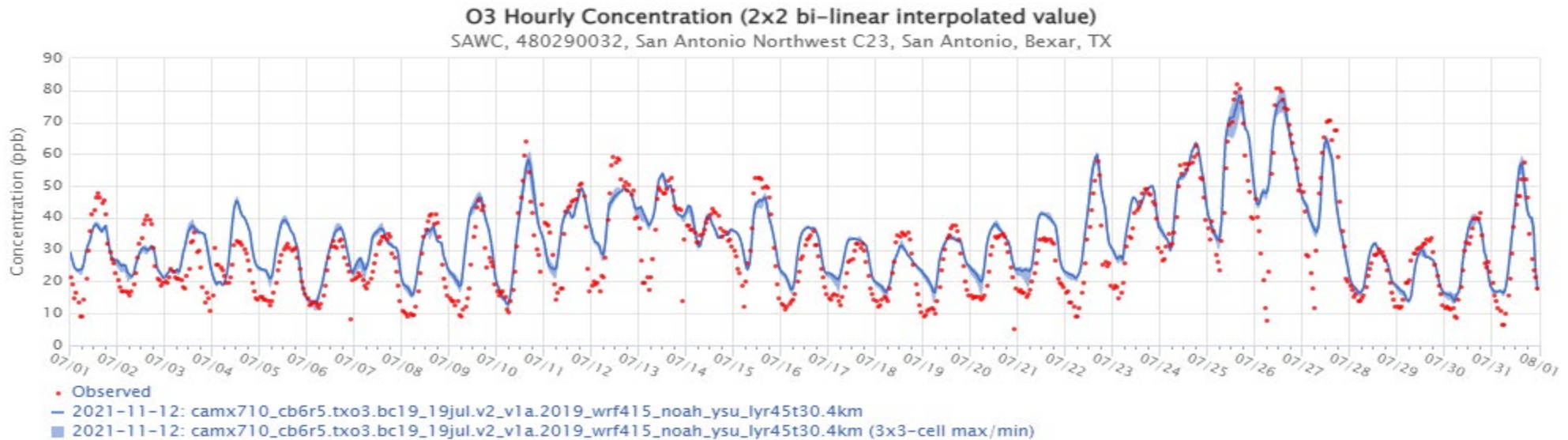


Daily 1-hr Averaged Ozone for SA Northwest

June



July



CAMx Configurations Tested

- **Wesely86 (Default)**
 - Dry deposition scheme: Wesely89
 - Vertical diffusion: K-theory
- **Zhang03**
 - Dry deposition scheme: Zhang03
 - Vertical diffusion: K-theory
- **Wesley89/Acm2**
 - Dry deposition scheme: Wesely89
 - Vertical diffusion: ACM2
- **Zhang03/Acm2**
 - Dry deposition scheme: Zhang03
 - Vertical diffusion: ACM2

MPE for CAMx Configurations

- Evaluated maximum daily 8-hr average ozone (MDA8)
- Statistics are for all SAN sites and MDA8 \geq 60 ppb

CAMx Configuration	June NMB %	June NME %	September NMB %	September NME %
Wesely89/K-theory	-14.53	14.76	-6.63	7.01
Zhang03/K-theory	-7.68	9.75	-3.55	5.73
Wesely89/acm2	-13.4	13.81	-6.08	6.67
Zhang03/acm2	-6.46	9.01	-2.9	5.53

Model Attainment Test

- How to calculate Future Design Value (DV)?

$$\text{Future DV} = \text{DVB} * \text{RRF}$$

Base Design Value
Anchor point for future DV

Relative Response Factor

RRF =

$$\frac{\text{Future Year Modeled Ozone Values}}{\text{Base Year Modeled Ozone Values}}$$

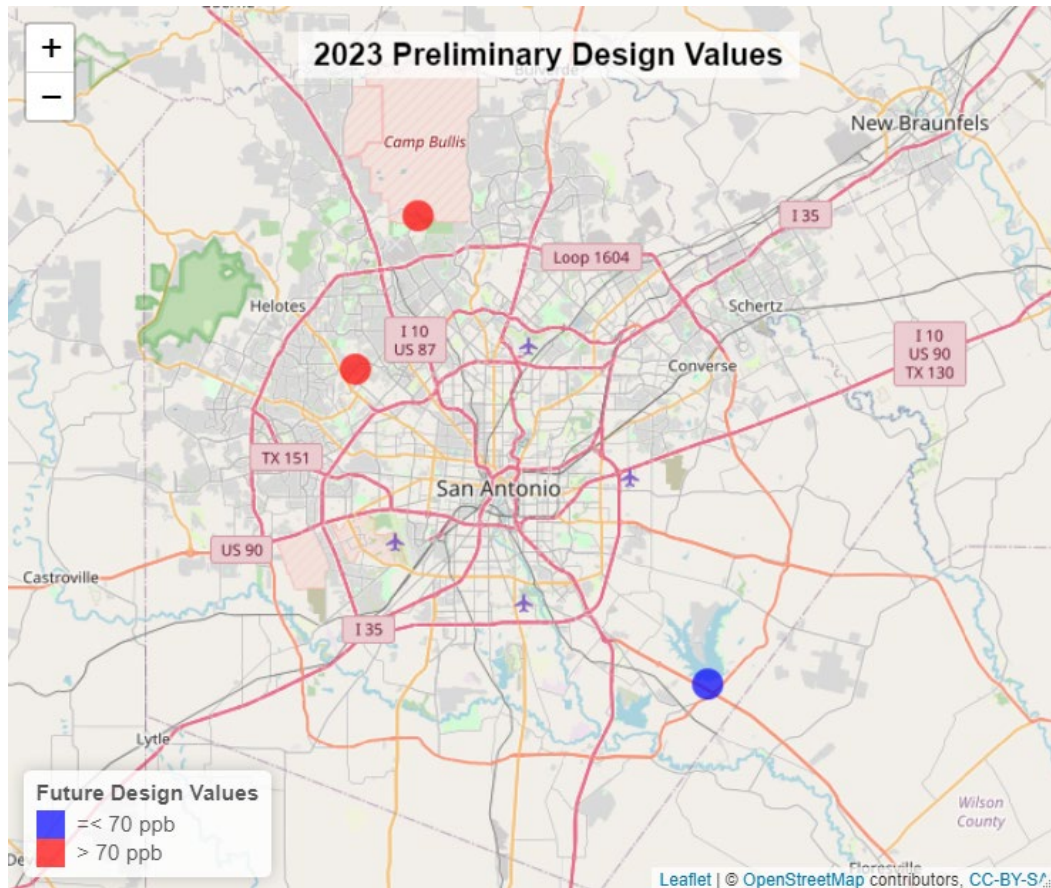
2019 DVB	2017	2018	2019	2020	2021
2019 DV					
2020 DV					
2021 DV					

Preliminary Future Data Calculation

- Based on 10 days of highest modeled 2019 MDA8 > 60 ppb
- Based on 3 by 3 cell maximum values

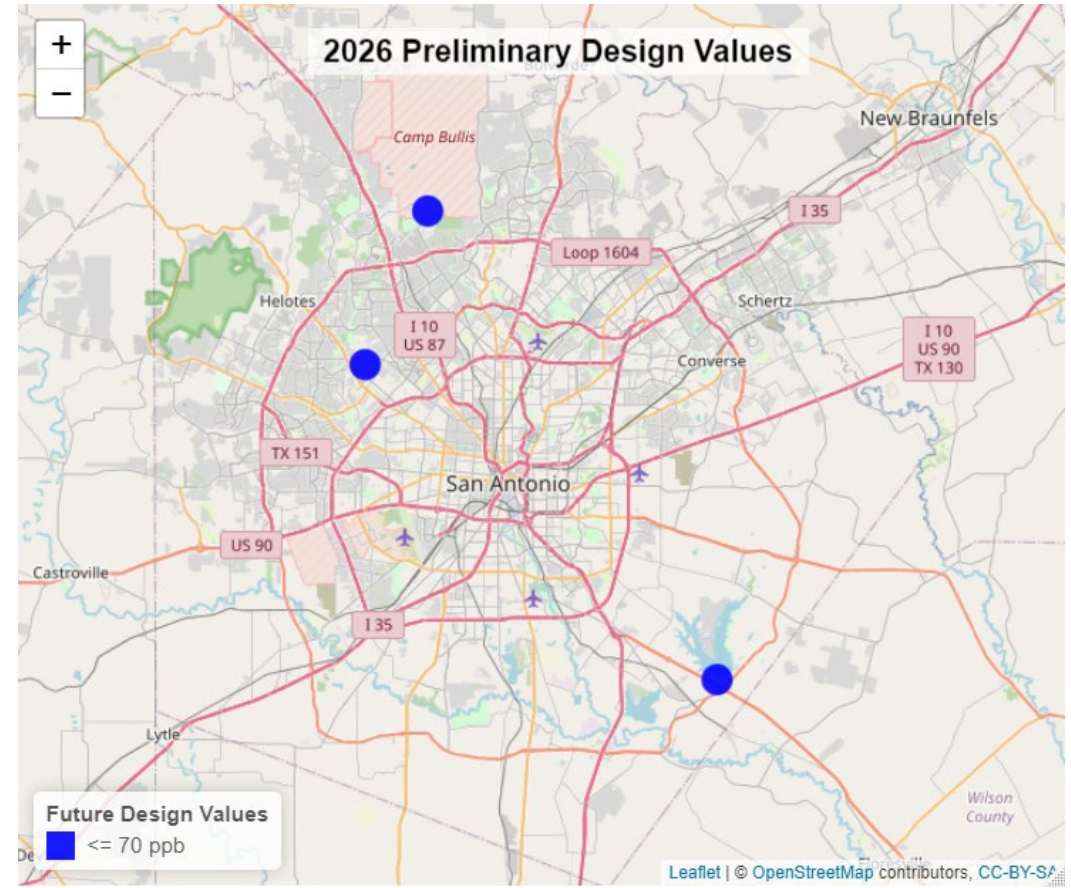
Site	BOER	CALA	SAWC	BVES	COGR	ECES	FORH	GCGR	HTMS	NEWF	PECV	SOLC
2019 DVb	72.00	65.667	72.00	64.00	65.50	68.00	65.00	63.667	61.333	60.00	62.50	59.05
2023 RRF	0.997	0.999	0.995	1.006	1.002	0.995	0.999	0.995	0.999	0.998	0.998	1.004
2023 DVf	71	65	71	64	65	67	64	63	61	59	62	59
2026 RRF	0.976	0.983	0.97	0.991	0.988	0.975	0.98	0.97	0.981	0.984	0.979	0.991
2026 DVf	70	64	69	63	64	66	63	61	60	59	61	58

Preliminary Future Ozone Design Values



2 monitors with **2023** DV above standard

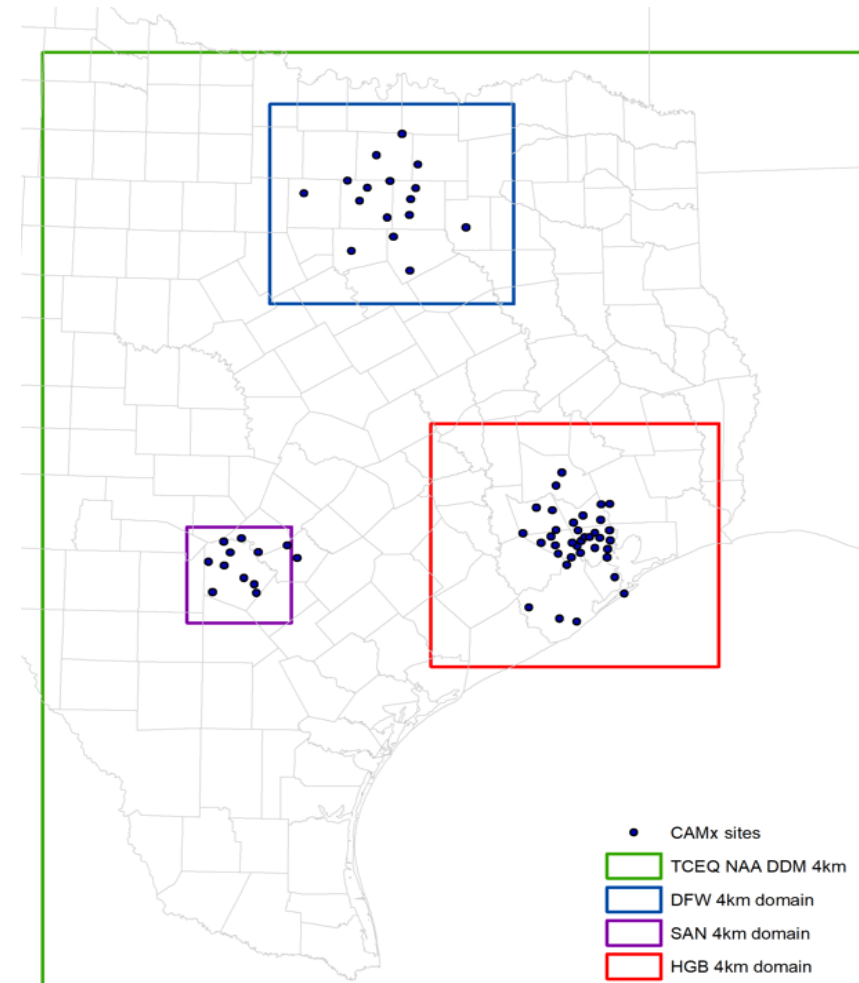
- BOER – Camp Bullis
- SAWC – San Antonio Northwest



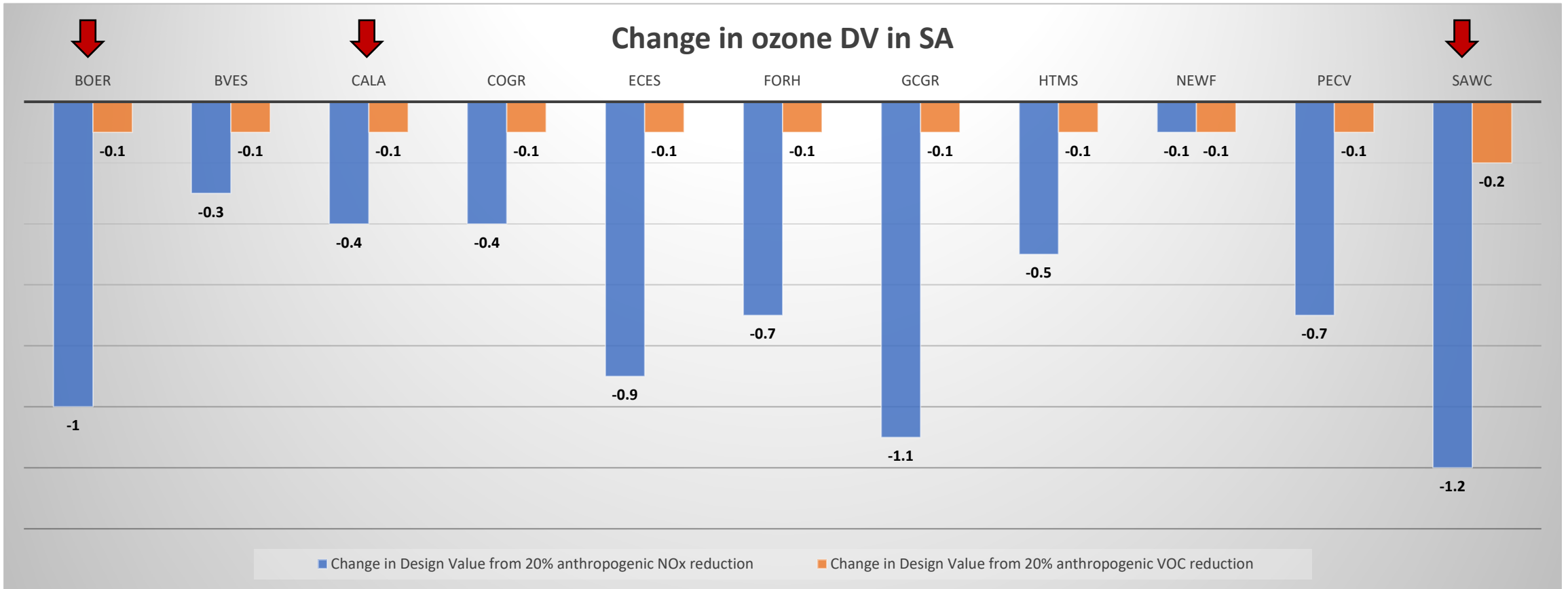
No monitors with **2026** DV above 70 ppb standard

Ozone Sensitivities – Set up

- Modeling for 2019 base case
- Three subdomains covering ozone nonattainment areas
- 20% reductions in anthropogenic NO_x and VOC emissions in each subdomain



Change in Ozone DVb in SAN (ppb)



NO_x reductions are more impactful than VOC.

On-line Modeling Resources

- Air Quality Modeling information
 - Air Quality Technical Information Meetings
 - Air Quality Research

<https://www.tceq.texas.gov/airquality/airmod/am>

- Preliminary 2019 Modeling Platform Files


FTP Host: amdaftp.tceq.texas.gov

FTP Username: anonymous

FTP Password : user's email address

FTP directory : /TX_O3/camx

Questions?

-  **air modeling data analysis**
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