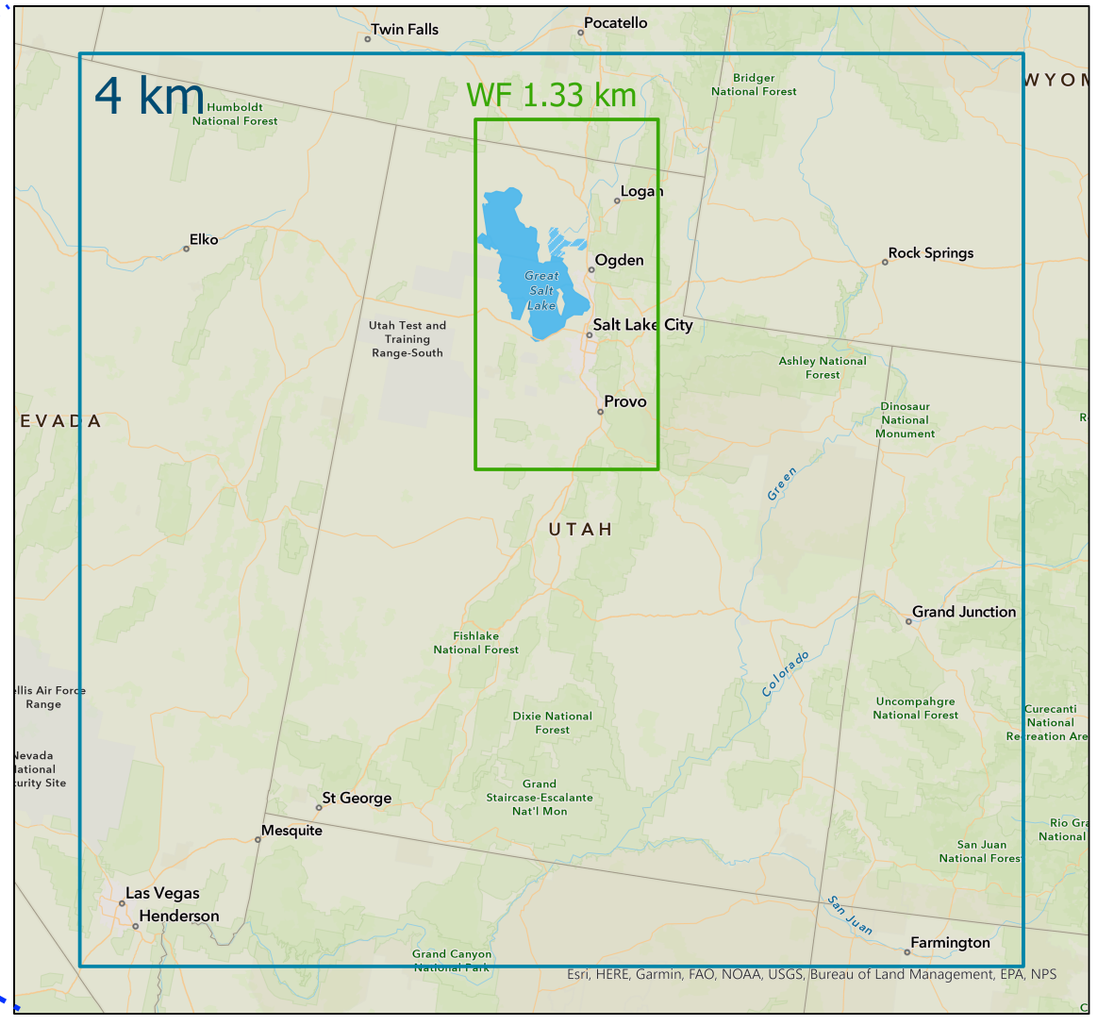
MODELING SUMMERTIME O3 FORMATION IN THE SALT LAKE VALLEY: MODEL PERFORMANCE & SENSITIVITY ANALYSES

NANCY DAHER
LEXIE WILSON, RACHEL EDIE, MARK SGHIATTI

UTAH DIVISION OF AIR QUALITY

MODELING DOMAINS



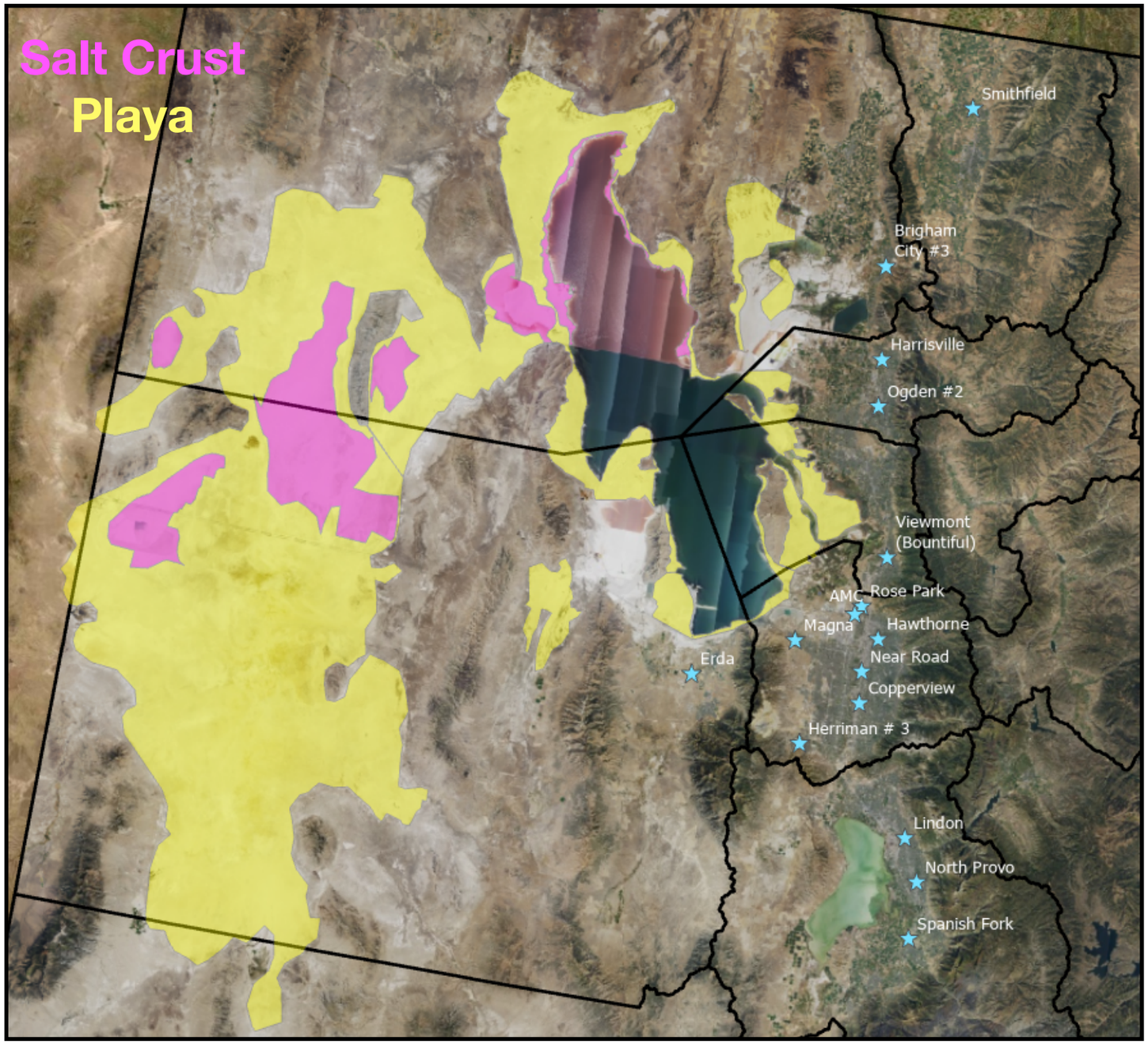
06/15-08/01 2017 Modeling Episode

MODEL CONFIGURATION

Photochemical Grid Model	CAMxv7.10
Grid Interaction	12 km one-way nest 4/1.33 km two-way nesting
Boundary/Initial Conditions	- from GEOS-CHEM12.9.3 for 12 km - from 12 km for 4/1.33 km
Gas Phase* Chemistry	cb6r5h
Meteorology	WRF 4.2 (Hybrid Vertical Coordinates)
Emissions Processing	SMOKE 4.7
On-road/Non-road Mobile	MOVES3
VCPs	2016 VCPy projected to 2017
Biogenics	Beis 3.6/Beld 4.1

***developed by Ramboll for UDAQ**

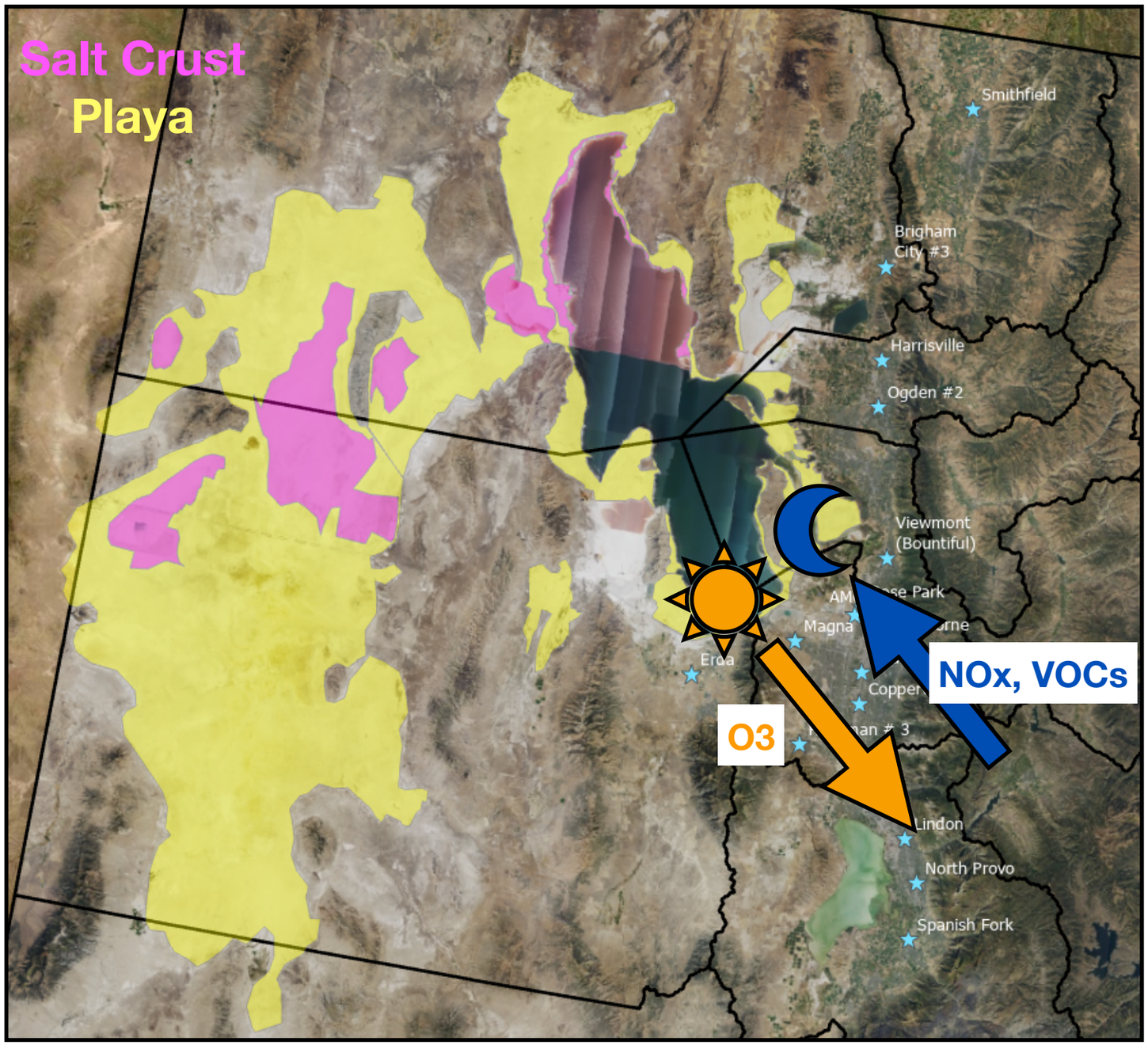
GREAT SALT LAKE: SURFACE ALBEDO MODIFICATIONS



Used Satellite Imagery + Measurements to:

- **Distinguish between Playa & Salt Crust**
- **Change UV albedo value from 8% to 69% (salt crust) & 34% (playa)**
- **Change Lake Extent & Depth**

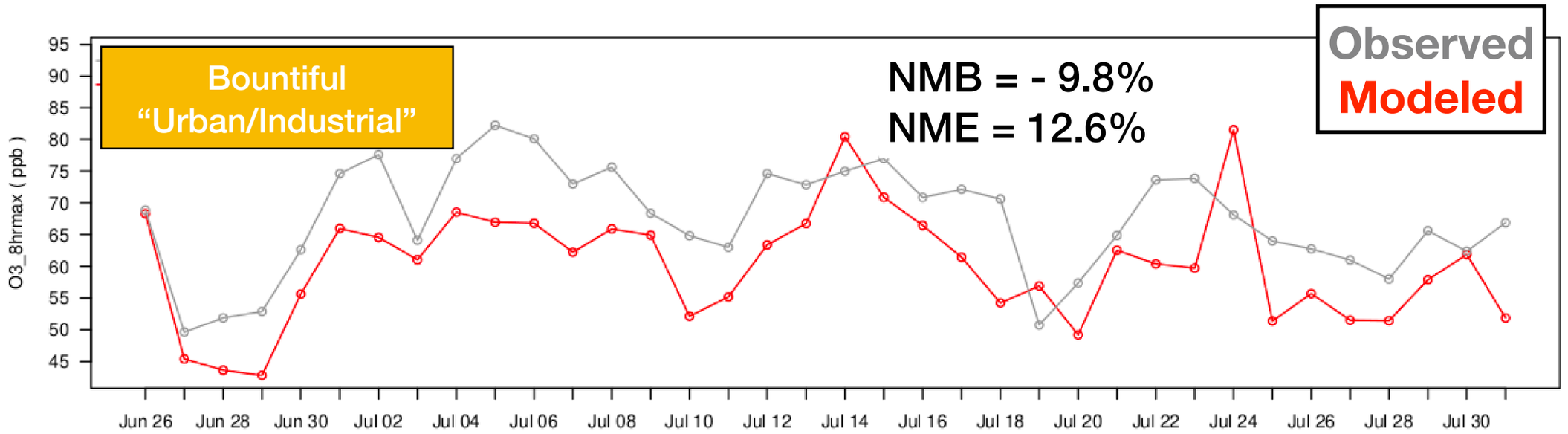
GREAT SALT LAKE: SURFACE ALBEDO MODIFICATIONS

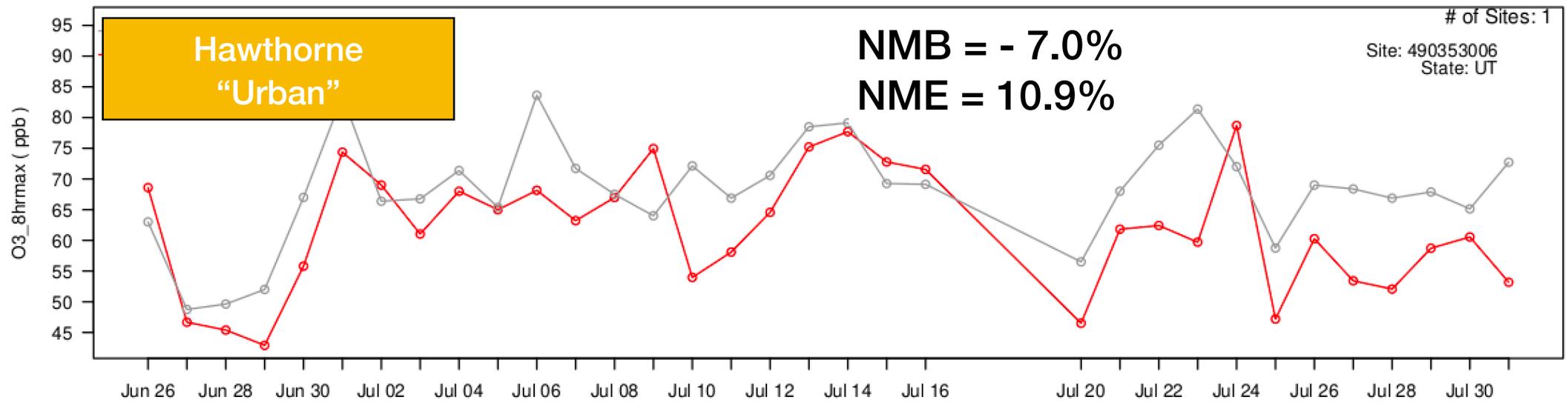


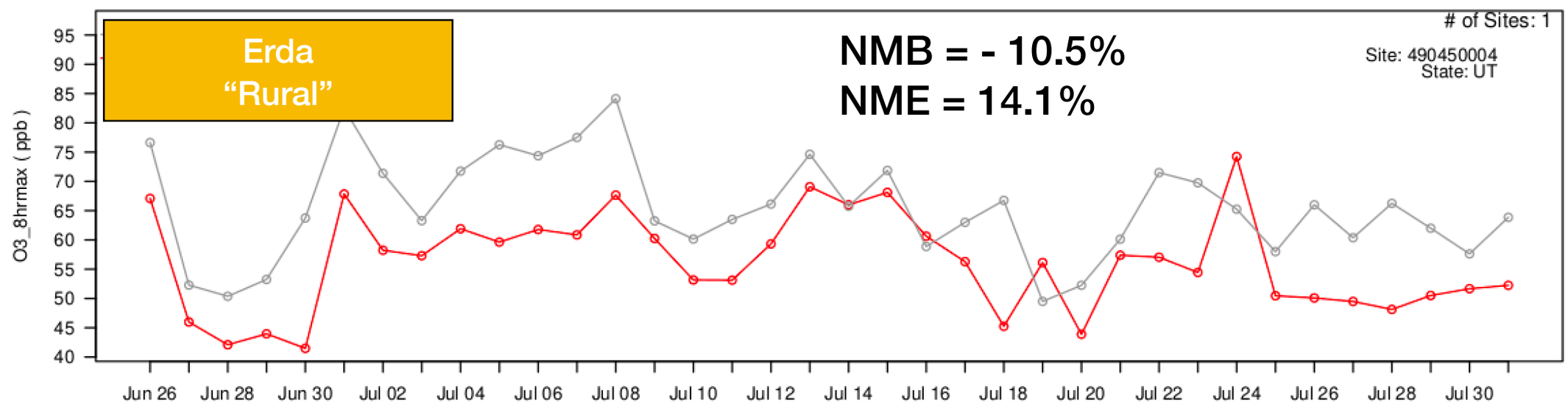
Used Satellite Imagery + Measurements to:

- **Distinguish between Playa & Salt Crust**
- **Change UV albedo value from 8% to 69% (salt crust) & 34% (playa)**
- **Change Lake Extent & Depth**

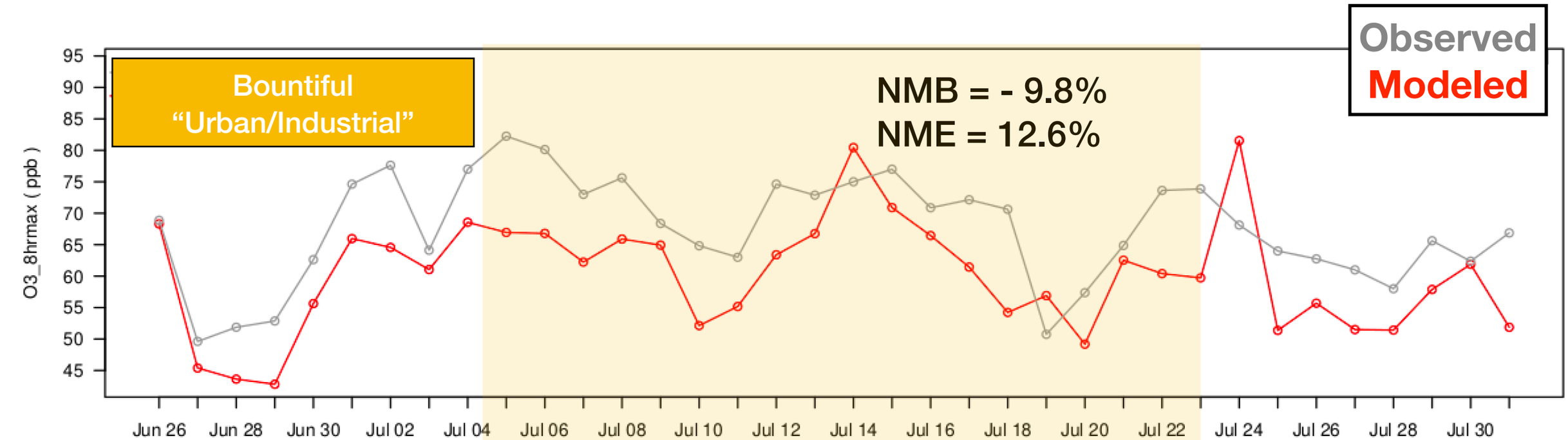
MODEL PERFORMANCE: MDA8O3 – TEMPORAL VARIATION

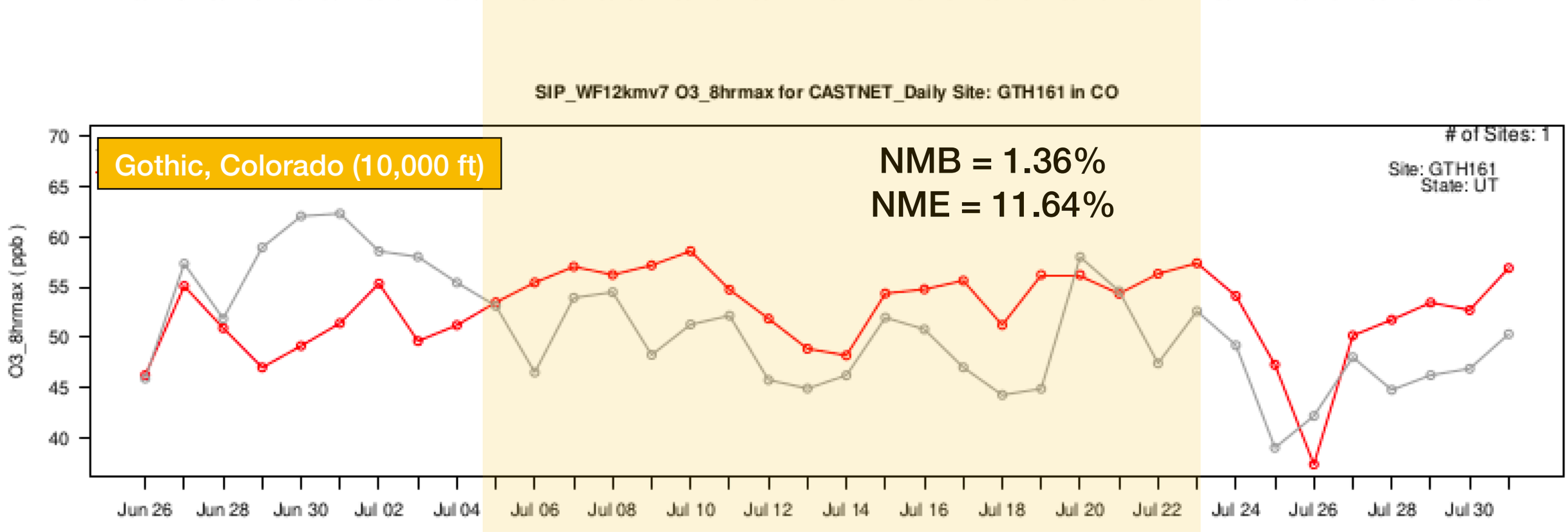




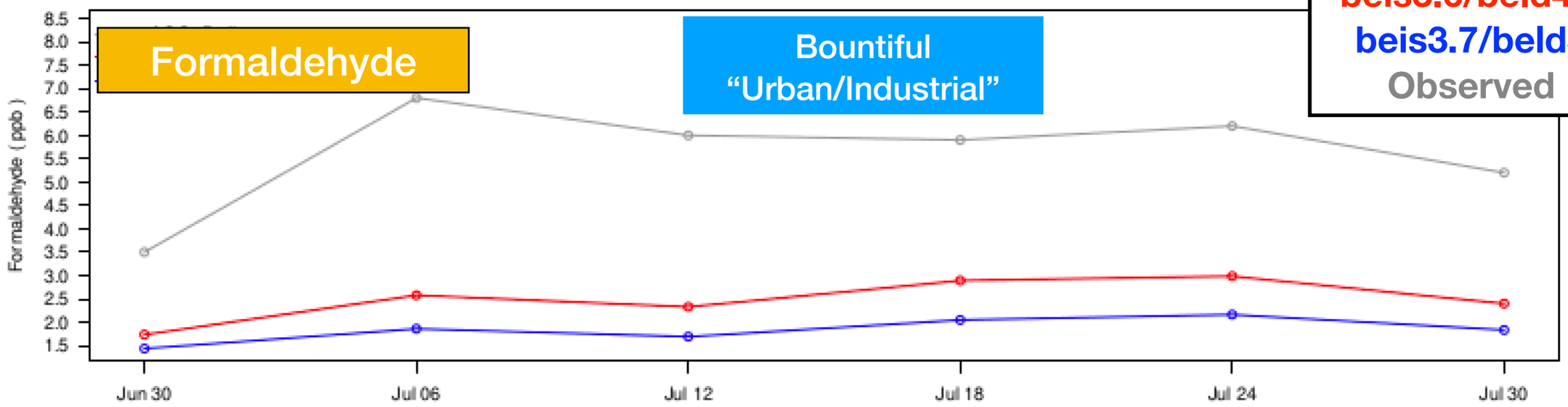


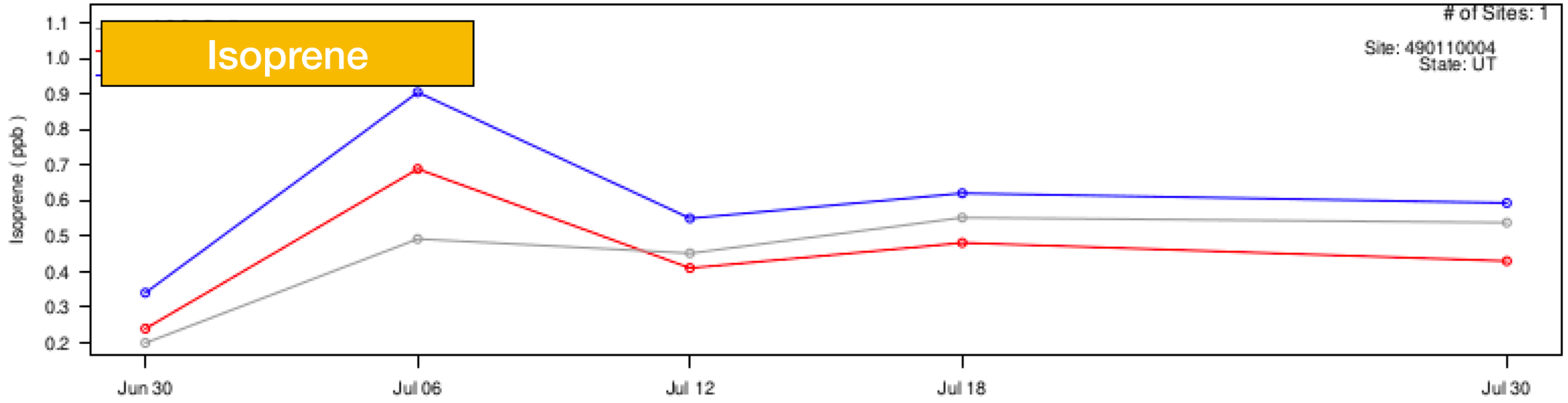
MODEL PERFORMANCE: MDA8O3 – BACKGROUND

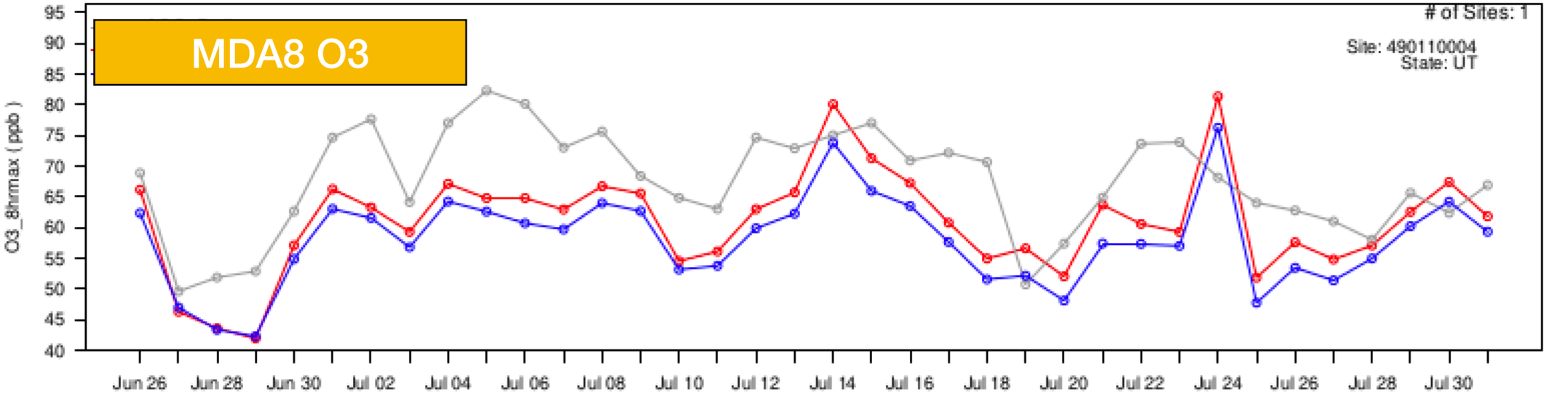




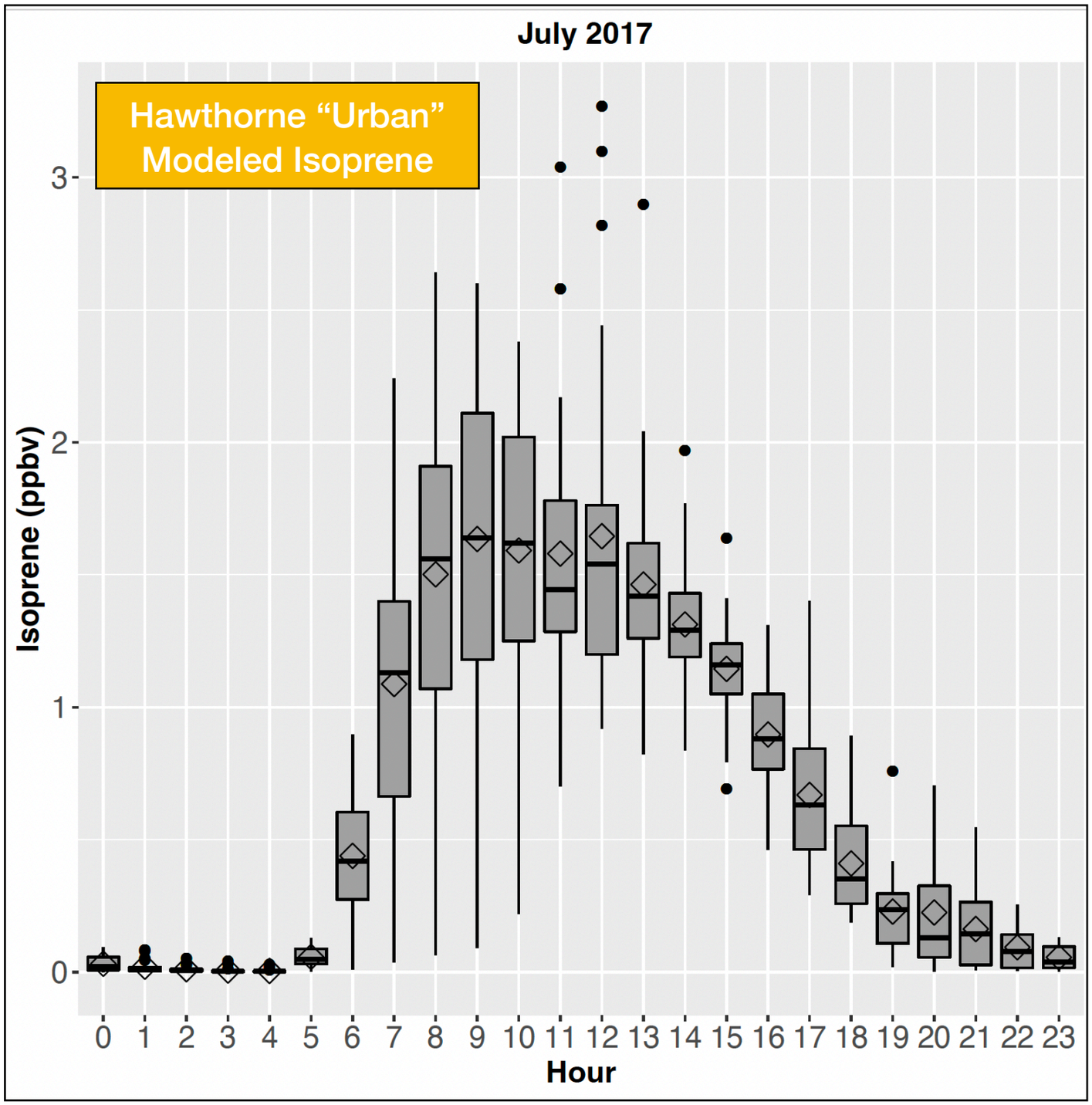
BIOGENIC VOCS: SENSITIVITY TO BEIS/BELD

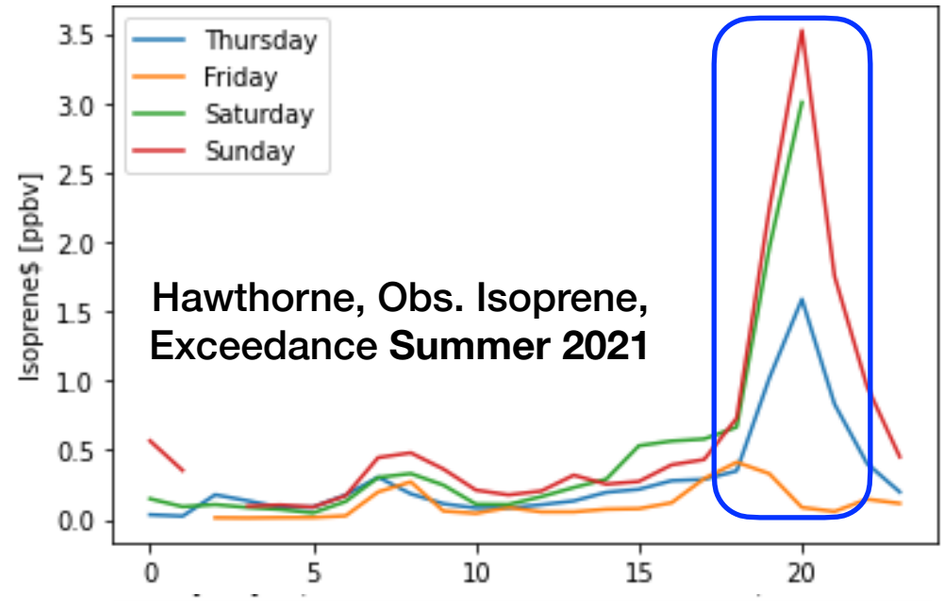


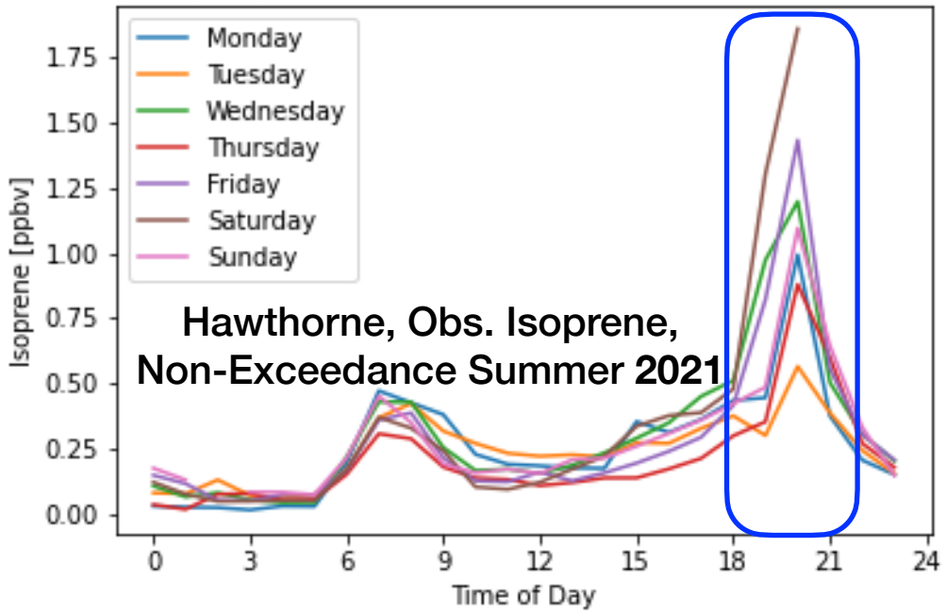


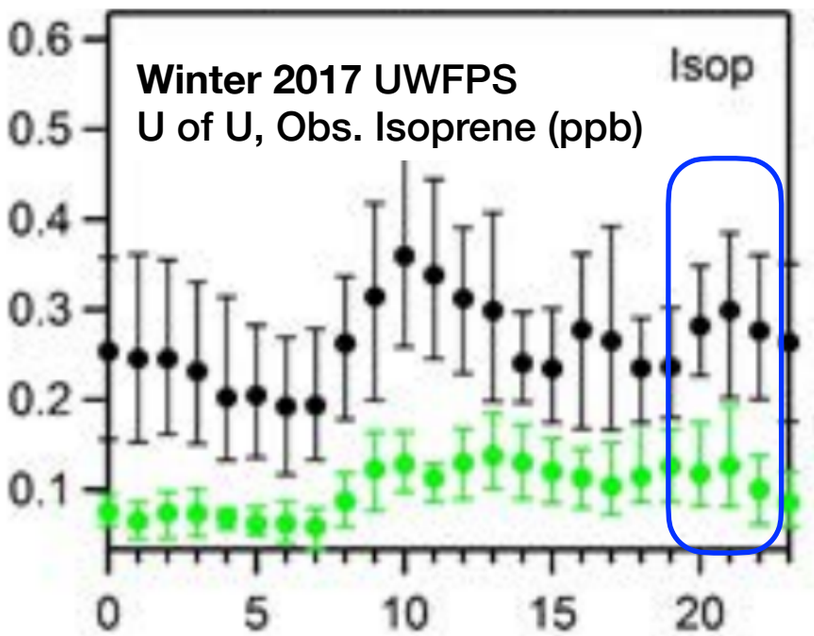


BIOGENIC VOCS: ISOPRENE







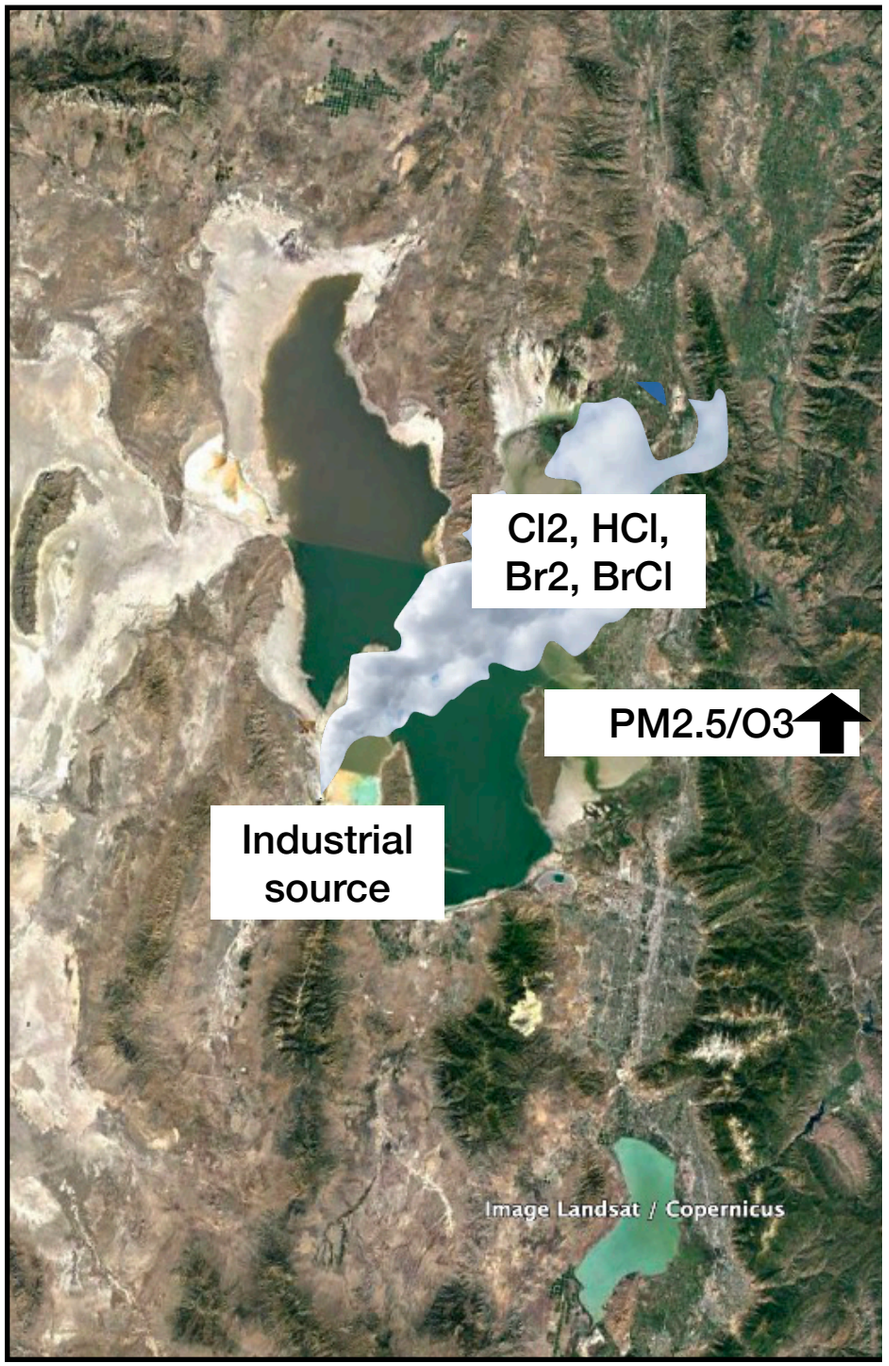


SENSITIVITY TO HALOGENS

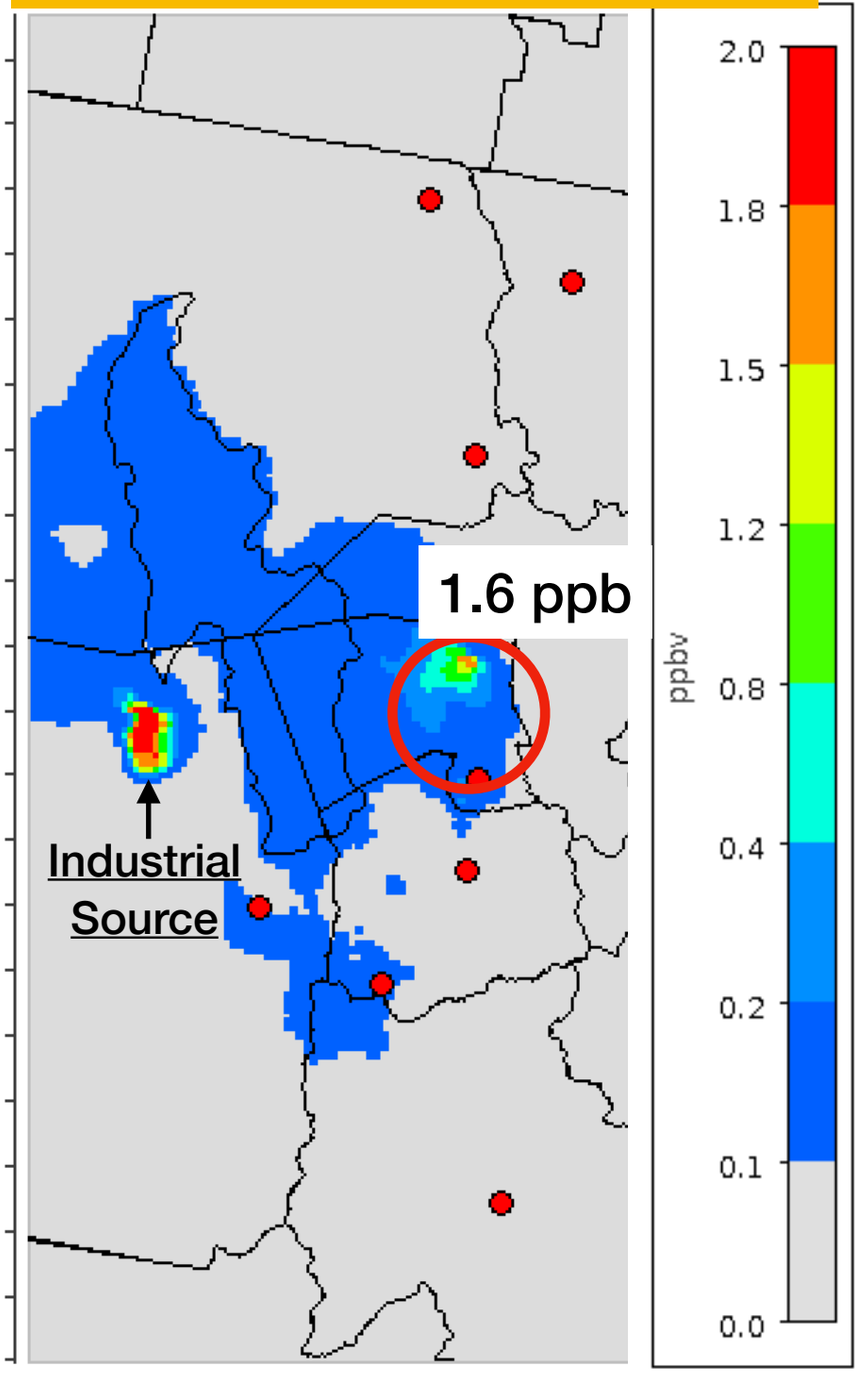
- NOAA's 2017 Aircraft Winter Measurements + Modeling showed
  - High levels of halogens from an industrial source W of Lake
  - These halogens contribute to winter O3/PM2.5 formation downwind
- Determined change in O3 formation between two CAMx runs: 1) with and 2) without halogens from the industrial source using cb6r5h

	Emission flux +/- one standard deviation (g/sec)
Cl2	85.66 +/- 131.75
HCl	51.40 +/- 60.02
Br2	5.51 +/- 7.86
BrCl	30.09 +/-41.17

NOAA. 2017 Utah Winter Fine Particulate Study



(with - without Halogens) MDA8O3
Typical O3 Exceedance Day

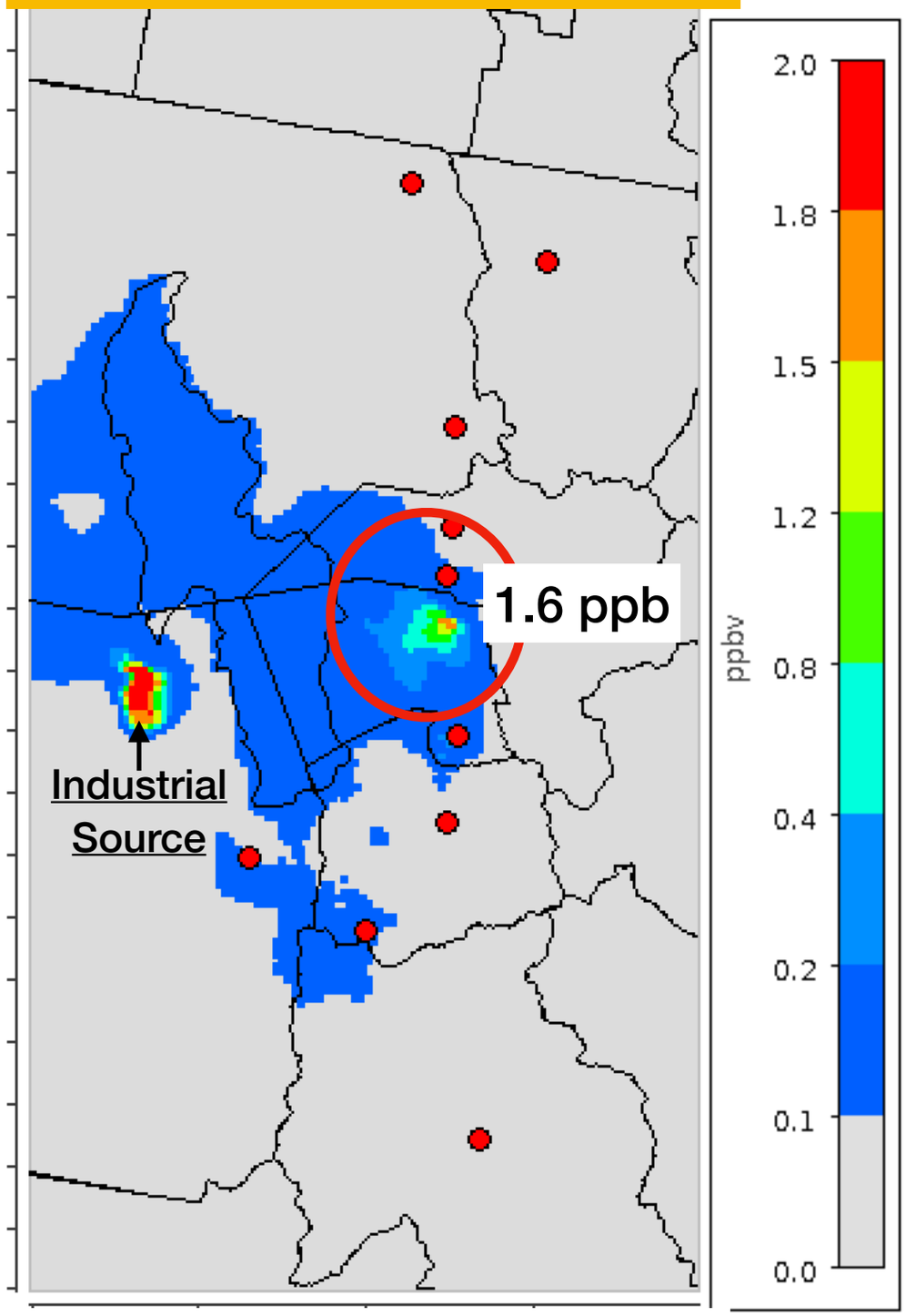


Red dots are monitoring stations

SENSITIVITY TO HALOGENS

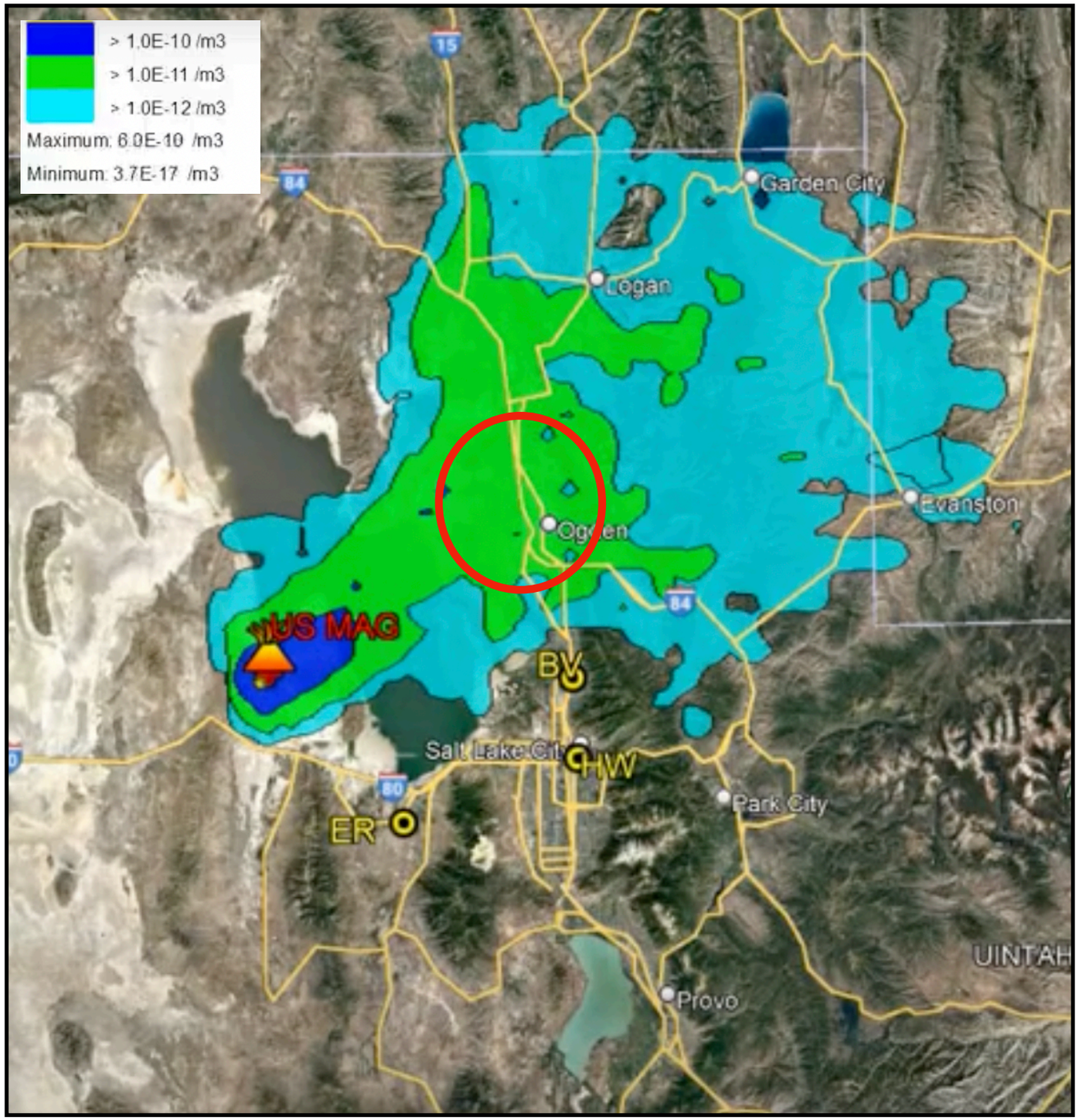
July 13 2017
Typical O3 Exceedance Day

(with - without Halogens) MDA8O3



Red dots are monitoring stations

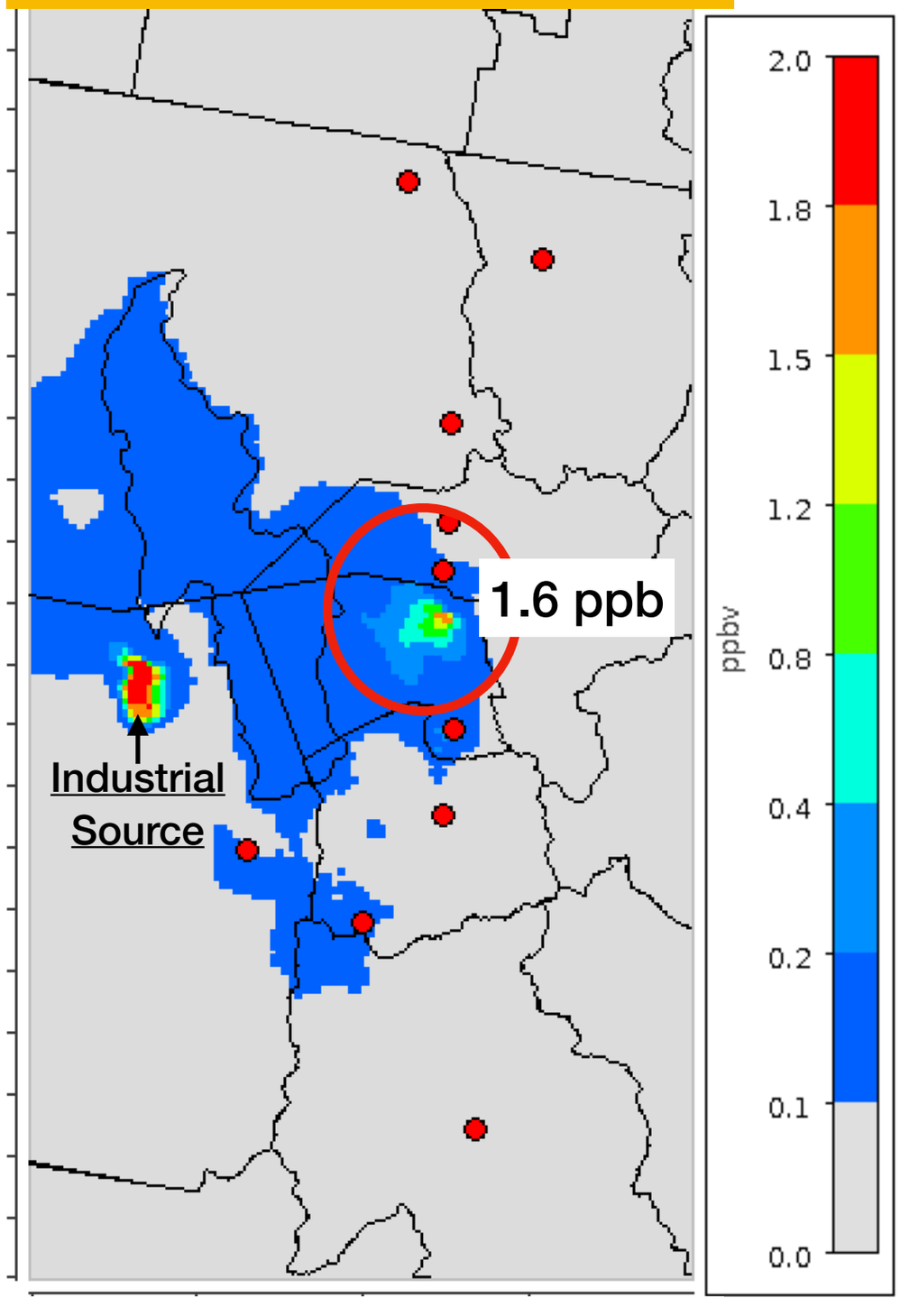
HYSPLIT DISPERSION ANALYSIS



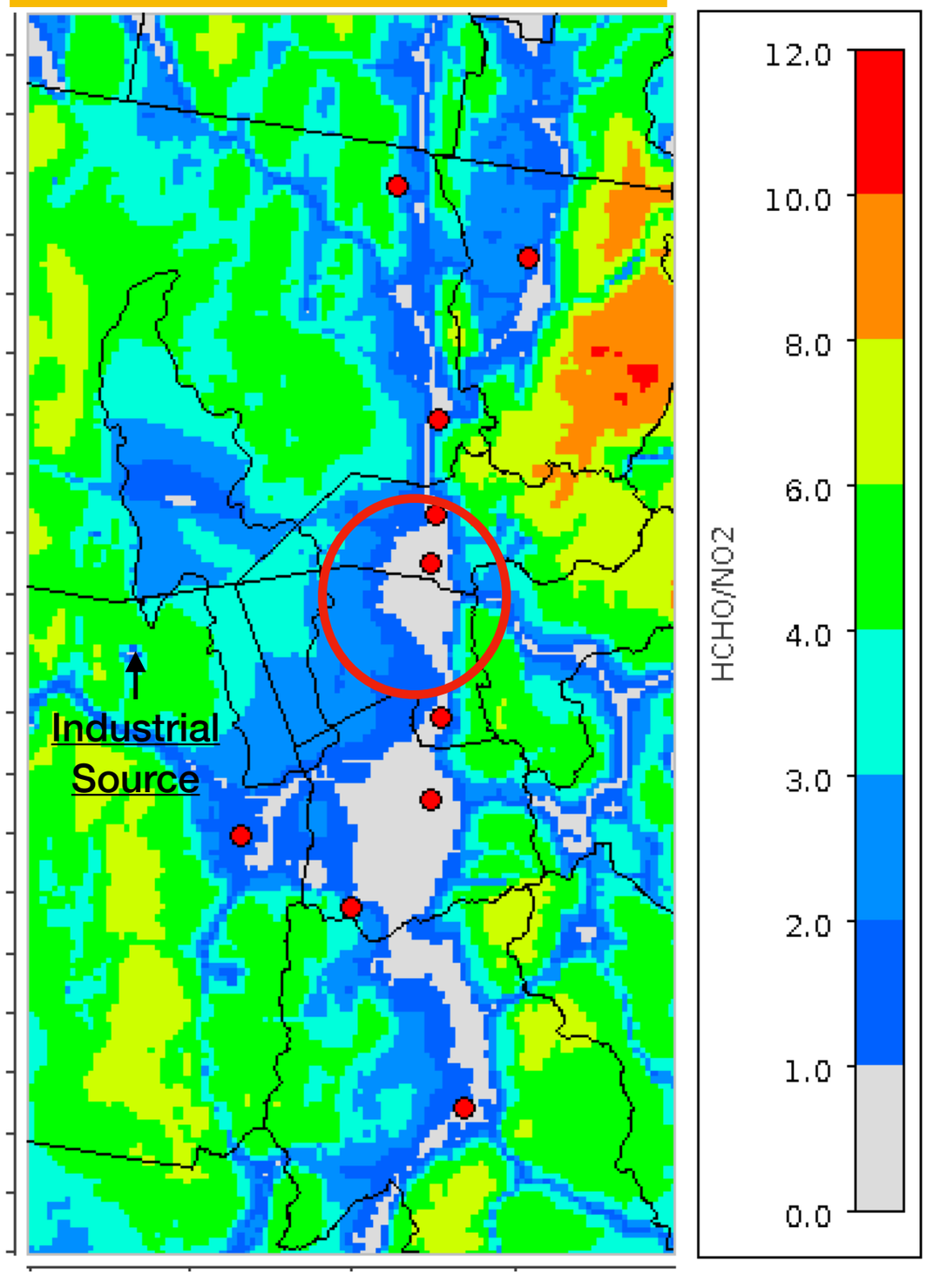
SENSITIVITY TO HALOGENS

July 13 2017
Typical O3 Exceedance Day

(with - without Halogens) MDA8O3



Mean Formaldehyde/NO2 Ratio



Red dots are monitoring stations

FINDINGS AND IMPLICATIONS

- Temporal Variation in O3 Overall Well Replicated
- Underestimation in Local Ozone Production
  - Overall underestimation in Formaldehyde/Isoprene
  - Misrepresentation of Isoprene
- Halogens from Industrial Source Impacting Downwind Chemistry

THANK YOU

ndaher@utah.gov