Impact of Lake Breezes on Ozone Concentrations Near The Great Salt Lake from 2015-2020

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Background

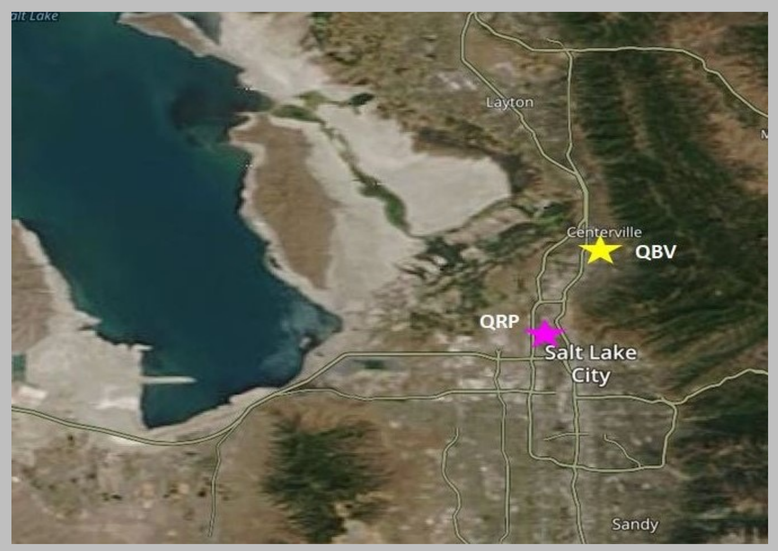
- 2015 Great Salt Lake (GSL) Ozone & 2017 Lake Michigan Studies
  - *Both have:*
    - Favorable meteorological conditions for high ozone events
    - Pronounced diurnal ozone cycles
    - Lake breezes
    - Elevated ozone levels during the summer months
  - *These two locations differ in topography*

Objectives

- Analyze data and report ozone concentrations >80ppbv
- Investigate causes and meteorological conditions that impact elevated ozone concentrations in the GSL
- Observe trends and patterns of high ozone events from 2015-2020 in the GSL Area

Data Collection & Methods

- Time Period: May 2015 – September 2020
- Source: Utah Division of Air Quality (DAQ)
- Observations:
  - Bountiful (QBV) - Located E of the GSL
  - Rose Park (QRP) - Located in a metro area SE of the GSL
  - Hourly observations
- Method: MesoWest Utah Air Quality – Time Series Interface
  - Real-time, fixed site data collection
  - Processed in MesoWest database
  - Data synthesized on: (https://utahaq.chpc.utah.edu/aq/)



Ozone Days > 80ppbv Annually

Year	Bountiful (QBV)	Rose Park (QRP)
2015	11	--
2016	9	--
2017	40	--
2018	14	19
2019	6	7
2020	13	13
2021	6	7

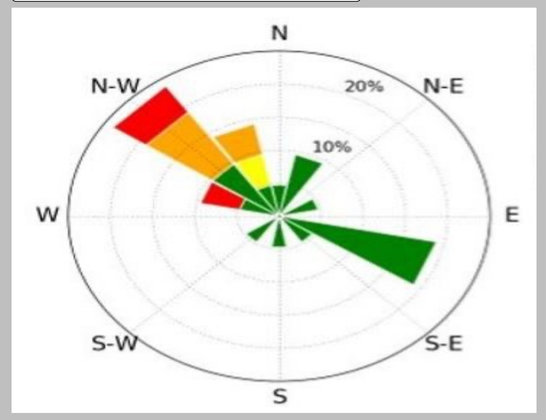
Ozone Days > 95ppbv Annually

Rose Park (QPR) Date	Ozone (ppbv)
Jun 27, 2018	104
Jul 6, 2020	101
Jun 13, 2018	99
Jul 13, 2018	98
Aug 10, 2018	96
Jul 12, 2021	95

Bountiful (QBV) Date	Ozone (ppbv)
Aug 29, 2017	120
Jun 24, 2015	108
Aug 4, 2016	106
Jul 5, 2017	105
Jun 27, 2018	101
Jul 31, 2020	100
Jul 8, 2017	99
Jun 13, 2018	99
Aug 21, 2020	98
Aug 22, 2020	98
Jul 6, 2017	97

Lake Breeze Case Study: June 27, 2018

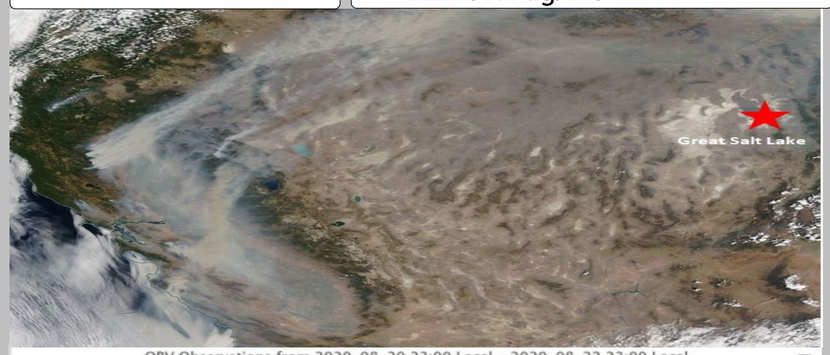
At QBV:
- 101ppbv at 1500 MDT

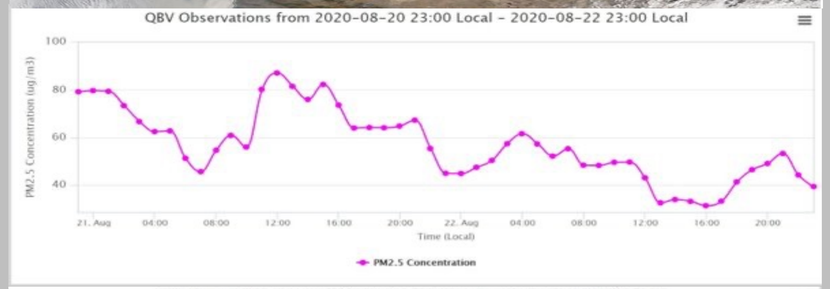


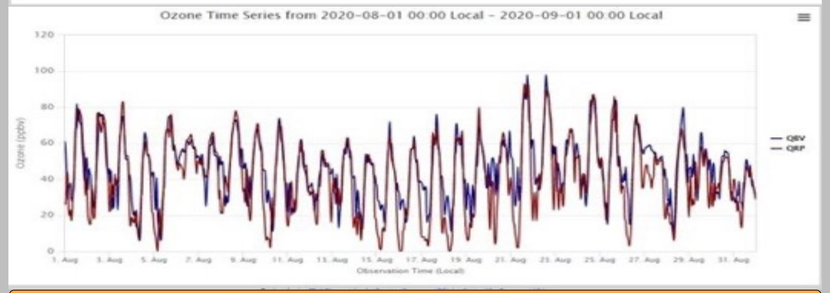
Wildfire Case Study: August 21 & 22, 2020

At QBV:
- 98ppbv at 1800 MDT

PM2.5 Concentrations:
- Max: 87.1 ug/m3
- Min: 31.4 ug/m3







Summary & Future Work

- Prevailing meteorological conditions and geography have direct impacts on ozone in the GSL area
- Ozone peaks between June-August
- QBV averaged ~14 episodes >80ppbv annually
- Worst Ozone Season:
  - 2017 with 40 days above 80ppbv
- Causes:
  - Lake breeze and local processes (June Case Study)
  - Smoke from distant wildfires (August Case Study)
- This study helps to prepare for a Summer 2022 field study on high ozone periods in the GSL area sponsored by DAQ

References & Acknowledgements

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