

BAROMETRIC CONTROL OF LANDFILL VACUUM: LESSONS LEARNED

NW SWANA 2021

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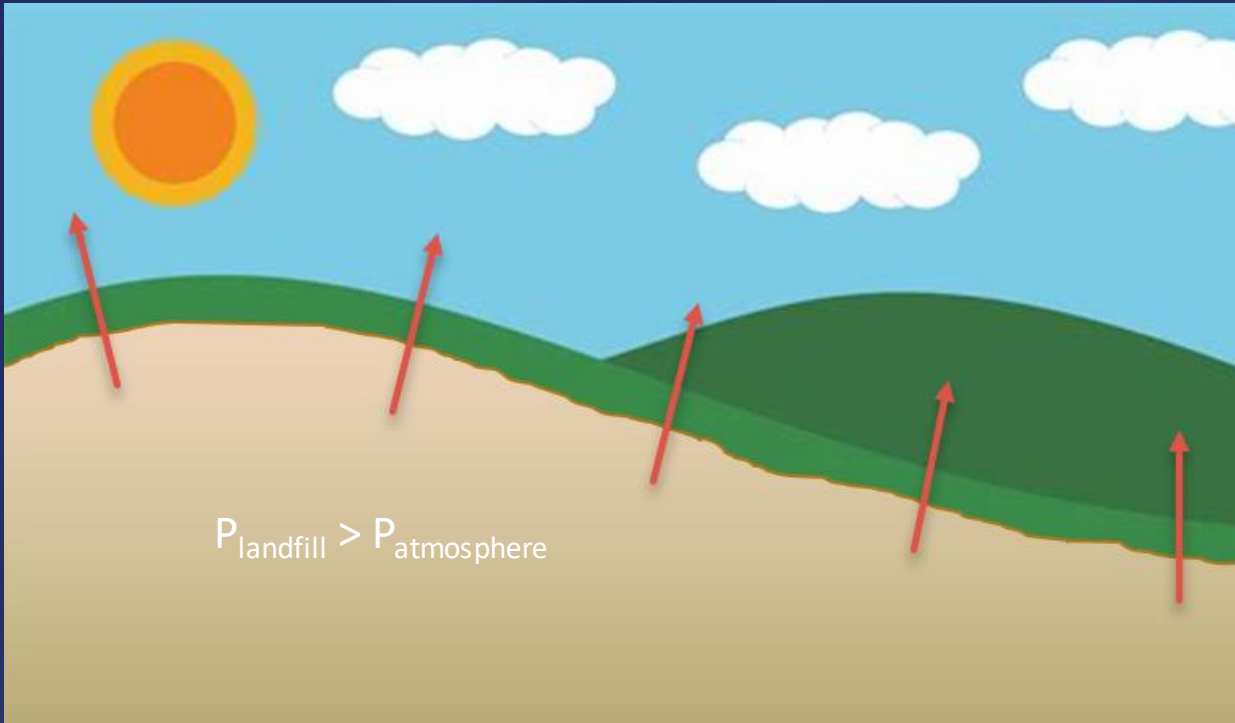
OUTLINE

- Background
- Theory for barometric control
- Implementation
- Results
- Lessons learned

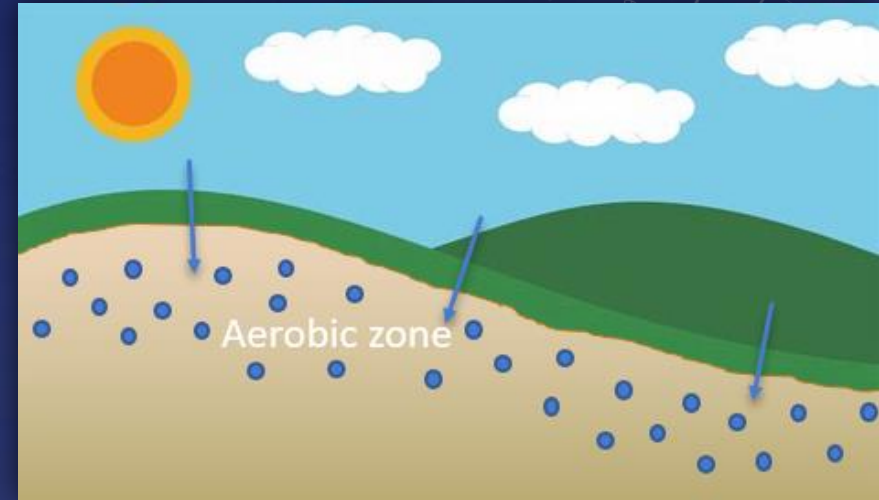
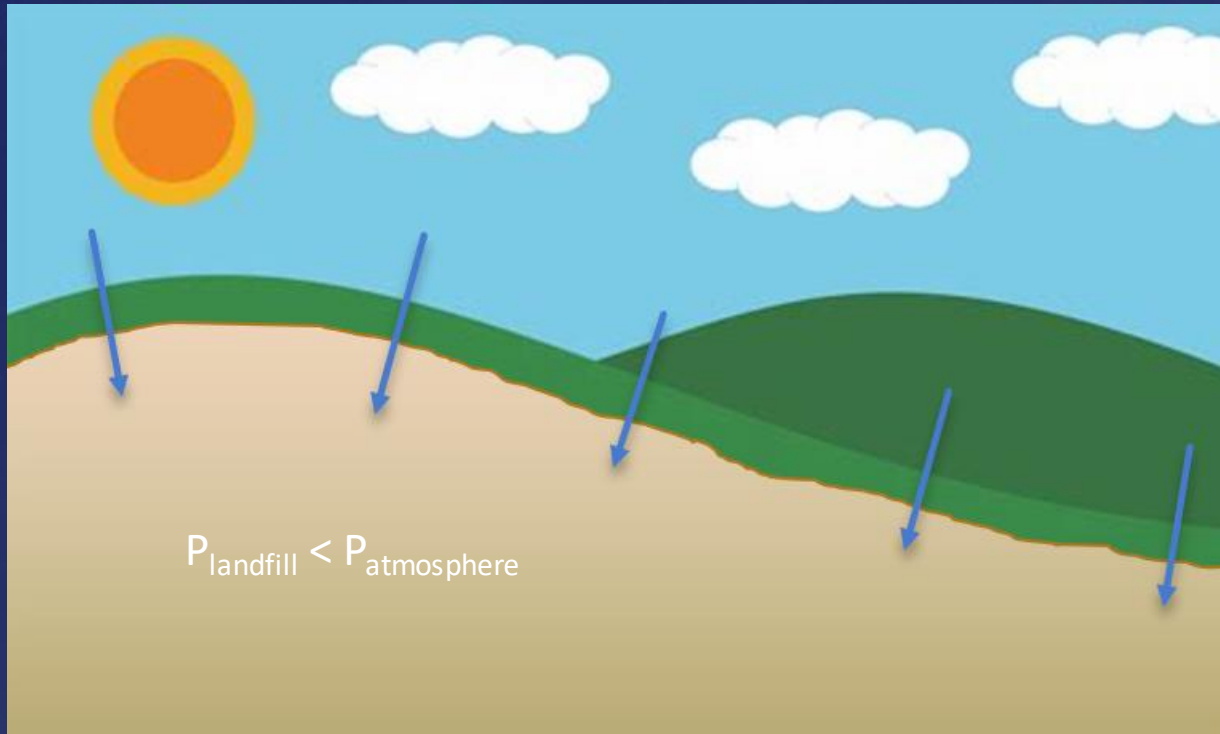
BACKGROUND

- Atmospheric Pressure Effects on the landfill
 - Fugitive emissions (environmental concern, lost revenue for biogas utilization project)
 - Air intrusion (safety concern, possible downstream process concerns (RNG), dilution of engine fuel, aerobic zones)
- Goal:
 - Minimize above consequences
 - Improve gas quality, safety, environmental concerns, and biogas utilization

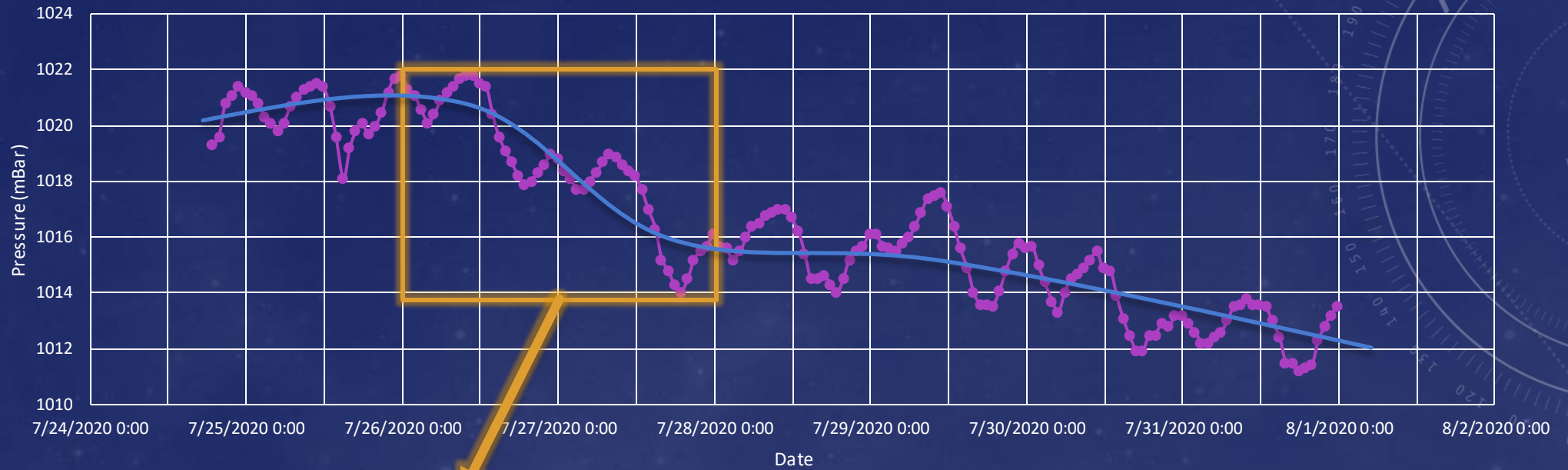
FUGITIVE EMISSIONS



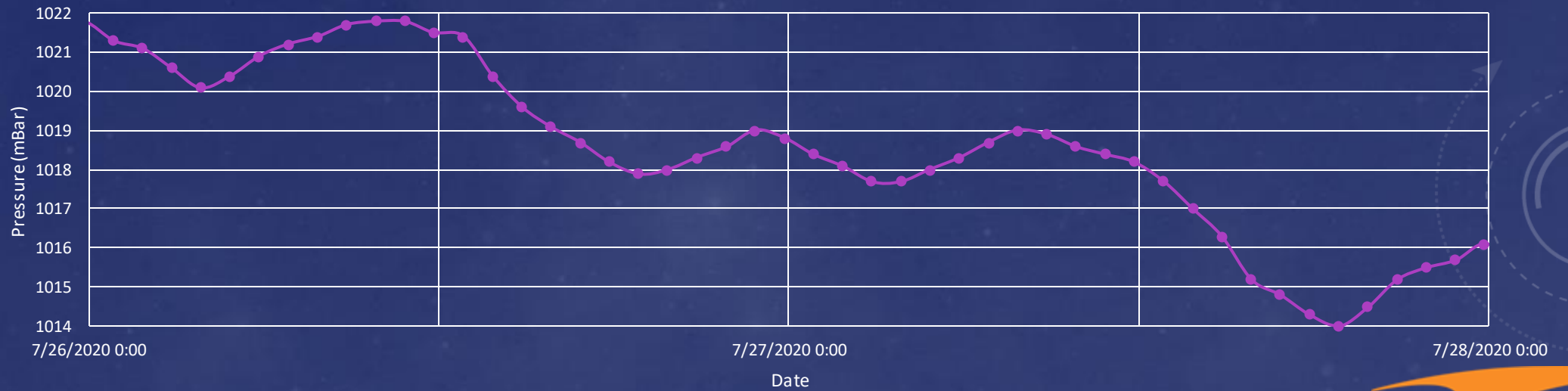
AIR INTRUSION



Athens Barometric pressure



Athens Barometric pressure

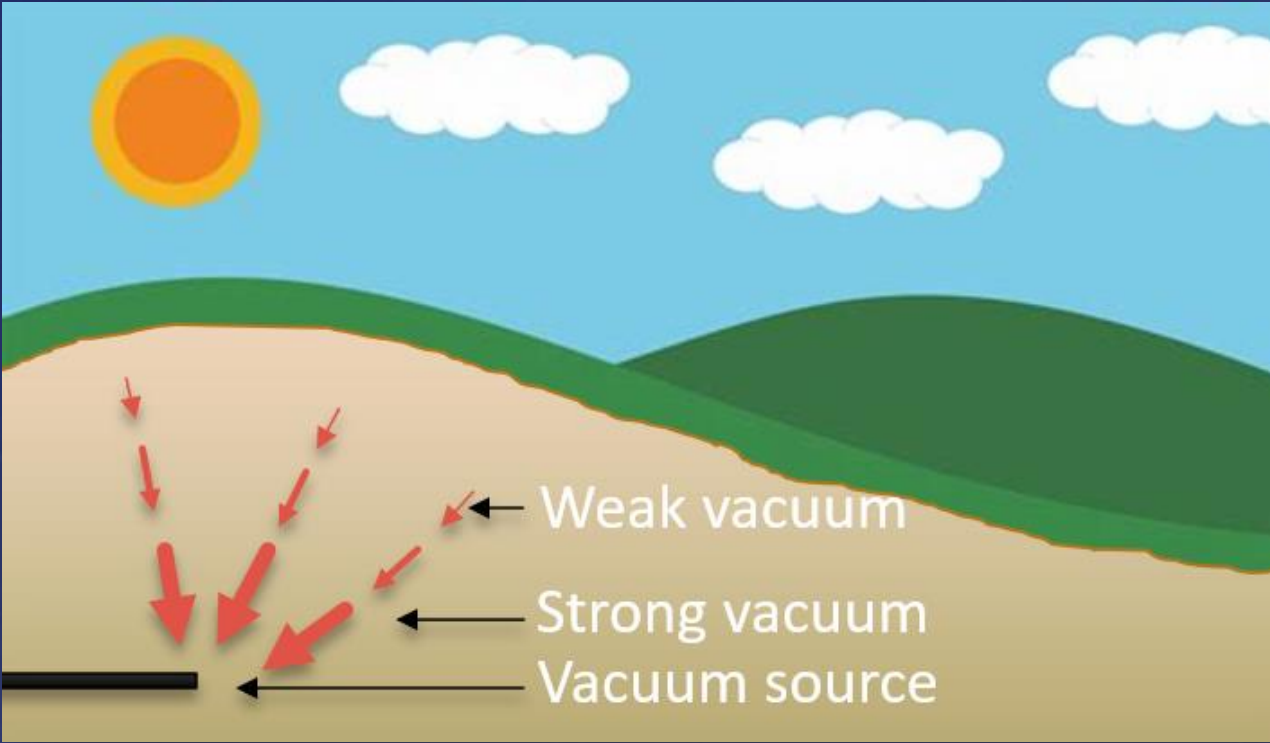


THEORY FOR BAROMETRIC CONTROL



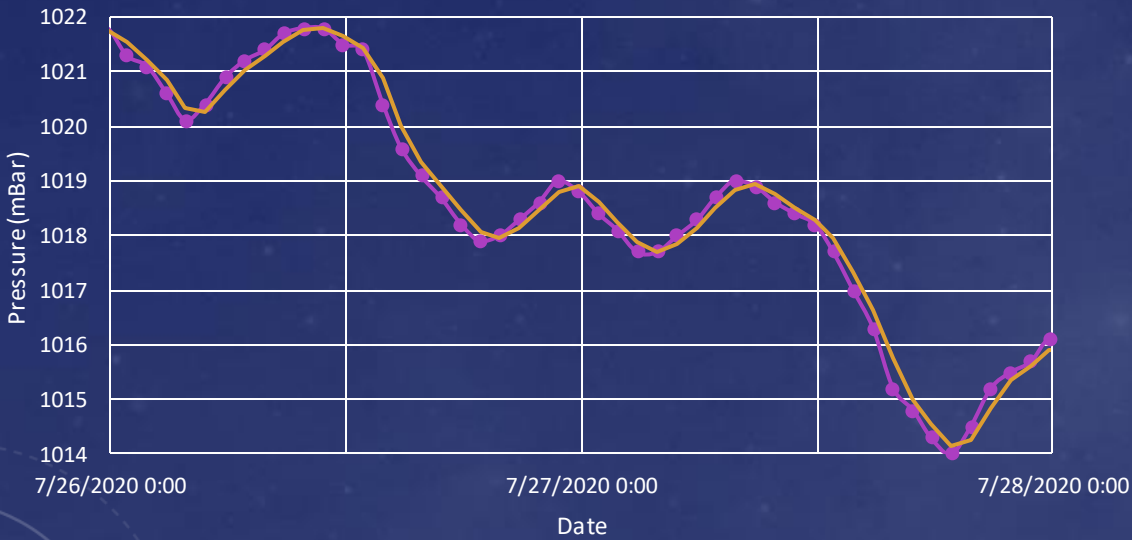
- Building on work done by Richard W. Prosser in his paper “The Effects of Atmospheric Pressure on the Availability of Gas from a Landfill” (1995- GC Environmental)

PRESSURE GRADIENT

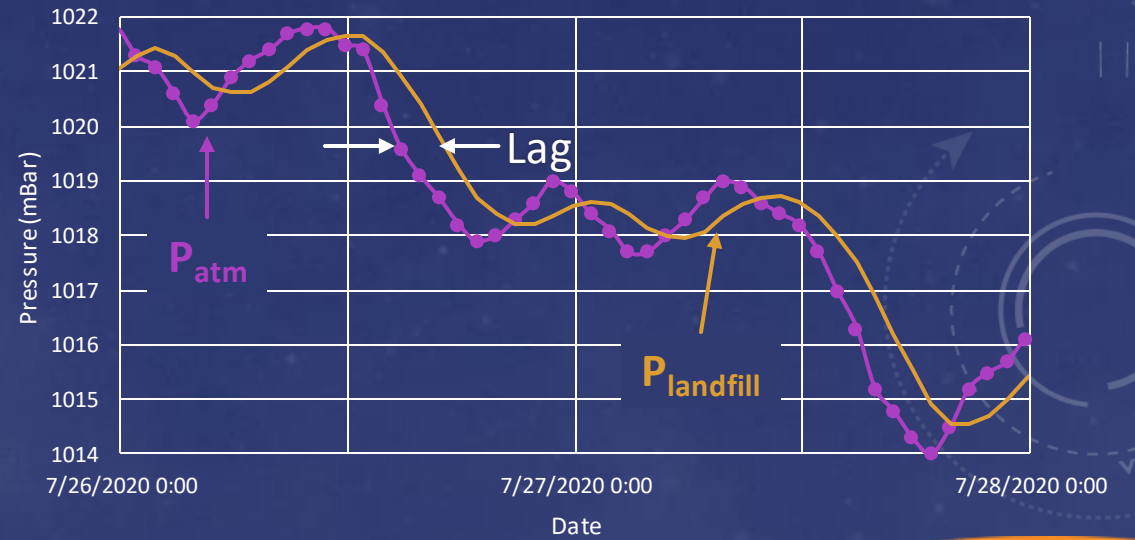


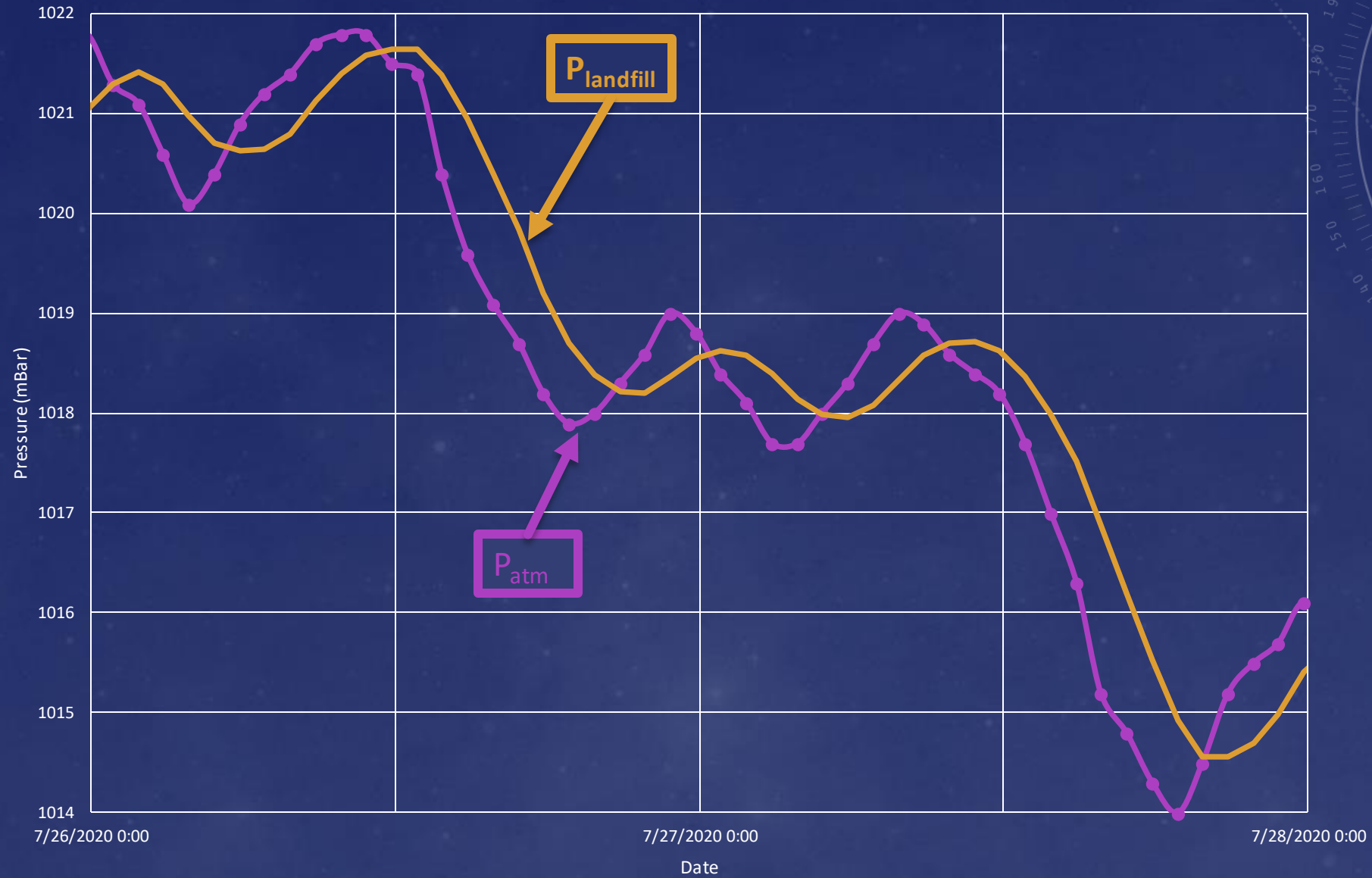


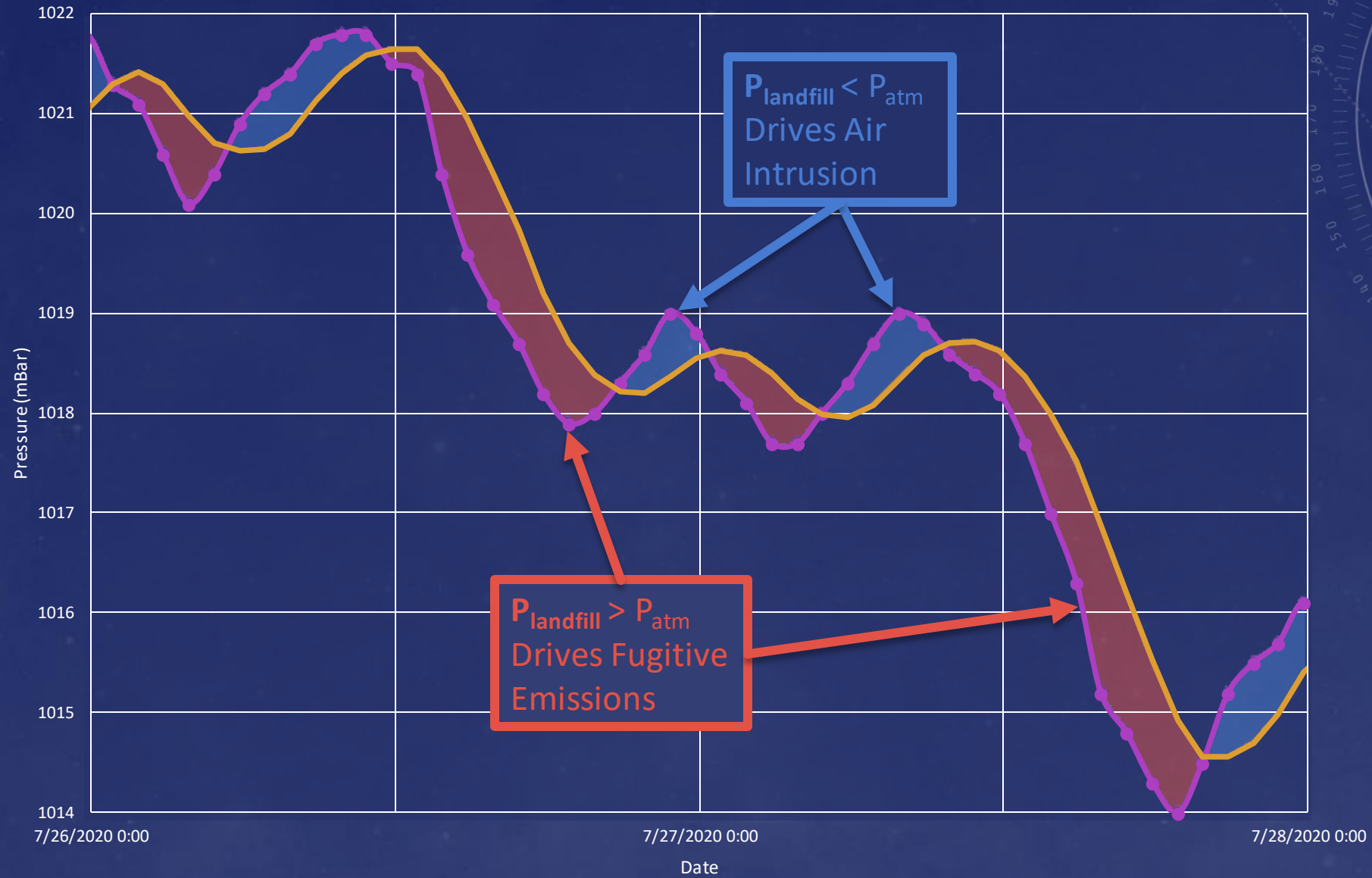
Loose Cover Lag



Tight Cover Lag







THEORY FOR BAROMETRIC CONTROL

- Adjust wellfield vacuum based on barometric fluctuations
 - Decrease vacuum during pressure rise
 - Increase vacuum during pressure fall



IMPLEMENTATION

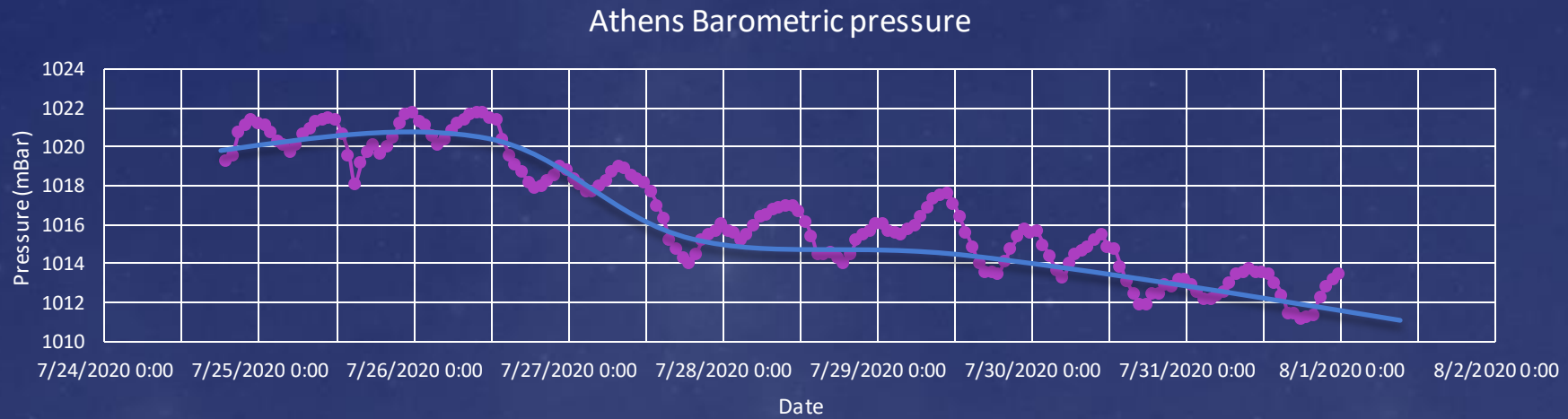
- Instrumentation
 - Absolute pressure sensor
 - Small range (800-1100 mBar)
 - Care to not put it in a pressurized building or cabinet

Vaisala BAROCAP[®]
Barometer PTB110 Series



IMPLEMENTATION

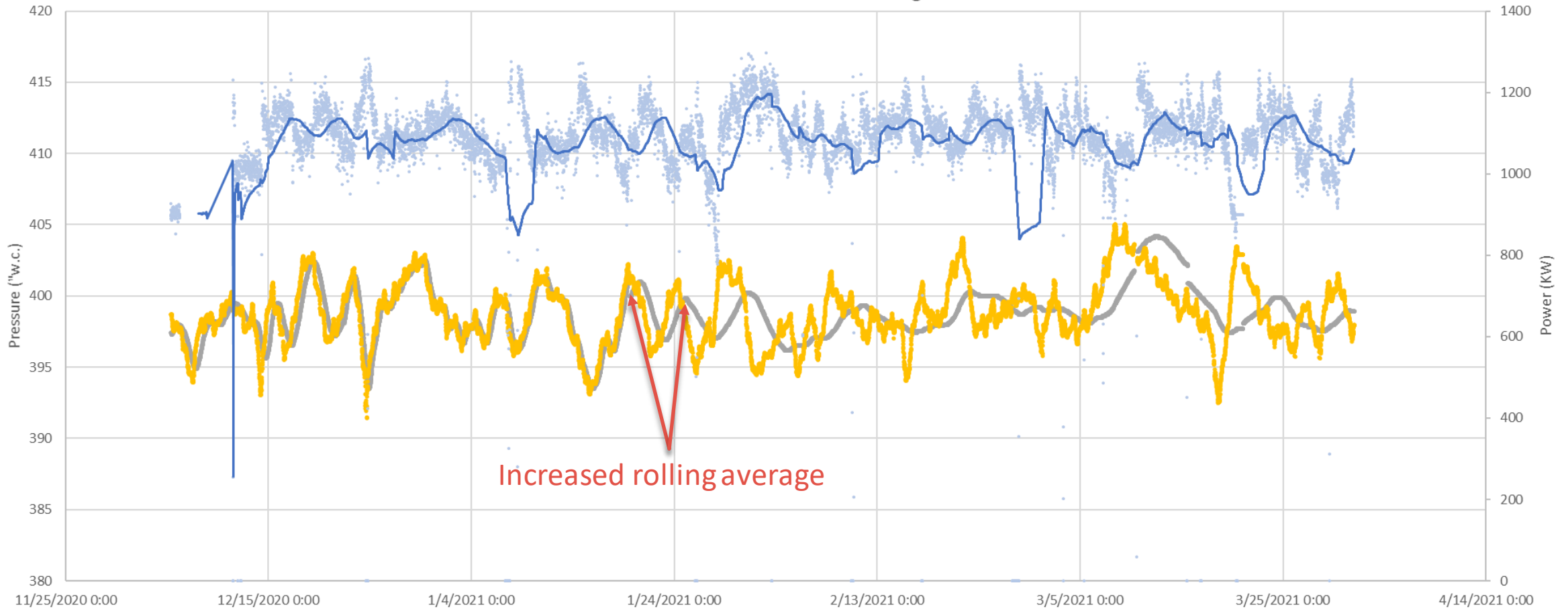
- Programming
 - Integrate into existing vacuum control (flare, engine plant, RNG upgrader)
- Comparing barometric pressure to a baseline
 - Rolling average



RESULTS

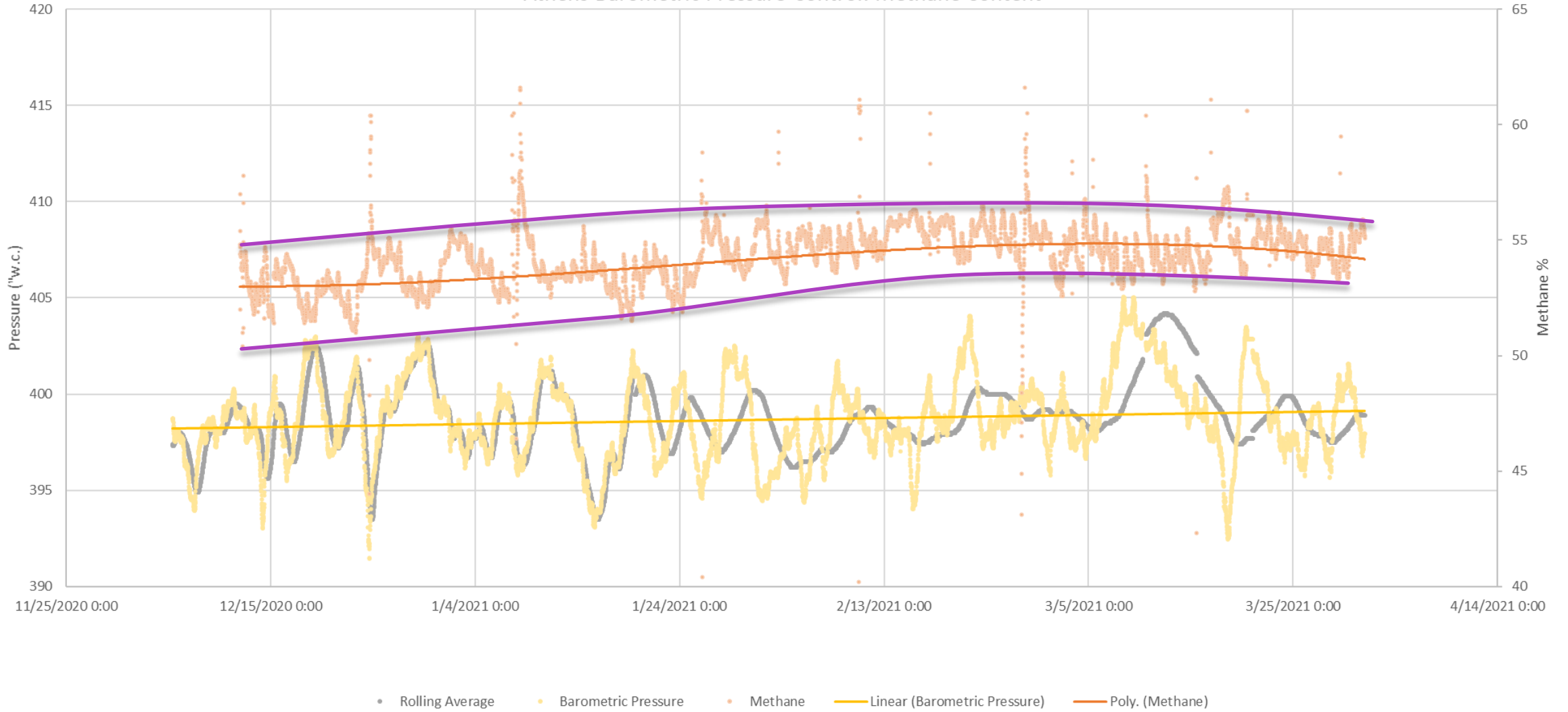
- Slight Increase in power production 25 kW
- Increased average CH₄ % by 1.5% by volume
- Cut CH₄ swings in half
- Decreased average O₂% to 0.25% by volume
- Cut O₂ swings in half

Athens Barometric Pressure Control: Engine Power

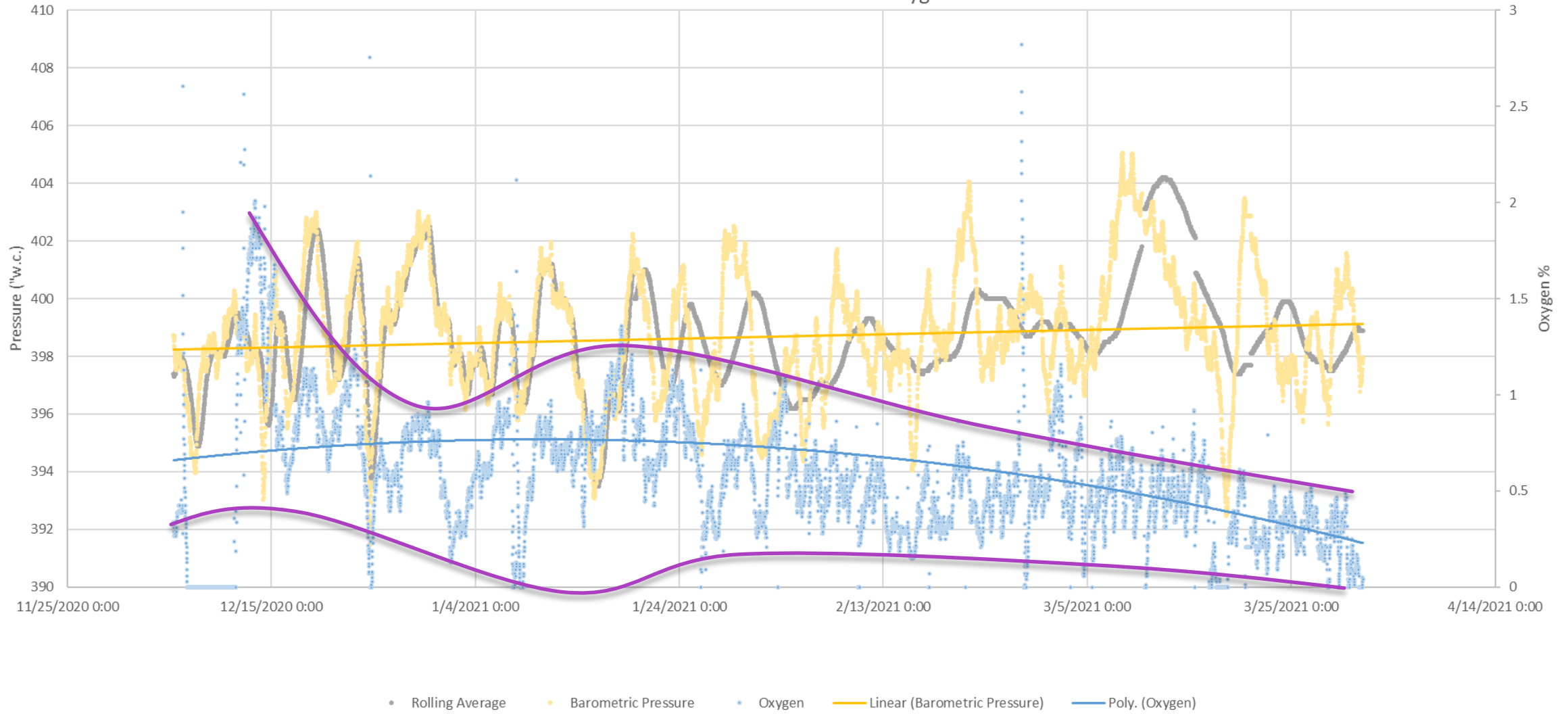


• Rolling Average • Barometric Pressure • Genset Power — 255 per. Mov. Avg. (Genset Power)

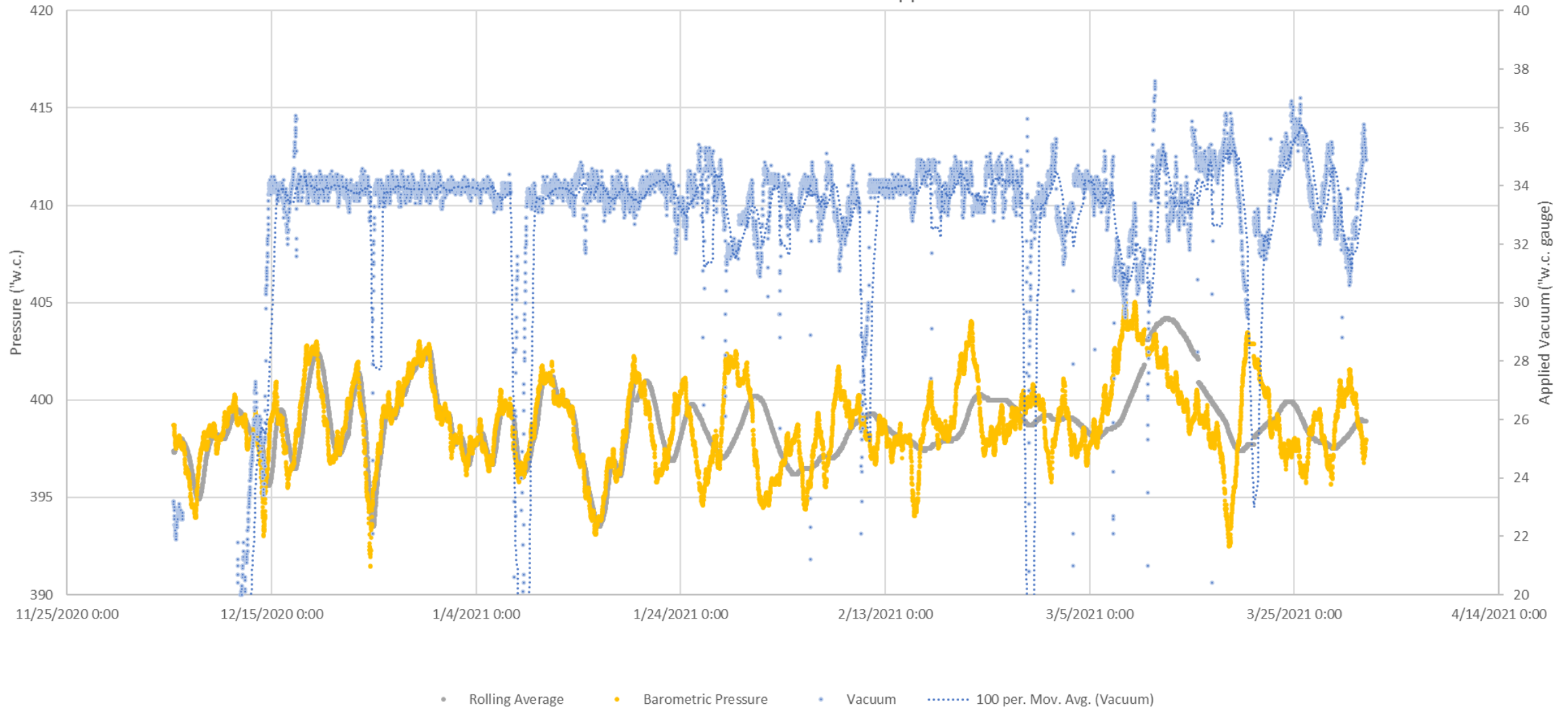
Athens Barometric Pressure Control: Methane Content



Athens Barometric Pressure Control: Oxygen Content



Athens Barometric Pressure Control: Applied Vacuum



LESSONS LEARNED

- Big picture look at barometric swings
- Programming in safeties

QUESTIONS