The Metroplex Overflight Noise Analysis (MONA) System: Implications for Noise Metrics Investigations

Noise Metrics and Impacts: Thinking Beyond DNL

Panel Presentation

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Juan J. Alonso and the MONA Team

Department of Aeronautics & Astronautics

Stanford University

Intro Remarks & Disclaimer

- Work presented here is a result of joint efforts of the MONA team
  - Don Jackson, Tom Rindfleisch
  - A number of Stanford graduate and undergraduate students over the past 4 years including Nick Bowman, Brian Munguía, Sanjaye Narayan, Aditeya Shukla (UG), Patricia Wei (UG), Priscilla Lui (UG), Vikas Munukutla, Chetanya Rastogi
- The MONA team is also funded by FAA / ASCENT Project 53 to help assess the accuracy of noise predictions using AEDT
- Comments in this presentation are not related to our FAA-sponsored research and do not represent FAA views / opinions

Let's Face It: Predicting Noise Impacts is Hard…

ELEMENTS

Airports

Waypoints

Routes

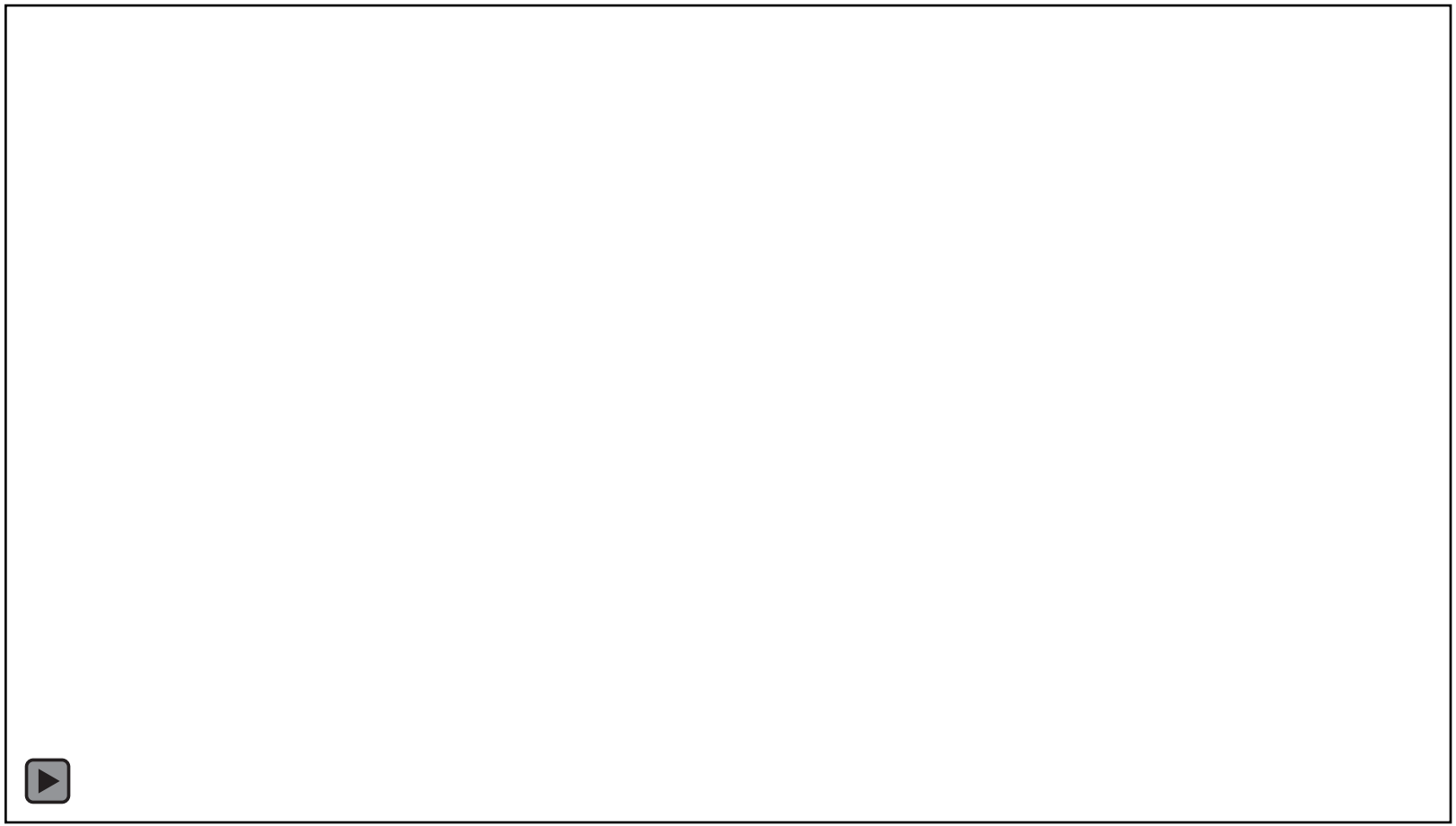
Traffic

METRICS

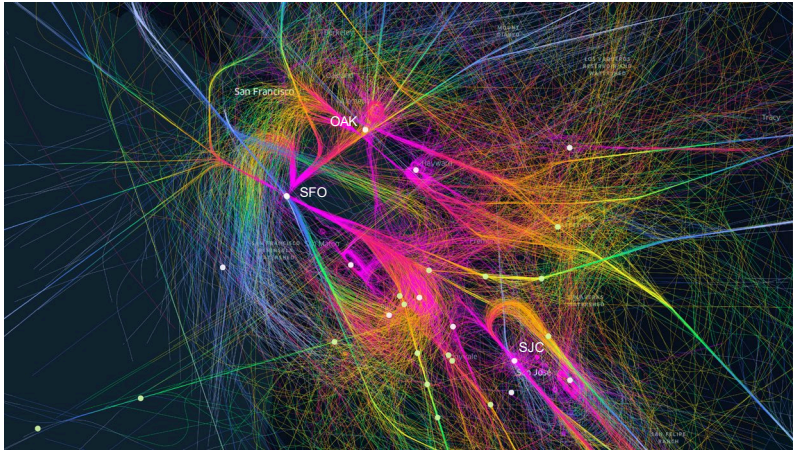
DNL

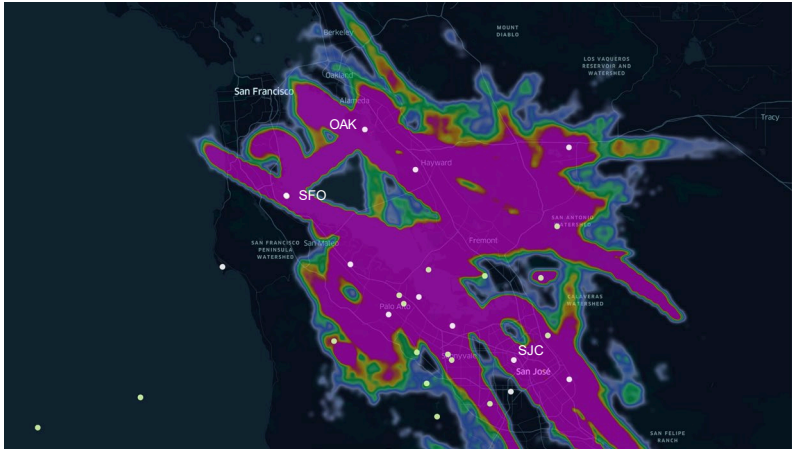
Counts

$N_{above60}$



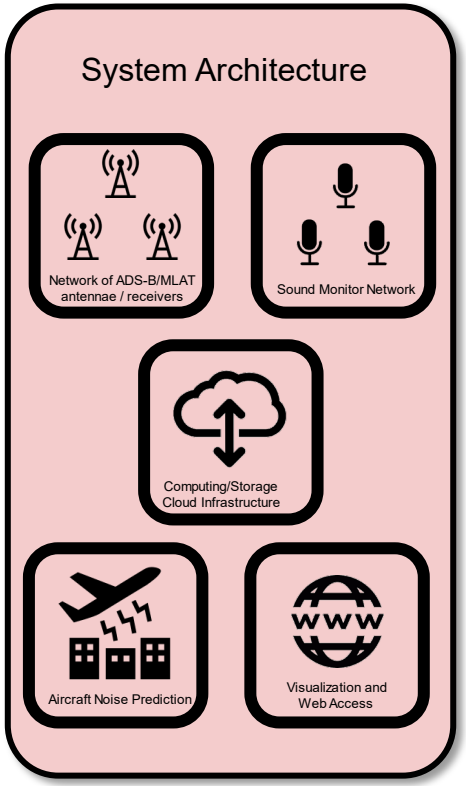
Let's Face It: Predicting Noise Impacts is Hard…

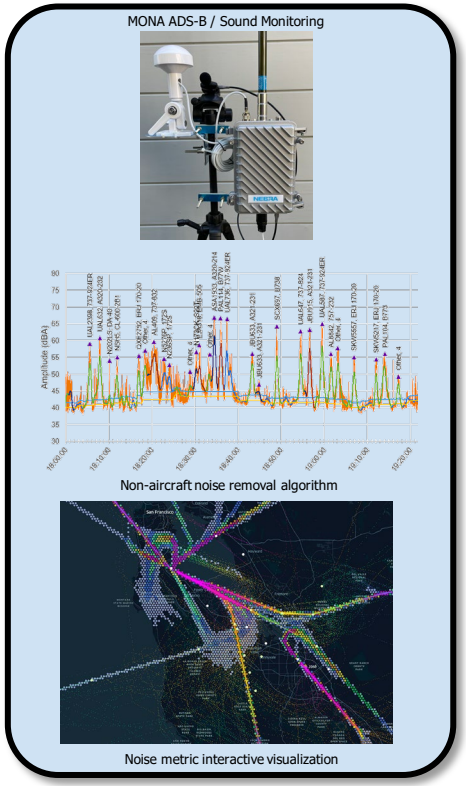


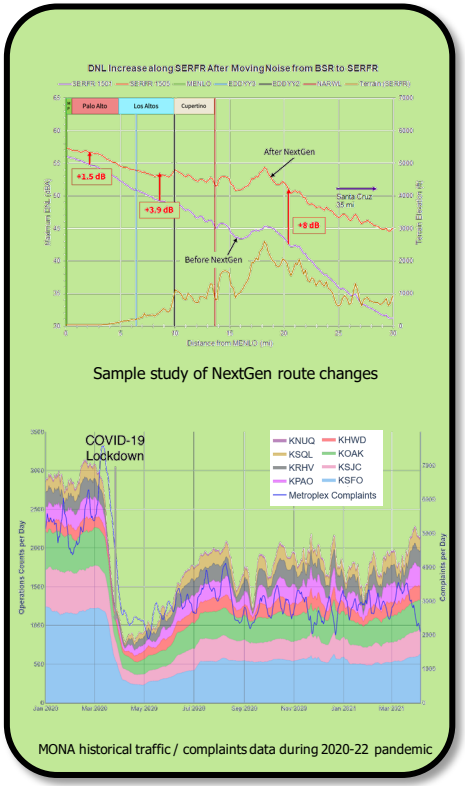


Figuring Out Appropriate Metrics Is HARDER

MONA System Overview







- Data (ADS-B and sound) collection, storage/compute infrastructure
- Open-source, scalable, platform to automatically perform analyses (AEDT), studies, visualizations
- Best-in-class algorithms / tools for data processing and predictions

MONA Software Infrastructure and Automated AEDT Analysis

Local Pipeline

- Create/manage VM instances
- Establish SSH connections
- Execute remote commands
- Enable remote access to AEDT databases

remote-aedt

Google Cloud

AEDT-enabled Google Cloud VM Instance

- Create new AEDT study databases
- Execute AEDT studies
- Extract study results

Study Specification File

- Flight(s)
- Receptor(s)
- Processing algorithm
- Sound metrics

User interaction

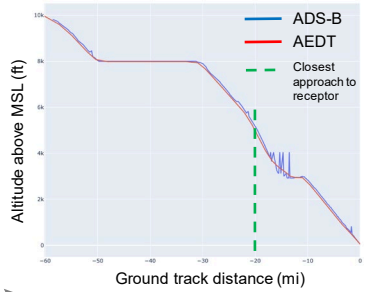
Software automation

Automated AEDT Study Execution

- Retrieve ADS-B trajectory data for flights of interest

MONA ADS-B Database

Trajectory Analysis



Sound Metrics

- Metrics e.g. LAMAX/SEL
- Sound peak profiles

- Compare AEDT and SLM profiles/metrics
- Assess AEDT strengths and weaknesses

MONA SLM Database

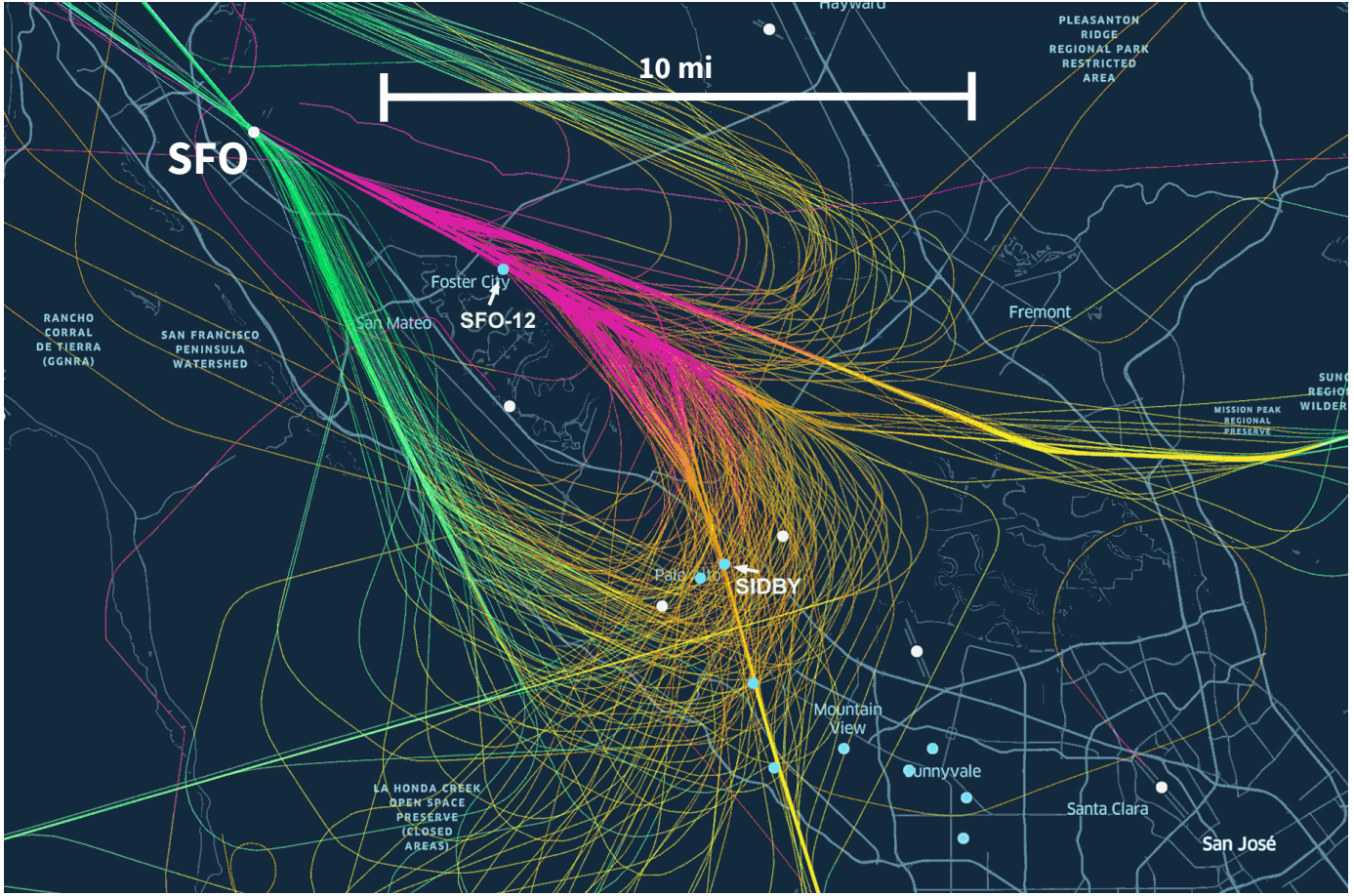
Google Cloud
MONA software
MONA databases

PostgreSQL
PostGIS

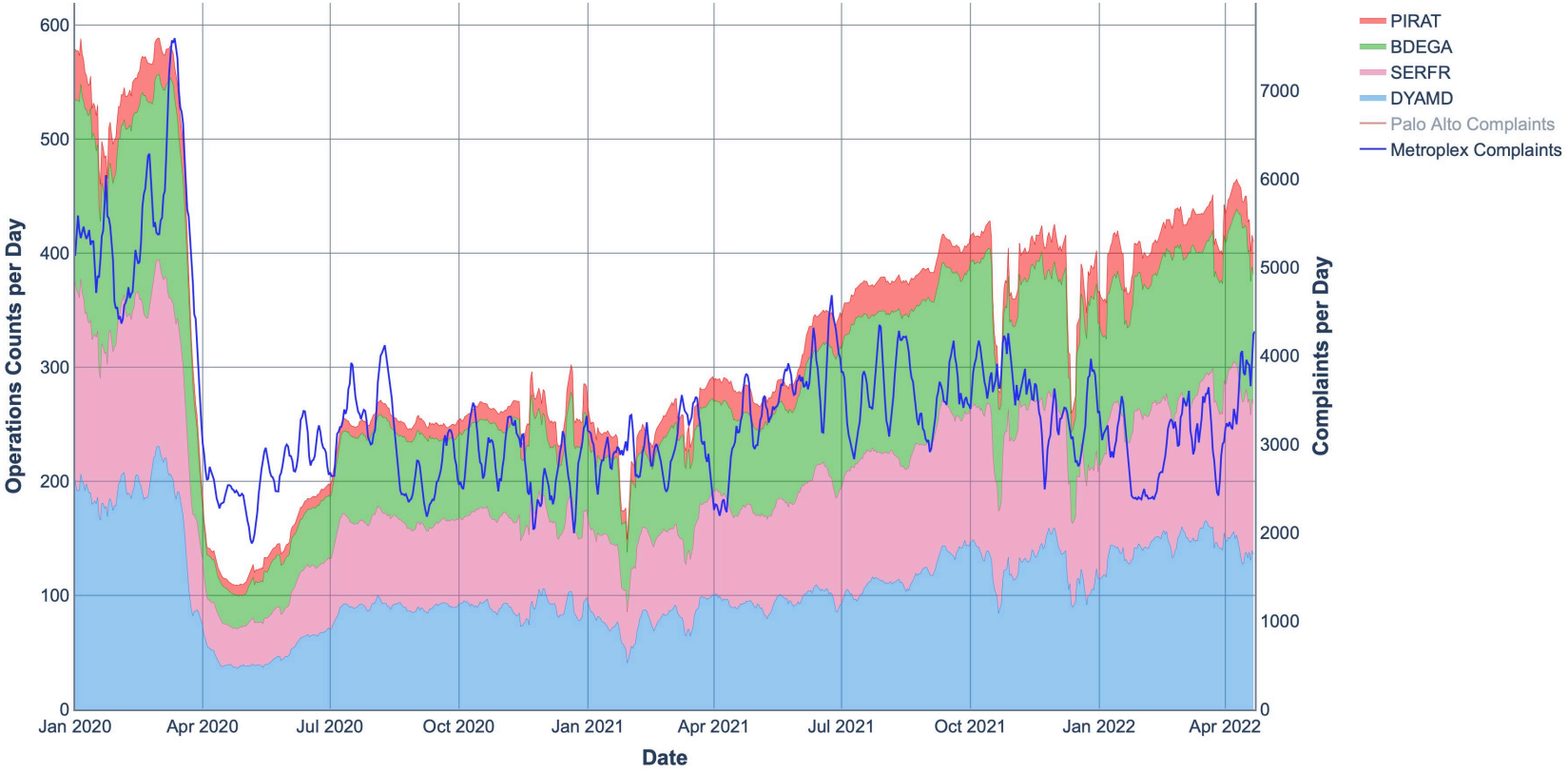
MONA System and Experiments of Opportunity

- What can MONA do to help with "*Thinking Beyond DNL*"?
- A better **understanding** of the correlations between **impact/annoyance** and **noise metrics** requires:
  - Larger amounts of high-fidelity data on noise exposure
  - Larger amounts of data on impact/annoyance
  - Not just more data, but better-quality data
- A system to analyze, correlate, and investigate all this data is needed
- A system that is open-source and can be applied to any airports / metroplexes
- A system that can be deployed anywhere in the US / abroad
- A system that can produce data of peer-review quality

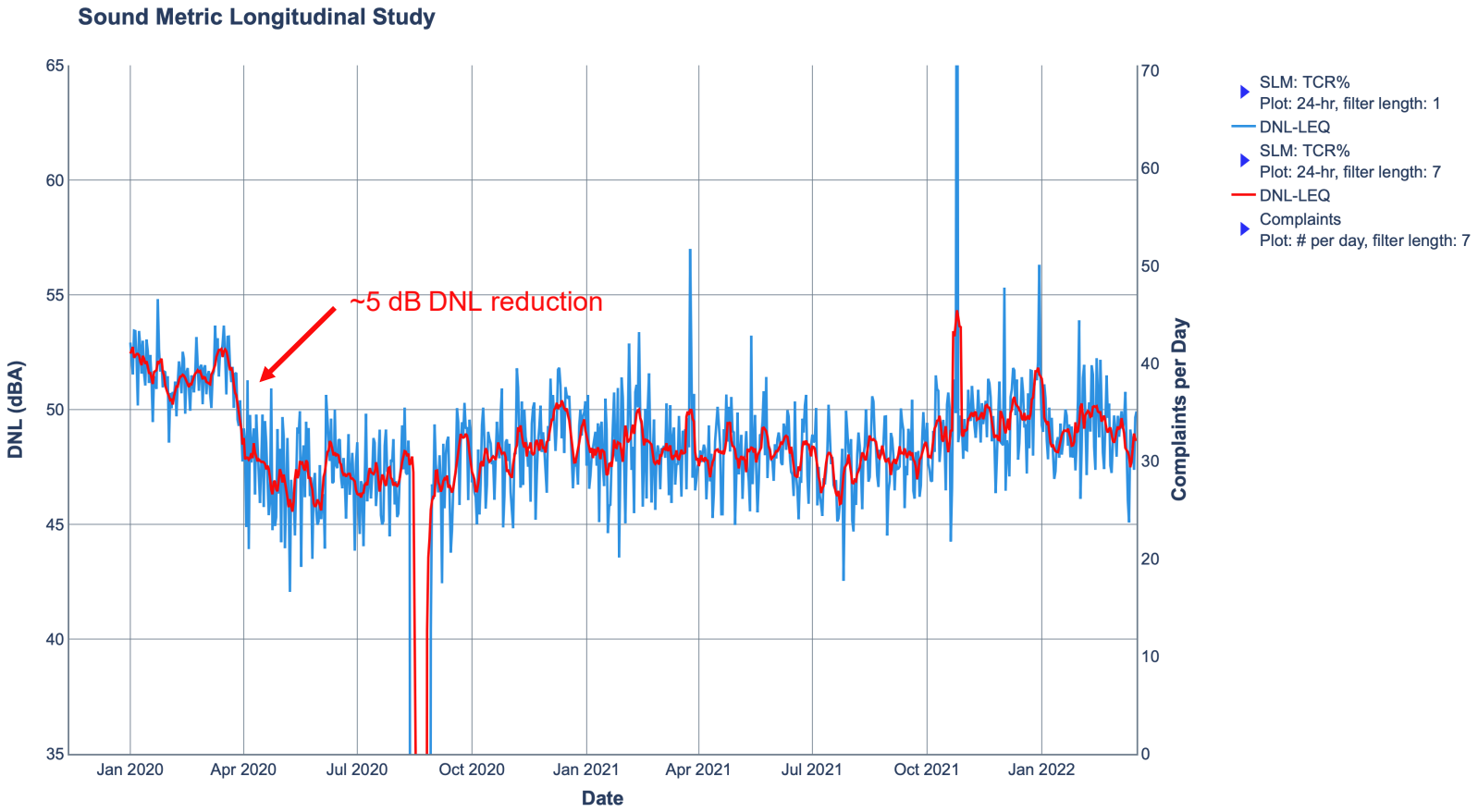
Let's Simplify: SFO Arrival Traffic Only



COVID19 Experiment of Opportunity



COVID19 Experiment of Opportunity: DNL Reduction



Thoughts on Metrics

- Previous panelist/s have stated the evidence clearly: DNL *alone* is not a good predictor of annoyance in the 2020s
- Frequency of overflights metrics (NEA-type) are well correlated with annoyance, particularly in low DNL areas
- Opportunities for better hybrid/composite metrics and non-linearly weighted (based on data) metrics abound
- Stakeholders should not be thinking about replacing DNL wholesale
  - It is more important to find metrics that can help inform future airspace redesign efforts to maximize safety, efficiency AND MINIMIZE NOISE impacts
- Large amounts of scientifically-proven data are necessary to achieve any of these goals

What Can MONA Help with and What Remains to be Done?

- What can MONA do to help with "*Thinking Beyond DNL*"?
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Final Thoughts for Discussion

- MONA has built a system to collect and curate data
  - We will continuously improve its quality to help inform future re-routes with accurate understanding of noise exposure from proposed traffic patterns
  - Open source = help is welcome (developers, testers, SMEs, data scientists …)
- New systems that generate large volumes of annoyance data are needed
  - Must be able to scientifically control for many typical outliers
- MONA not currently pursuing these efforts but would like to start discussions with other interested groups
- Crowd-sourcing is a promising way of generating such data (ask me how during Q&A)


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