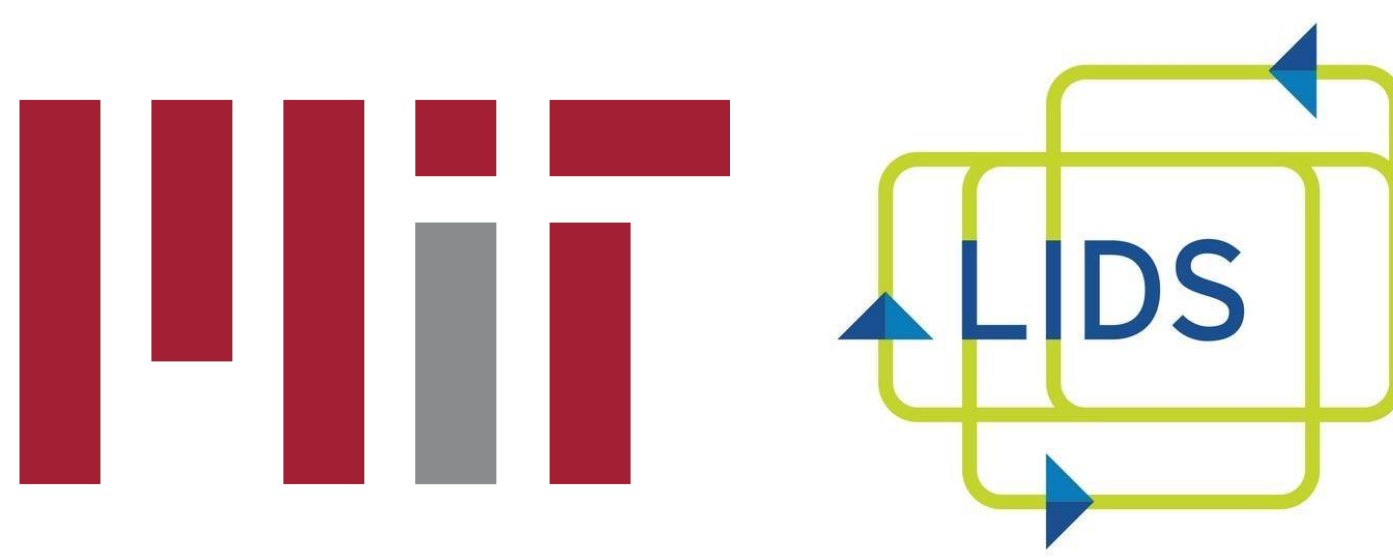


Can individuals use smoke forecasts for personal decision-making? A call to action

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Motivating example



A person needs to go out during the day to take care of a sick family member. They want to minimize their exposure to PM2.5. Can they decide when to go out based on model forecasts available in the morning?

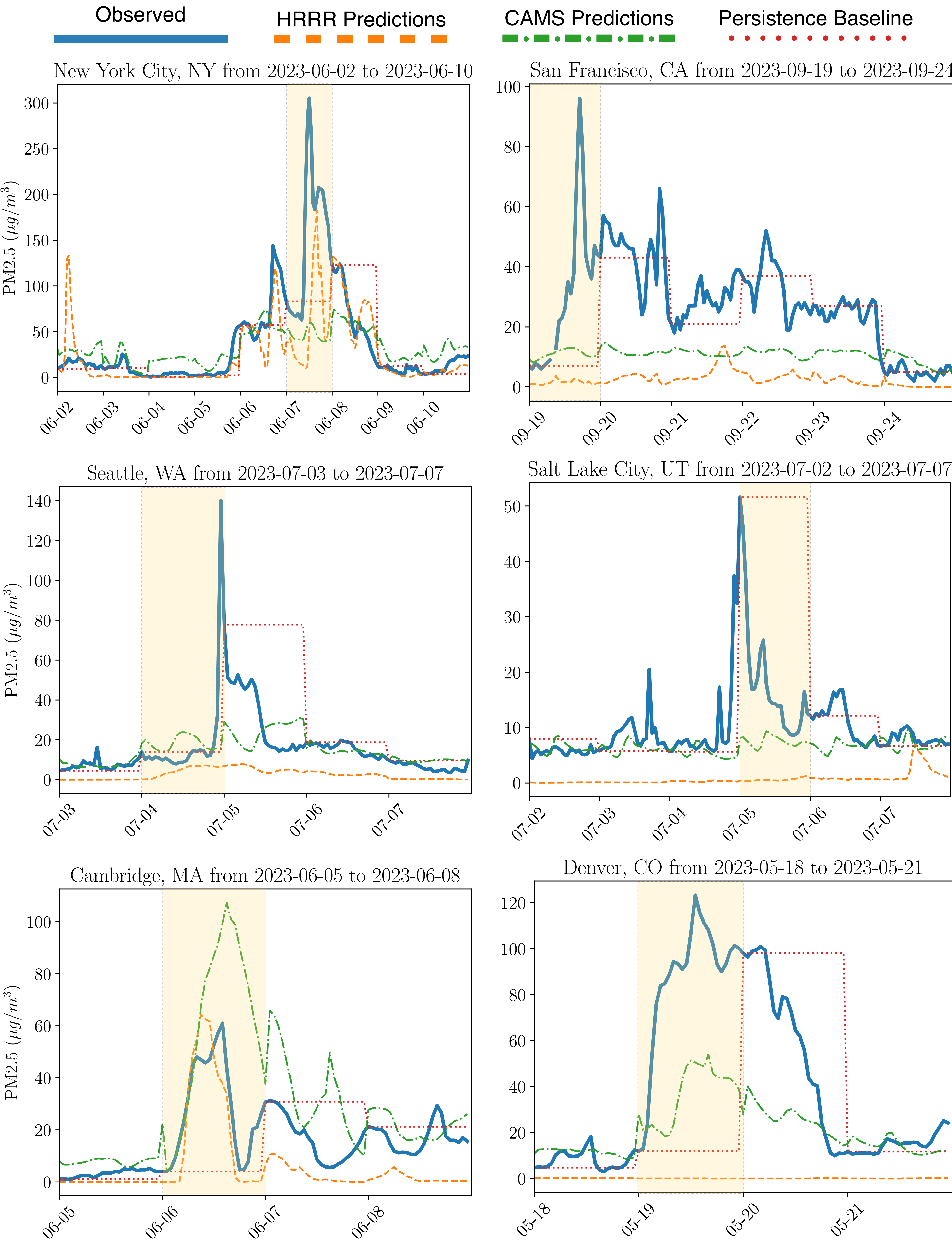
Can you trust PM2.5 forecasts to plan your day during extreme events?

No standard, publicly-available forecast facilitates reliable planning

Predictive Models

- **NOAA HRRR-Smoke:** Estimates smoke emissions from fires using satellite data, atmospheric model predicts surface smoke, ~3km over US
- **ECMWF CAMS:** Estimates smoke emissions from fires using satellite data, models transport with atmospheric model. Predicts PM2.5, ~40km resolution over US
- **Baseline (Persistence Model):** Predict most recent PM2.5 reading forward for 24 hours

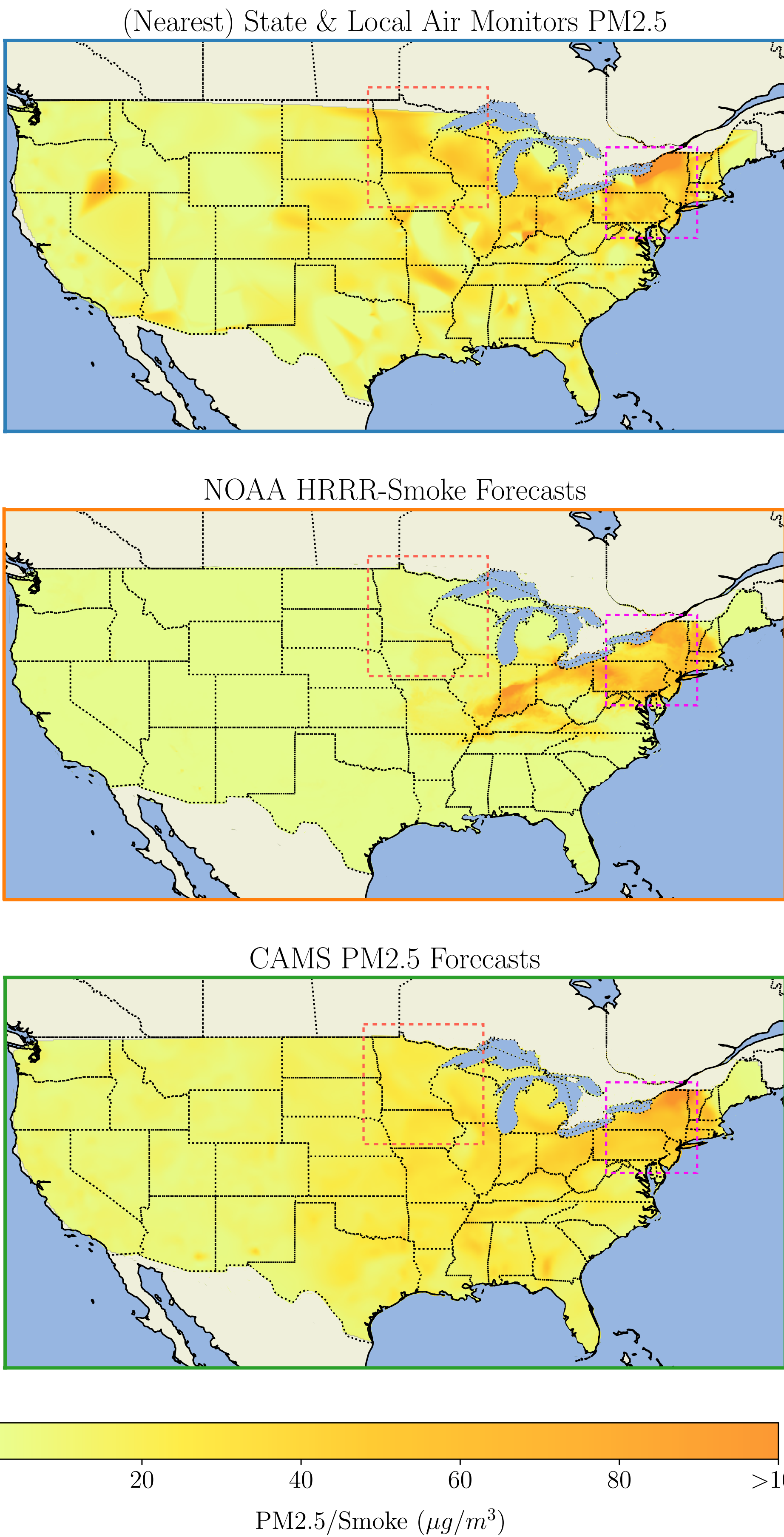
Predictions for Extreme Events in Different Cities



Takeaways

- CAMS and HRRR-Smoke often mis-estimate the magnitude or timing of extreme PM2.5 levels across the continental USA
- A simple baseline (predicting current conditions for 24 hours) provides similarly accurate predictions to either of these methods in many cases
- Individual planning around limiting PM2.5 exposure in cases of extreme smoke events requires more accurate short-term predictions

PM 2.5 at 12pm on 6-6-2023



Moving Forward

- **Smoke vs. PM2.5** — HRRR-Smoke predicts smoke. We compare to PM2.5. Adjustments might (slightly) improve the forecast, but are unlikely to dramatically improve extreme event predictions
- **Proprietary forecast models** — iPhone weather app by default uses BreezoMeter predictions, so many people might be using these to plan. But bulk data access is challenging
- **Several fire seasons** — We focus on 2023. We plan to look at fire seasons from other years
- **AirNow vs. Air Quality System** — We use (unvalidated) AirNow data as ground truth, because (validated) Air Quality System (AQS) data for summer 2023 was not yet available
- **Better methods to make predictions?**