

Satellite-constrained wildfire emissions and their air quality impacts: Applications within NASA AIR4US



Jet Propulsion Laboratory
California Institute of Technology

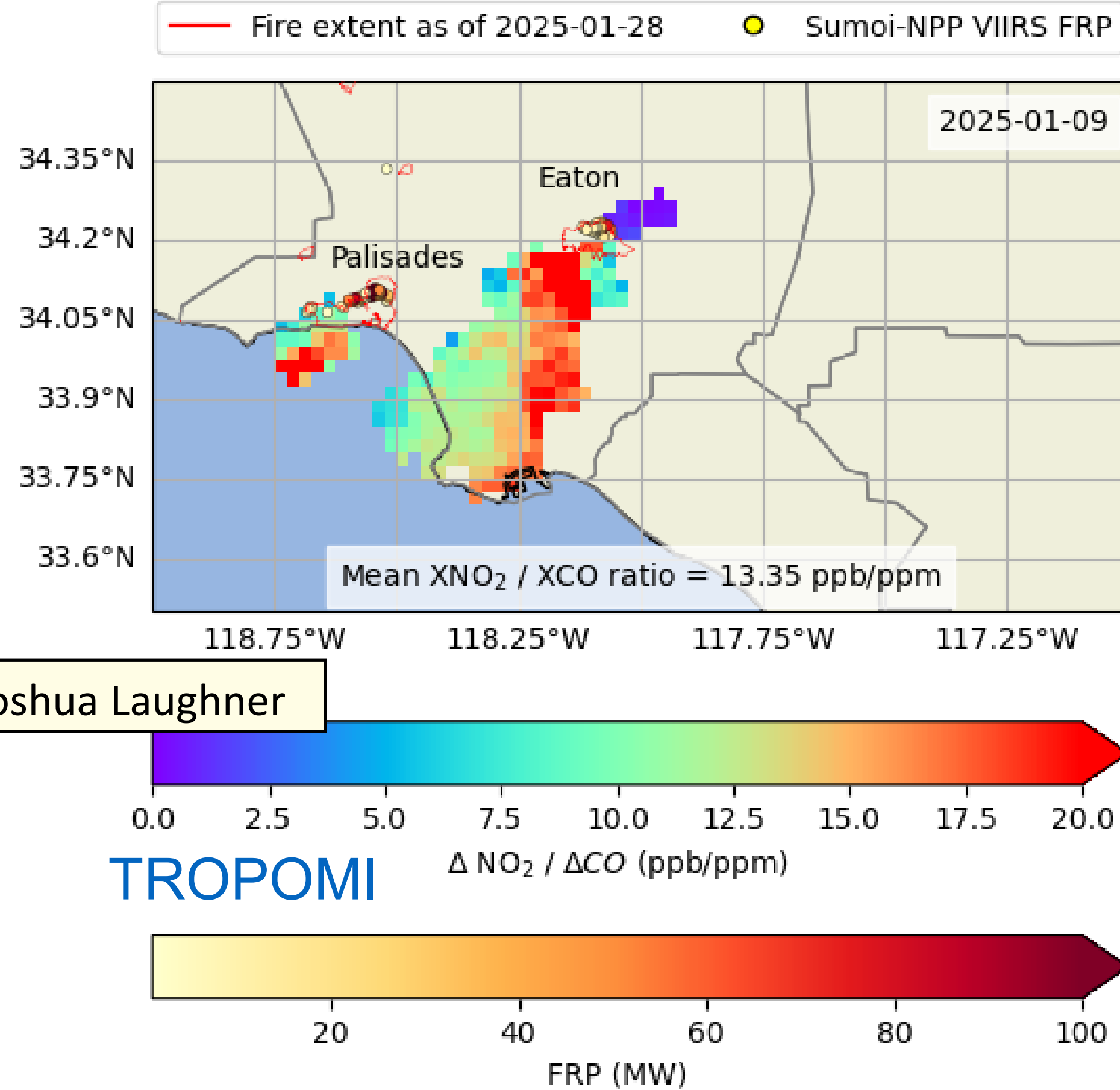
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Satellite observations of the 2025 California fires

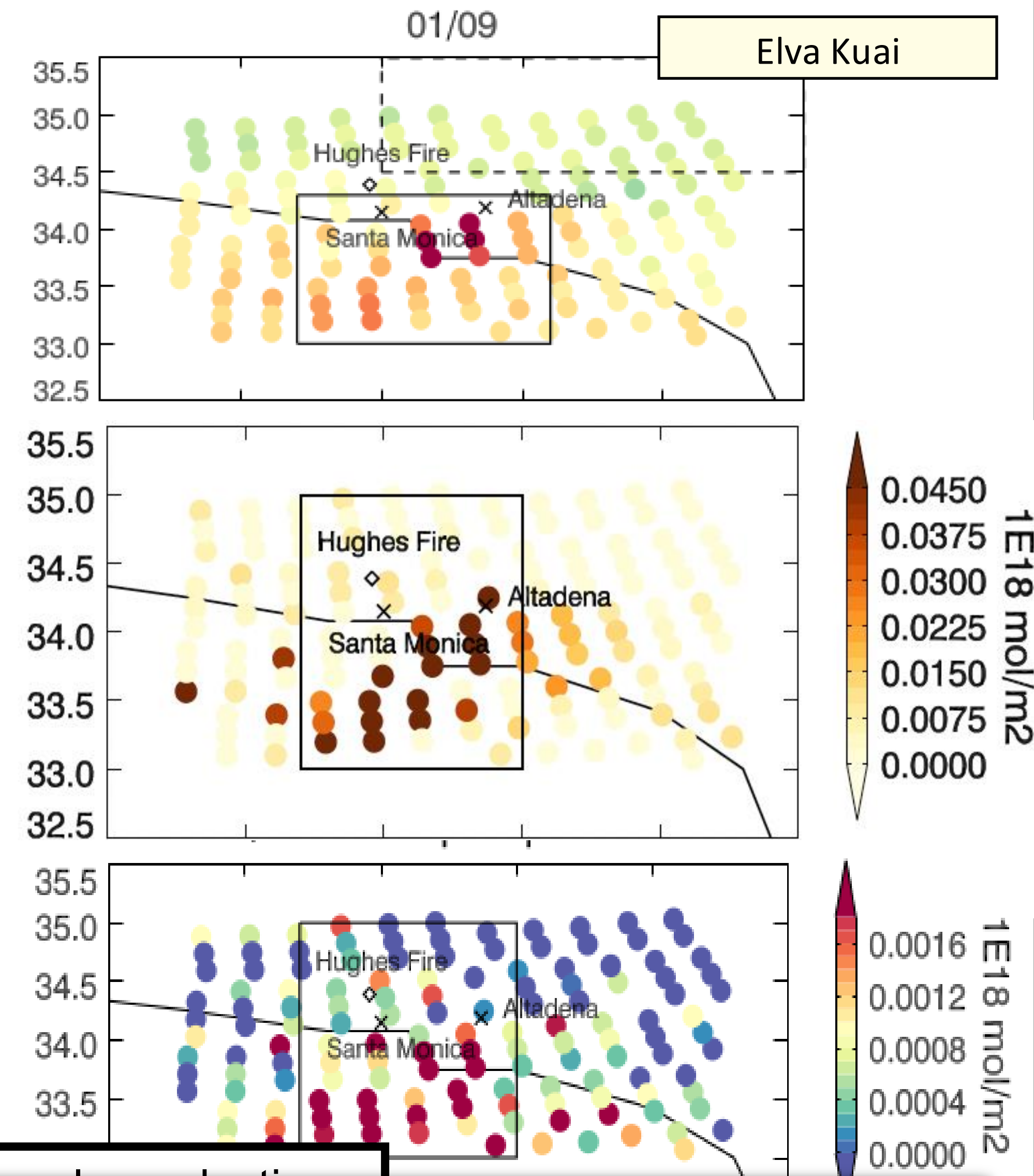


- Higher $NO_2:CO$ enhancement ratios from **TROPOMI** than other wildfires:
 - Greater NO_x emissions from structures and more powerful fires
 - Interaction with existing

CrIS
CO

CrIS
NH3

CrIS
PAN



Challenges: sensitivity, smoke plume height, column to surface air quality

Key Challenges in Using NASA Satellite Observations to Support Wildfire Recovery



**From columns
to surface**

PM2.5 & ozone exposure



Source attribution

Wildfire vs. traffic, industry



**Local & timely
support**

Neighborhood-scale decisions



**Integrated
prediction**

Satellites + ground +
models + DA



**Recovery to
resilience**

Safer rebuilding & planning

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Air Quality Portal

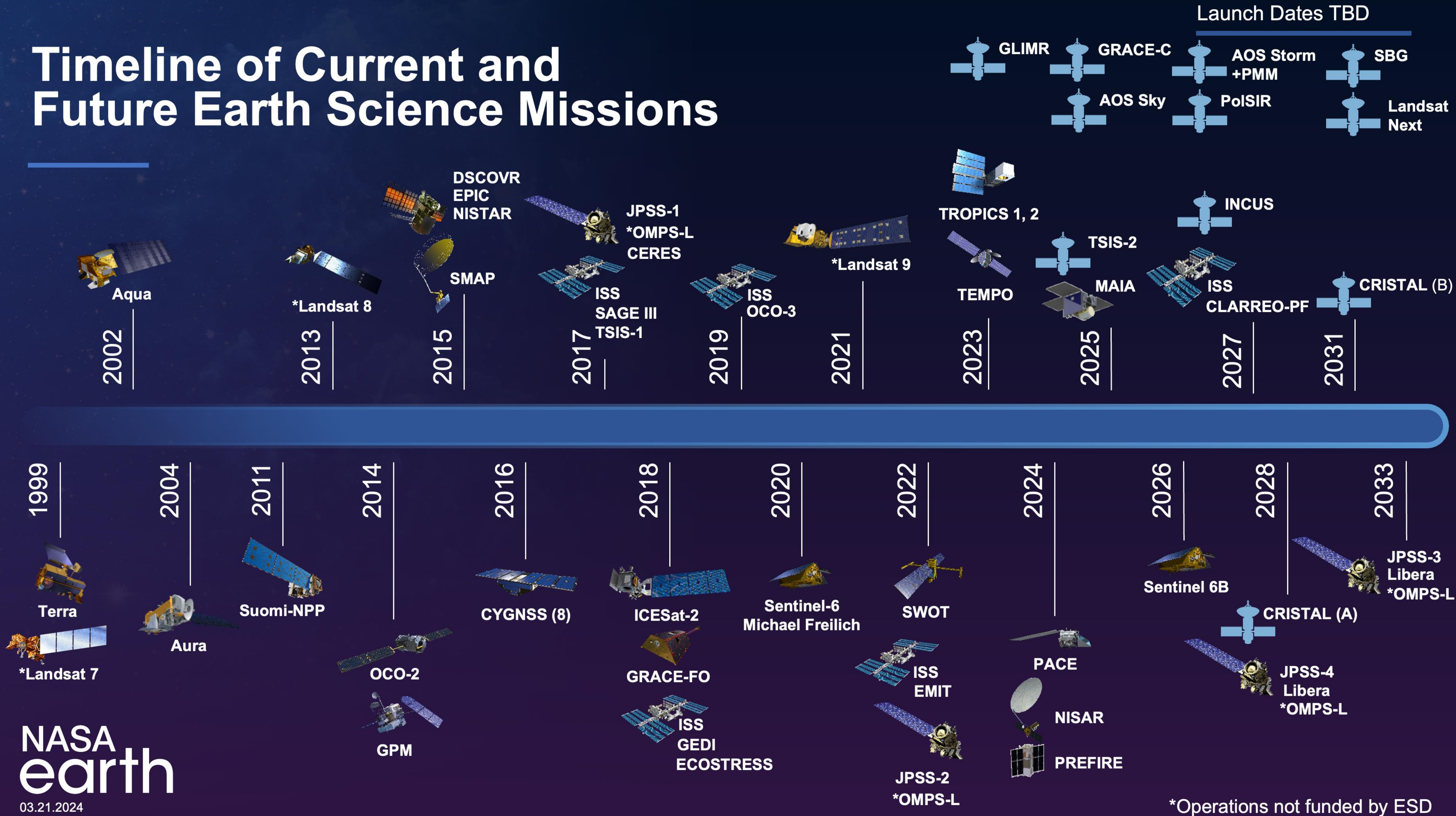


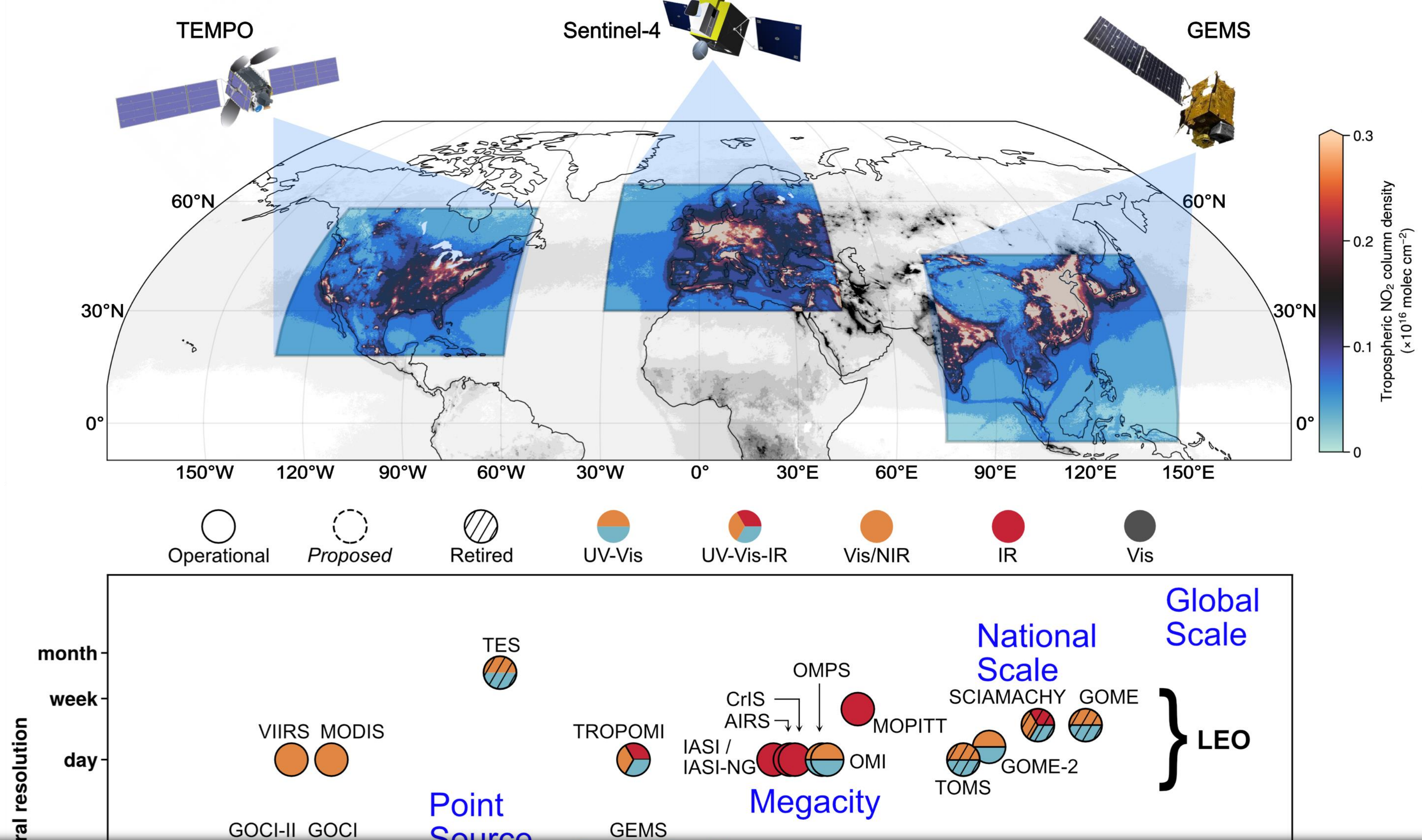
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U.S. DEPARTMENT OF COMMERCE



The Air Quality Portal opens up access to trusted data on air quality. This multi-agency effort consolidates air quality information from observations and models to create a unified source for U.S. government and other datasets. The goal of the AQ portal is to provide decision makers with one location for data and analysis.

Timeline of Current and Future Earth Science Missions





Atmospheric composition data assimilation

- (1) make best use of all available data from heterogeneous sensors
- (2) produce chemically and dynamically consistent integrated dataset

MLS
(Ozone, CO, HNO₃)

TES, AIRS/OMI, CrIS
(Ozone)

Long-lived GHGs

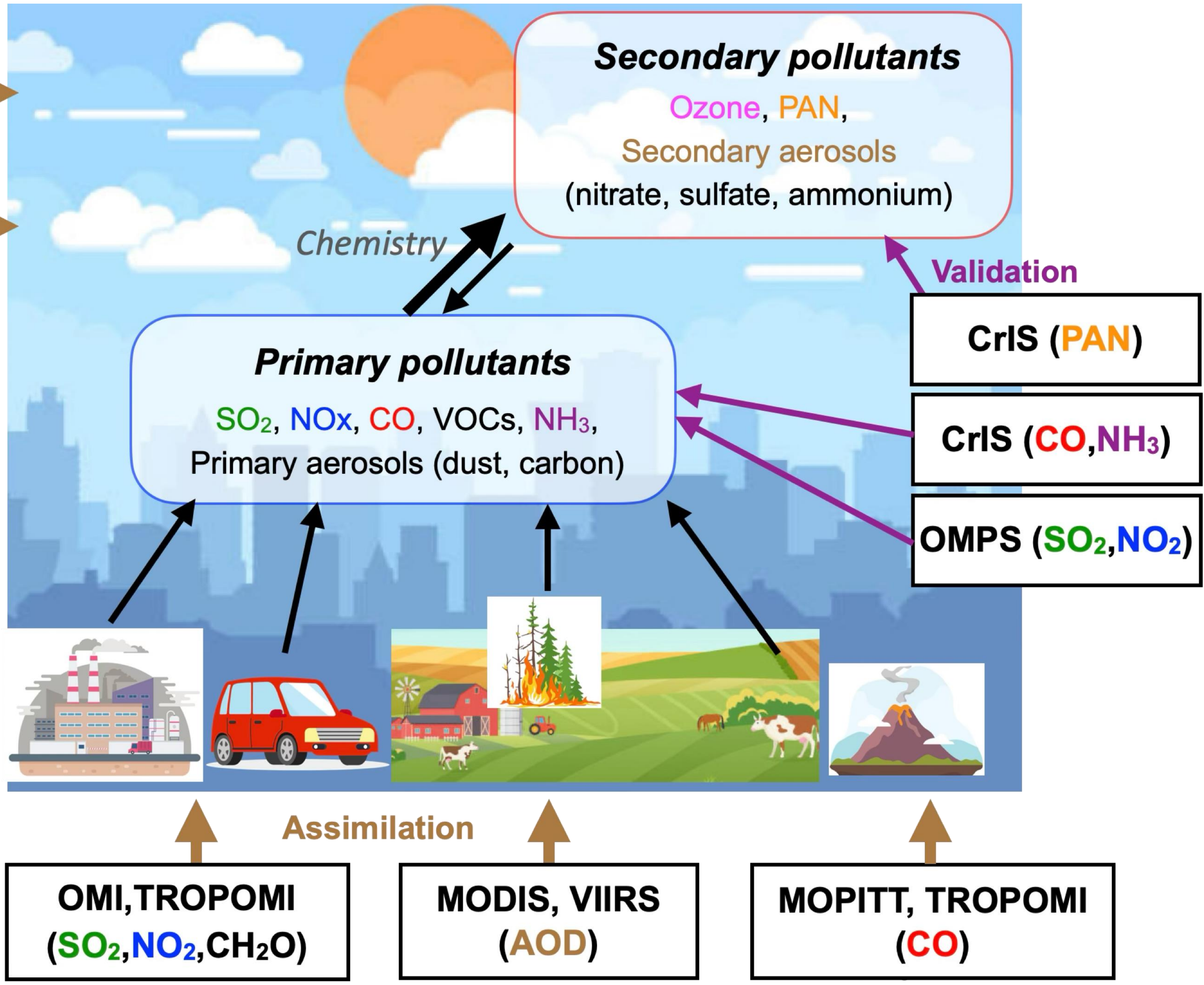
Oxidation capacity (OH)

↓
CH₄

AQ-GHG co-emissions

↓
CO₂

**Tropospheric Chemistry
Reanalysis (TCR-3)**



1. Scenario Experiments



Baseline (BAU)

CEDS v2 (2019), NEI2016 (2020), GFED v4, MEGAN v2.1



Transportation

urban corridors,
major metro areas
EV transition /
on-road controls



Agriculture

NH₃, livestock, fertilizer
relevant to PM_{2.5}
formation



Ports

major US ports and
shipping corridors

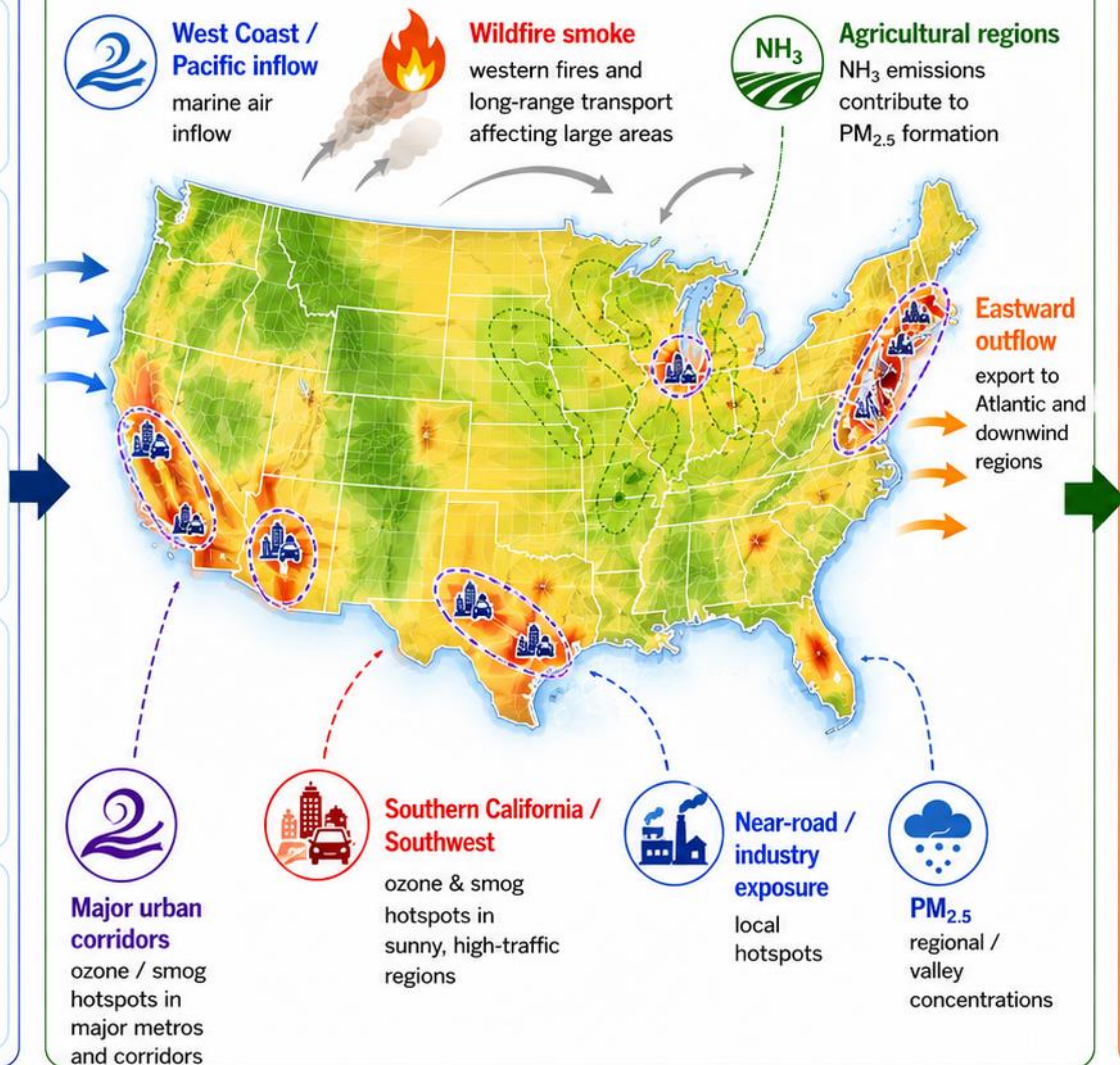
- Clean Ports Program
- ECA / IMO Tier III
- Green Shipping Corridors



All sectoral contributions:

on-road, off-road,
industry, energy,
area sources

2. What We Quantify



3. Decision Support

A

Evaluate
Environmental
Policies



B

Identify Ozone
and PM
Trade-Offs



C

Prioritize
High-Impact
Sectors and
Regions



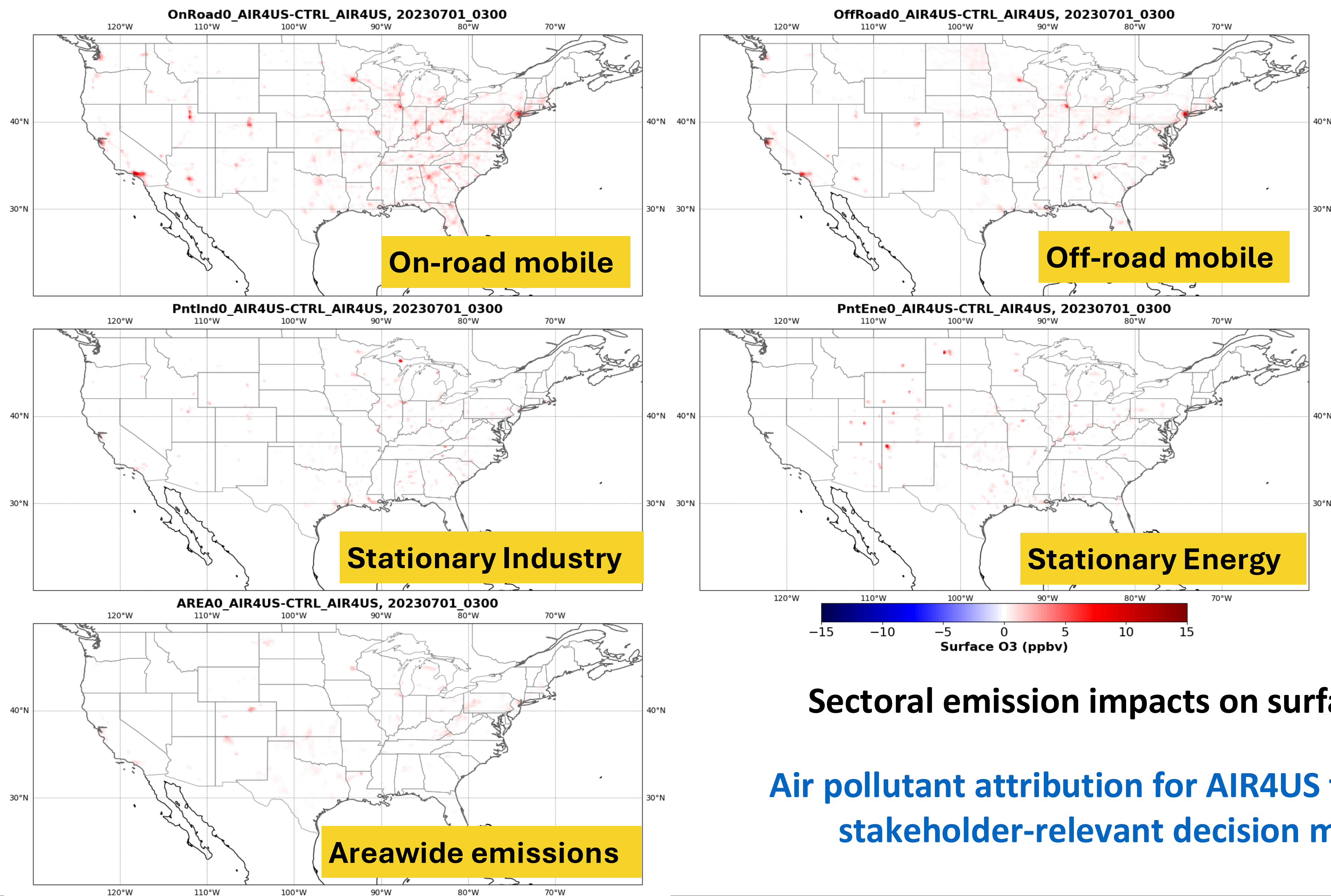
D

Deliver
Decision-
Support Tools





ES2A: What if scenario to support policy decisions



Sectoral emission impacts on surface ozone

Air pollutant attribution for AIR4US to support stakeholder-relevant decision making