

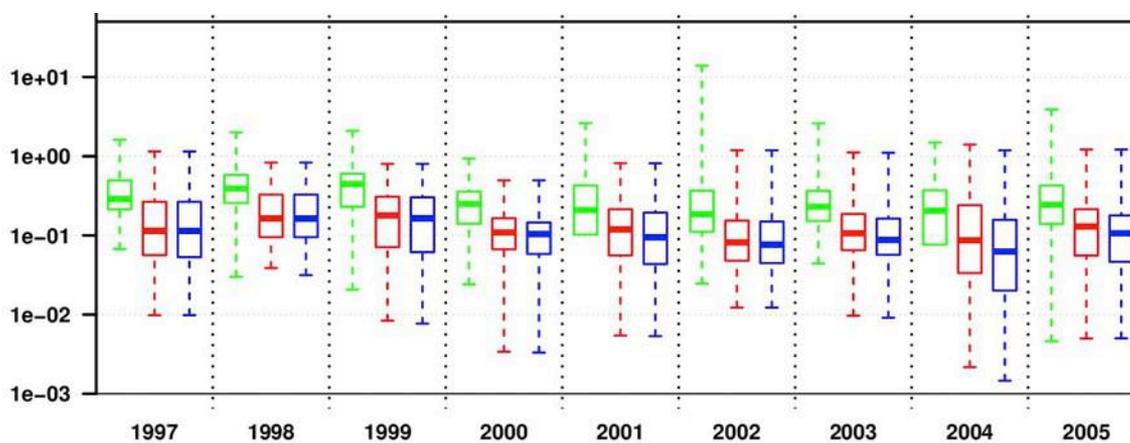
LAR Project Updates

Current and New Projects

- Joint Fire Sciences Program
 - Black Carbon and Climate Change—Chung, PI—ongoing, but nearing the end
 - Secondary Organic Aerosols (SOA) from fires—Barsanti, PI--initiated in Nov, 2014—3 yrs
 - WRF-SFire and AIRPACT—Vaughan, PI--new project starting this summer—3 yrs
- University Transport Center – Center for Environmentally Sustainable Transportation in Cold Climates – PIs Jobson and Chung
 - Cold start emissions from vehicles
 - \$100k, 1 year
- EPA PM and Climate STAR grant—Lamb PI
 - Just received word of the award, \$789K, 3 yrs
 - Joint effort among WSU, PNNL and UC Irvine
- EPA Community Monitoring--Lewiston – Clarkston Valley Formaldehyde Study (Community-Scale Monitoring)—Julie Simpson—PI
 - Just awarded **TODAY**, \$418K for 3 yrs

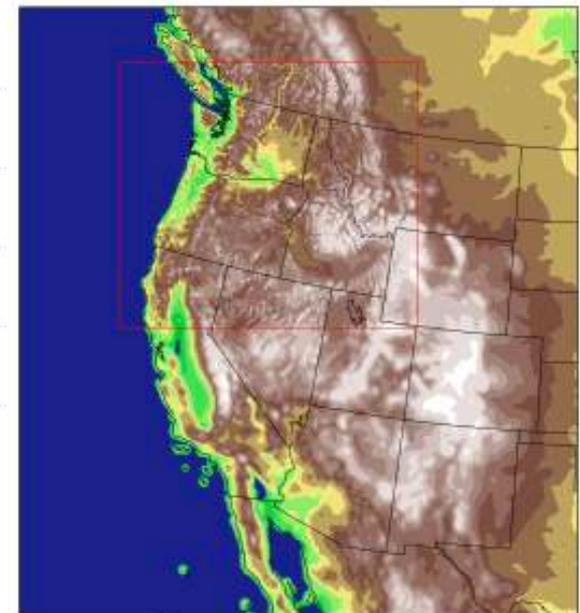
Black Carbon from Fires and Climate Change

- IMPROVE Data
 - Modeled, With Fires
 - Modeled, No Fires
- egion 5

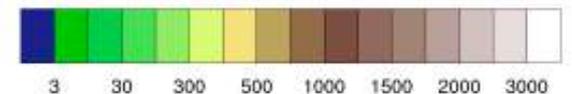


Interannual variability of ambient BC concentrations from fires in the Pacific Northwest

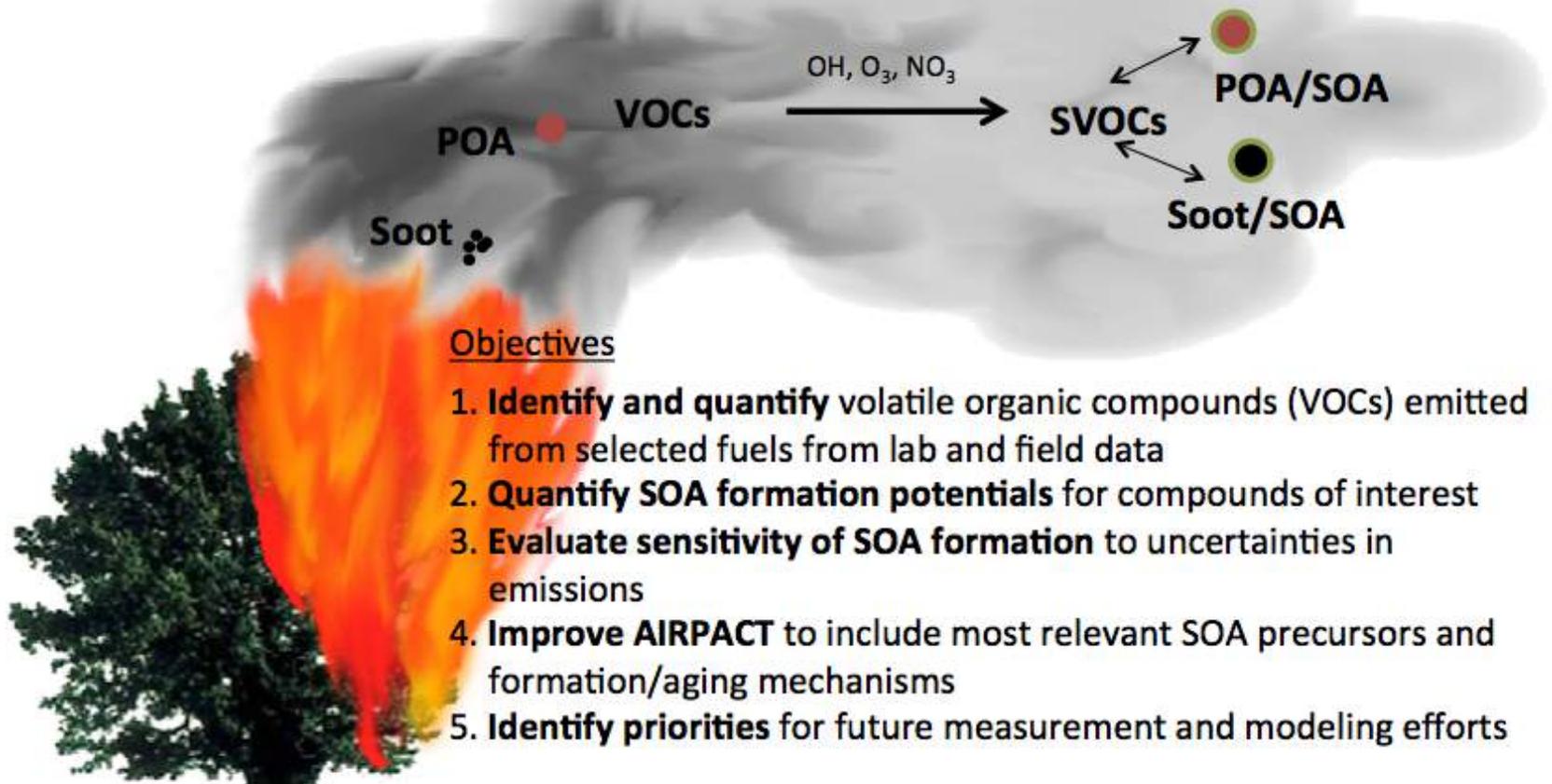
Simulations in Progress:
Deposition of BC from fires in the western US



Terrain Height (m)



Synthesis of Comprehensive Emissions Measurements and Multi-scale Modeling for Understanding SOA Chemistry in Wildland Smoke Plumes



Objectives

1. **Identify and quantify** volatile organic compounds (VOCs) emitted from selected fuels from lab and field data
2. **Quantify SOA formation potentials** for compounds of interest
3. **Evaluate sensitivity of SOA formation** to uncertainties in emissions
4. **Improve AIRPACT** to include most relevant SOA precursors and formation/aging mechanisms
5. **Identify priorities** for future measurement and modeling efforts

Collaborative Team:

Kelley Barsanti and Lindsay Hatch, Portland State University
Serena Chung and Brian Lamb, Washington State University
Bob Yokelson, University of Montana

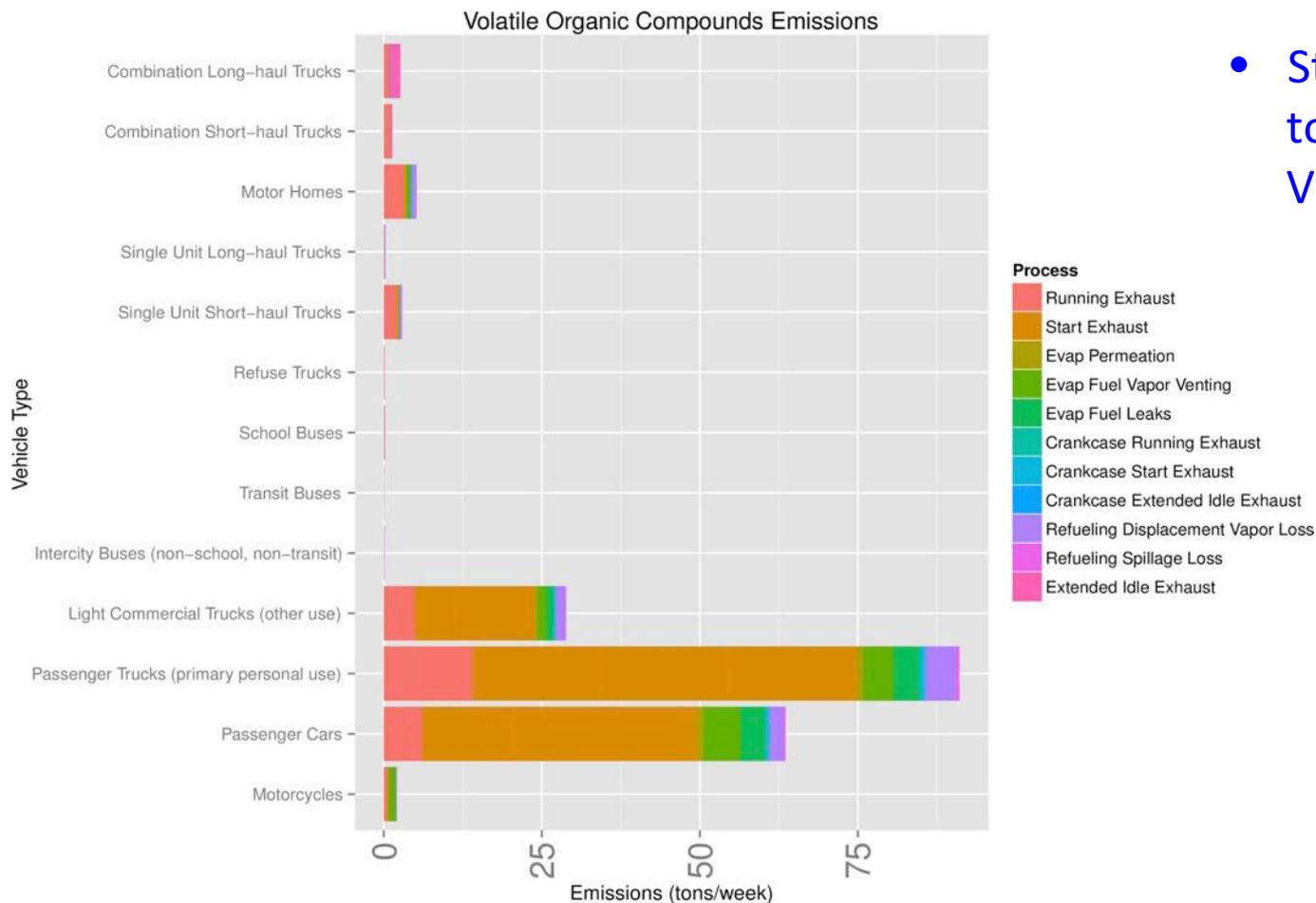
Funding:

Joint Fire Science Program



Start Emissions from Vehicles

VOC Emission Inventory for Yakima County (MOVES2010b)

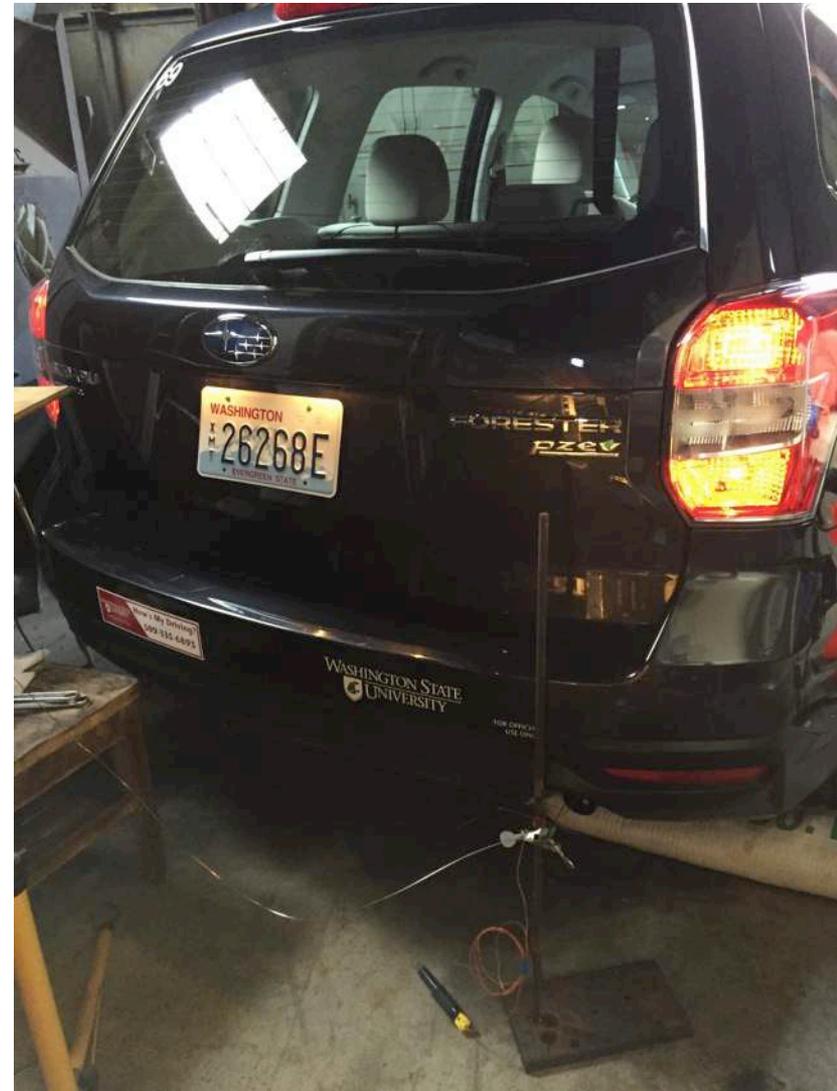
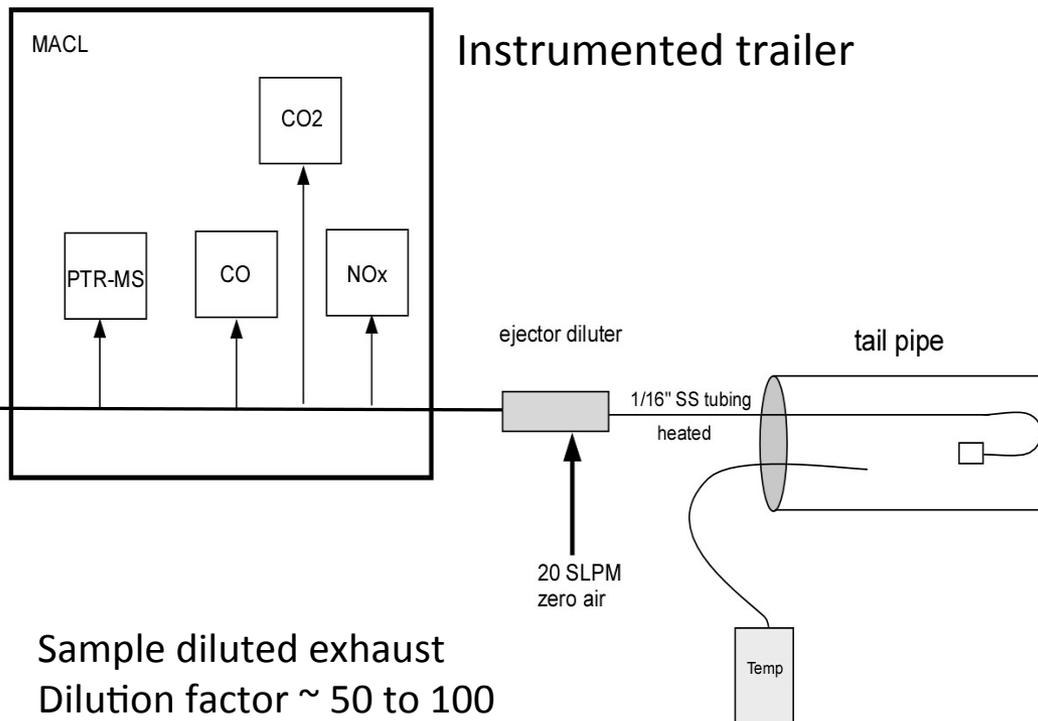


- Start emission is 63% of total vehicle emission for VOC.



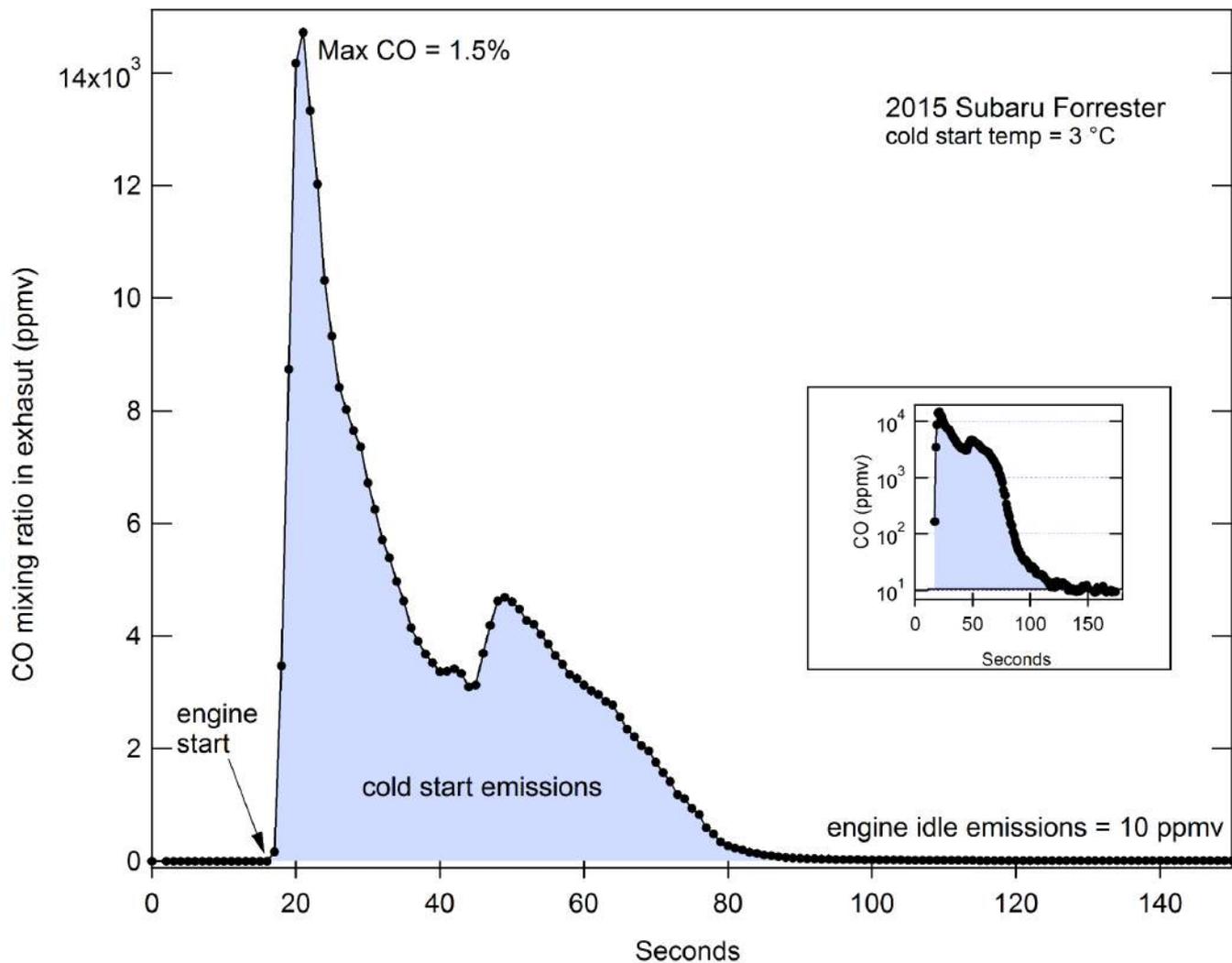
Cold Start Emissions from Vehicles

- Measuring engine cold start emissions of criteria air pollutants and air toxic compounds.





Cold Start Emissions from Vehicles

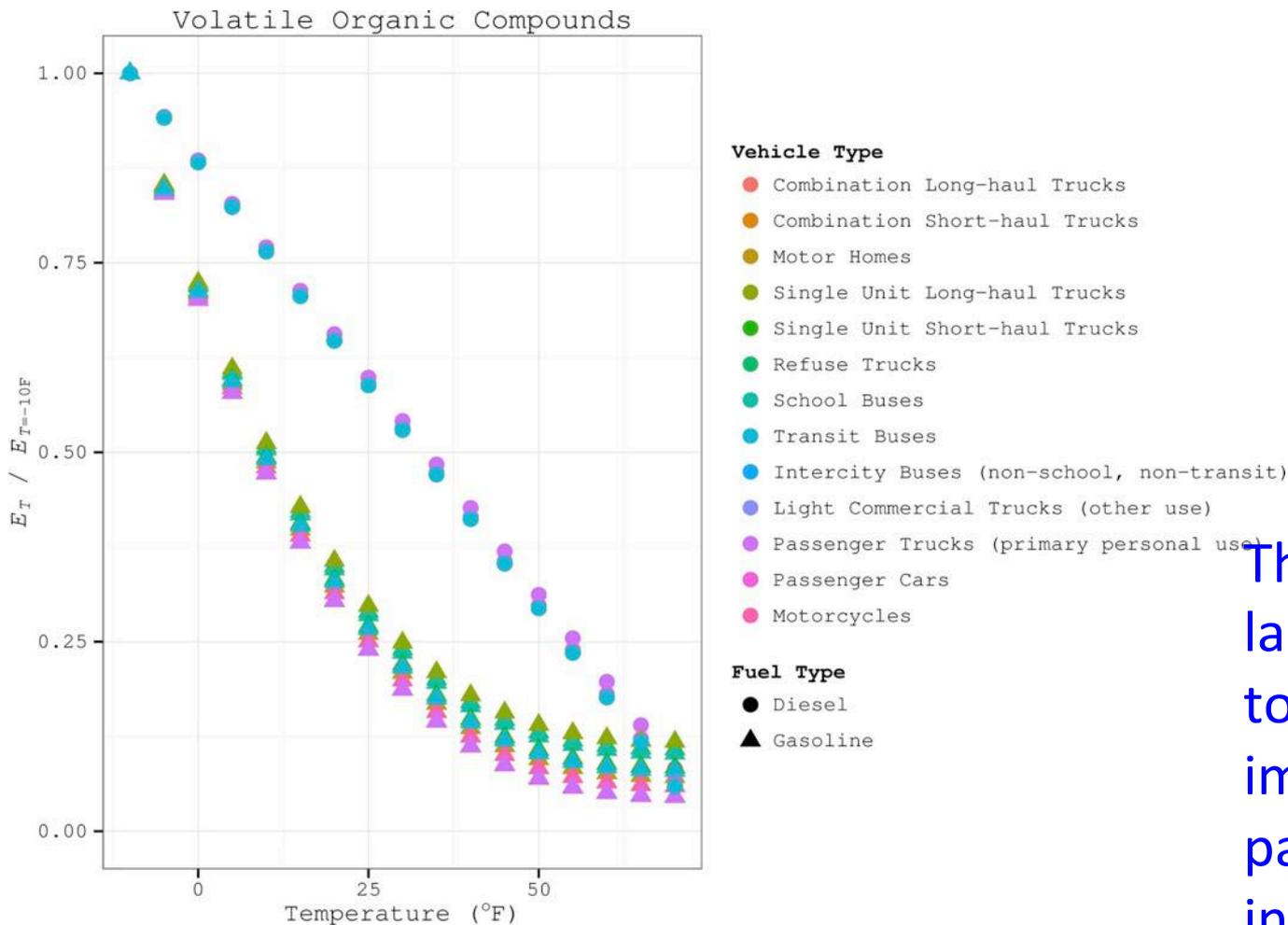


CO emissions
from a 2015
Subaru Forester

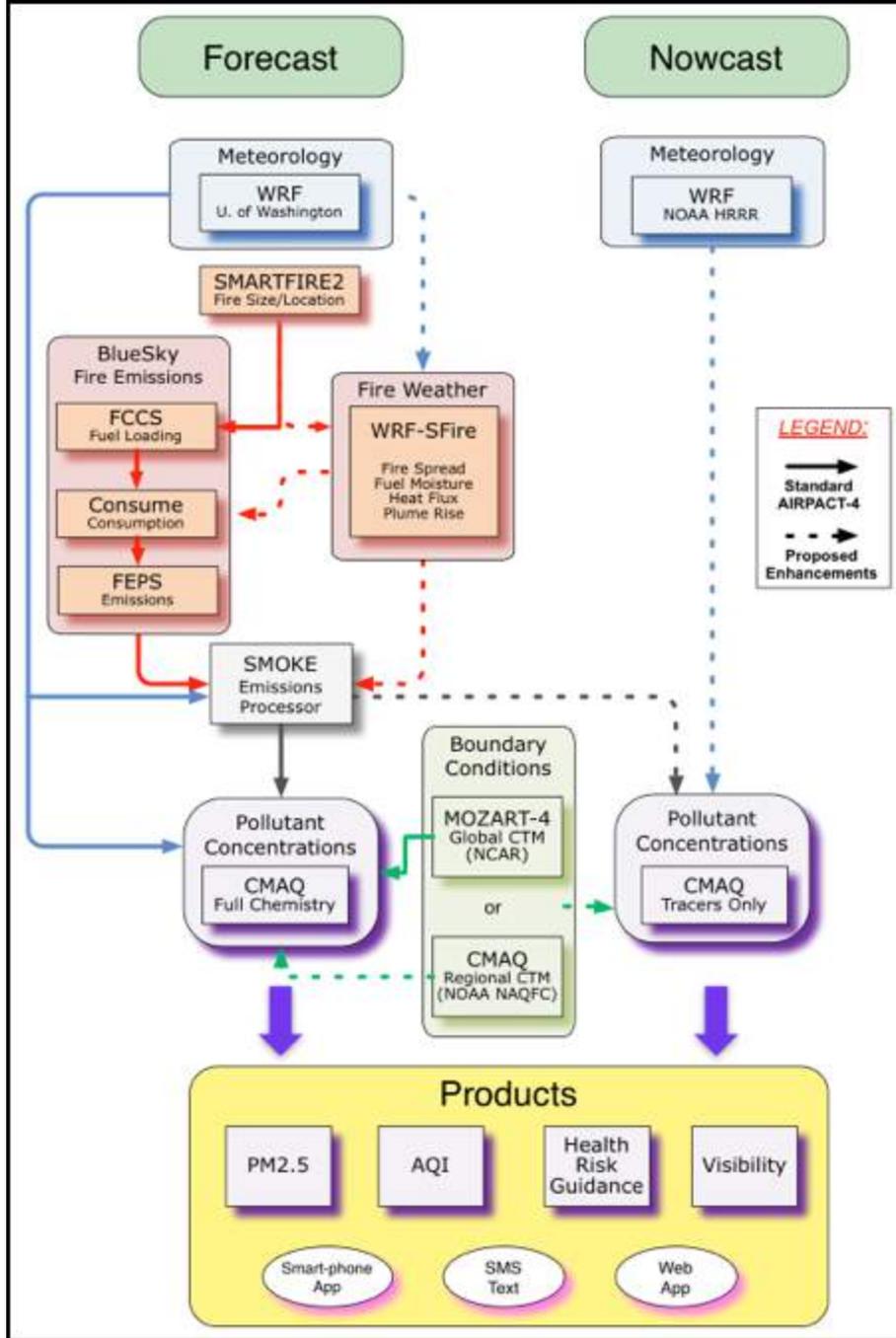


Cold Start Emissions from Vehicles

Temperature dependence of start emissions from MOVES2010b



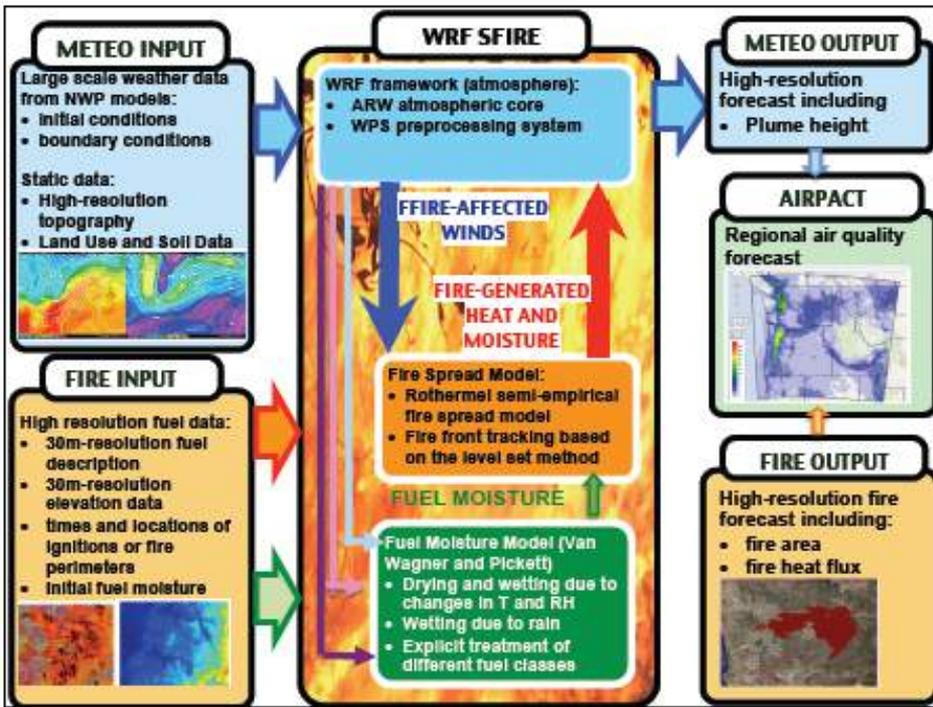
The goal is to use laboratory data to evaluate and improve parameterization in MOVES



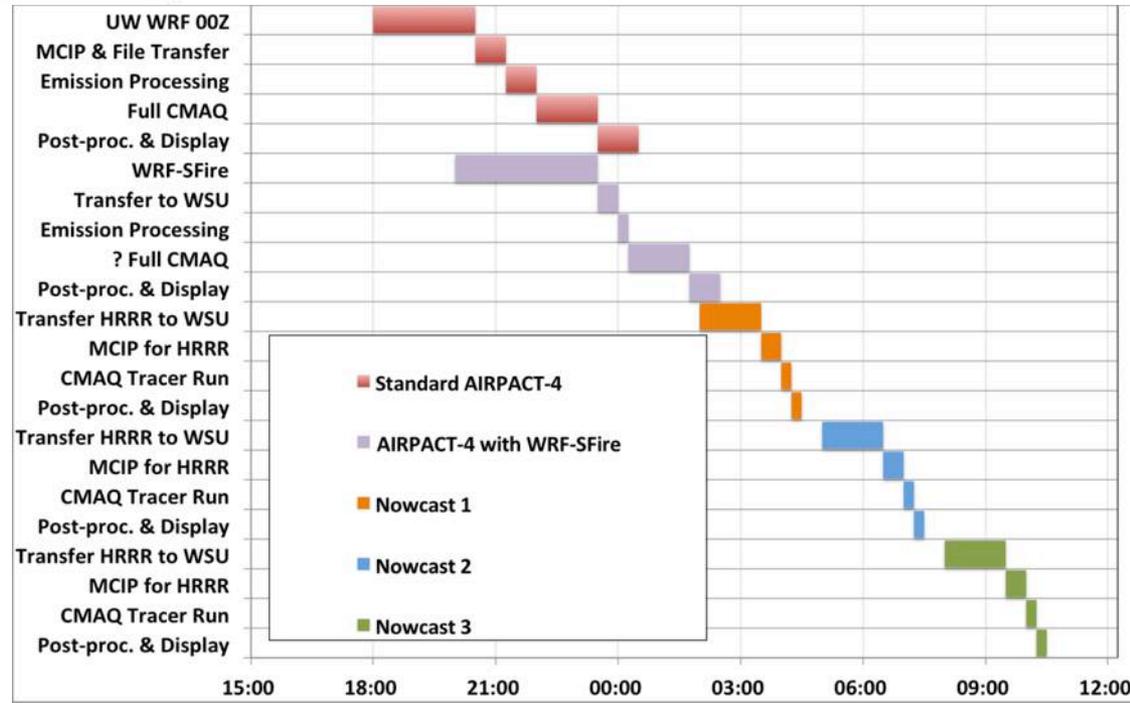
AIRPACT-Fire for enhanced communication of human health risk with improved wildfire smoke modeling—Joint Fire Sciences Program

- Implement WRF-Sfire within AIRPACT-5
- Implement a Nowcast capability in AIRPACT-5 using NCEP RAP/HRRR output
- Develop enhanced communication tools for the public and stakeholders

WRF-Sfire Components

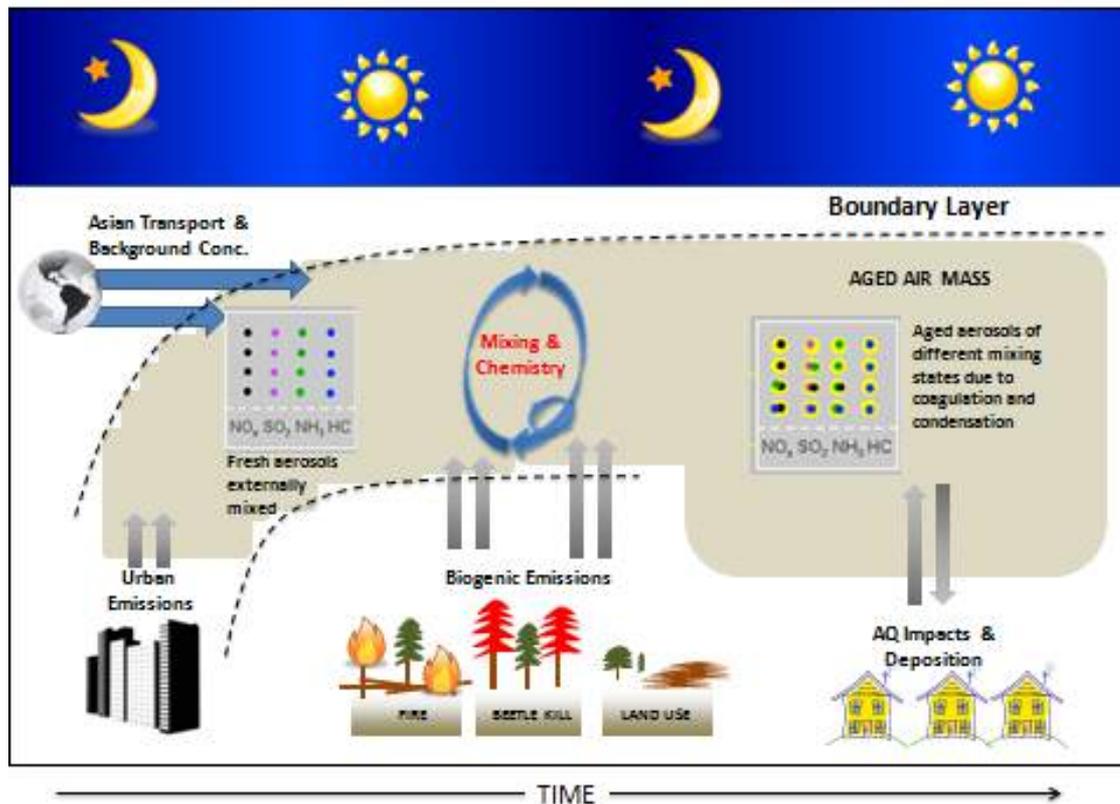


Proposed forecast cycle with AIRPACT-5



EPA PM and Climate Change

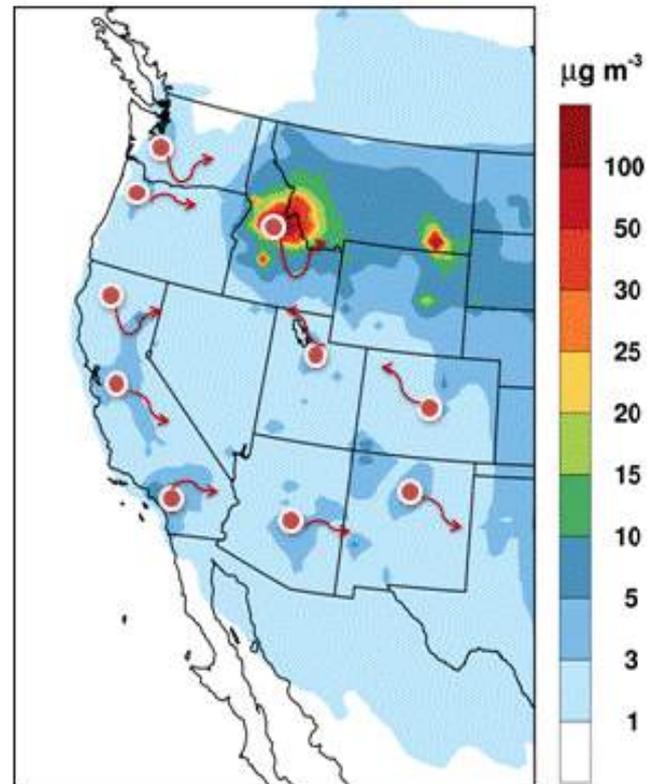
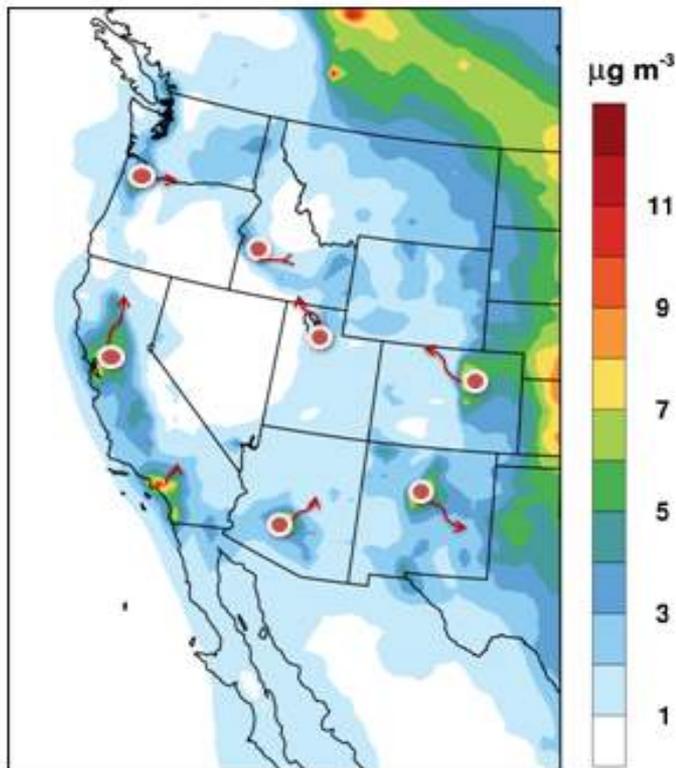
A novel Lagrangian modeling approach



Apply a full gas and aerosol phase Lagrangian model (MOSAIC) to specific air quality source-receptor scenarios in the western US

Drive the model with downscaled current and future climate conditions to address an ensemble of climate realizations

Map of the study domain and $PM_{2.5}$ concentration contours from WRF-CMAQ simulations for a wintertime stagnation period (left) and a summertime wildfire period (right). The red symbols and arrows show potential source- trajectory box modeling locations for wintertime stagnation cases, wildfires, and select urban to rural transport cases.



Climate Downscaling

MACA 4 km gridded downscaled climate conditions (Abatzoglou and Brown, 2011).

- bias-corrected data
 - daily maximum and minimum temperature
 - maximum and minimum relative humidity,
 - wind speed and direction
 - Precipitation
 - solar radiation
 - specific humidity
- Two IPCC scenarios
 - RCP 4.5—modest projected climate change
 - RCP 8.5--extreme projected climate change
- Historical MACA data exist from 1950 to 2005
- Future projections extend from 2006 to 2100.

