

PSU High-Resolution Air Quality Modeling Framework

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Oregon DEQ | Portland OR - Conference Room EQC A

Objective

To develop a fine-resolution air quality modeling framework to support activities at PSU-CCAR*

* Center for Climate and Aerosol Research

Why?

- Studies dedicated to investigate the health effects from acute and chronic exposure to PM_{2.5} and O₃ require reliable air quality simulations
- Increasing horizontal resolution of chemical transport models can result in improved simulations of pollutant concentrations
- Improved simulations of pollutant concentrations at fine resolution can capture the inherent population exposure gradients that exist in heavily populated regions

Why? cont.

- To take advantage of current research and activities carried out at PSU-CCAR and other agencies.
 - NO_x measurements
 - Deposition
 - Woodstoves emission inventory and spatial allocation

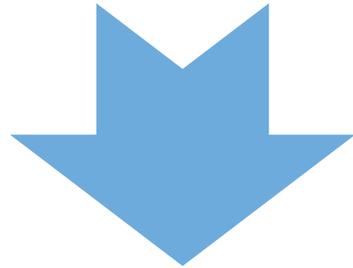
~~Requirements~~ Challenges for Hi-Res Air Quality Modeling

- Fine-Resolution
 - Meteorological Simulations
 - Emission Files
 - Biogenic Emissions
 - Measurements

SPATIAL ALLOCATOR

GIS
shapefiles

GRID Description
12km, 4km, 1km



SPATIAL
SURROGATES

2/3 Residential
1/3 Commercial

1/3 Residential
1/3 Commercial
1/3 Industrial

1/2 Residential
1/2 High Way

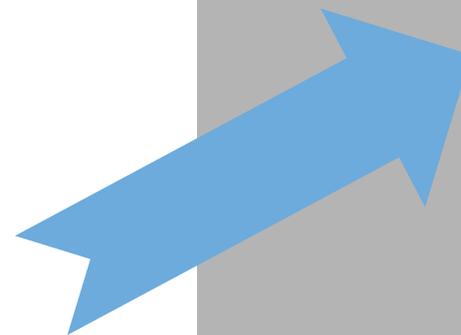
Biogenic
sources
only

SMOKE

NEI2011 V2 (FF10)
Area,
Mobile (Default)
Non-road,
Point (Hourly and Daily)

Gridding (EI)

Speciation
CB05

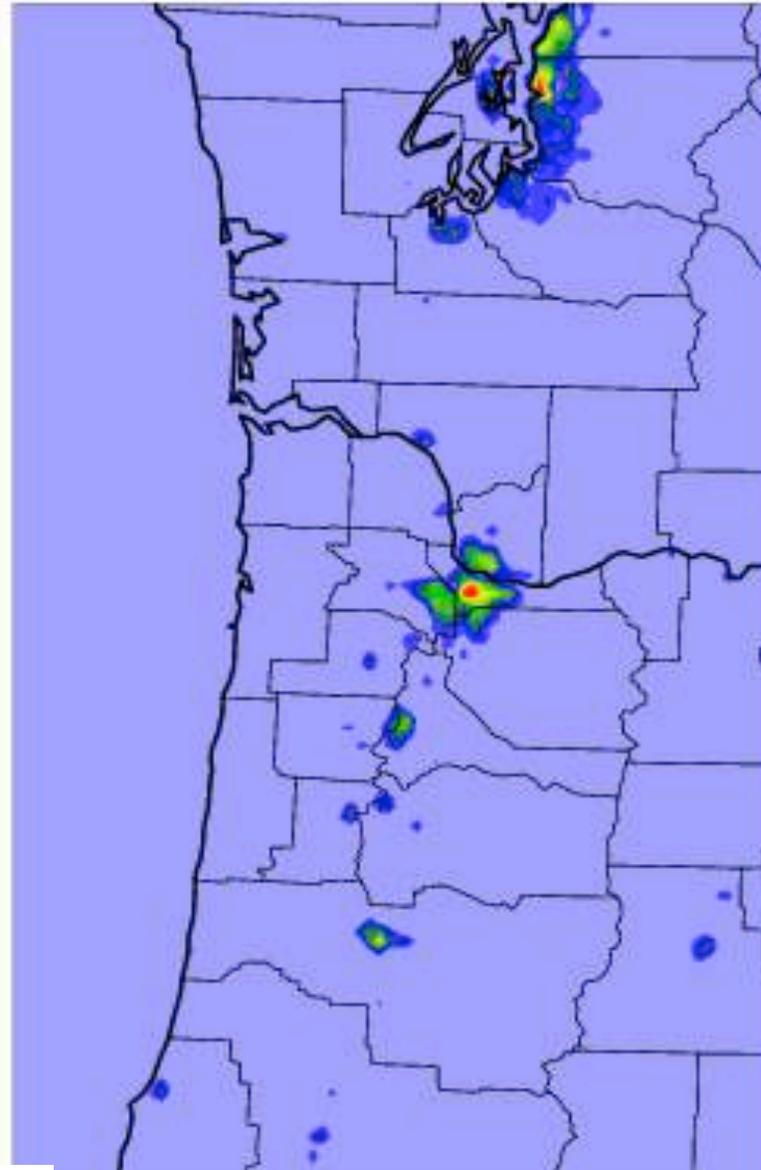
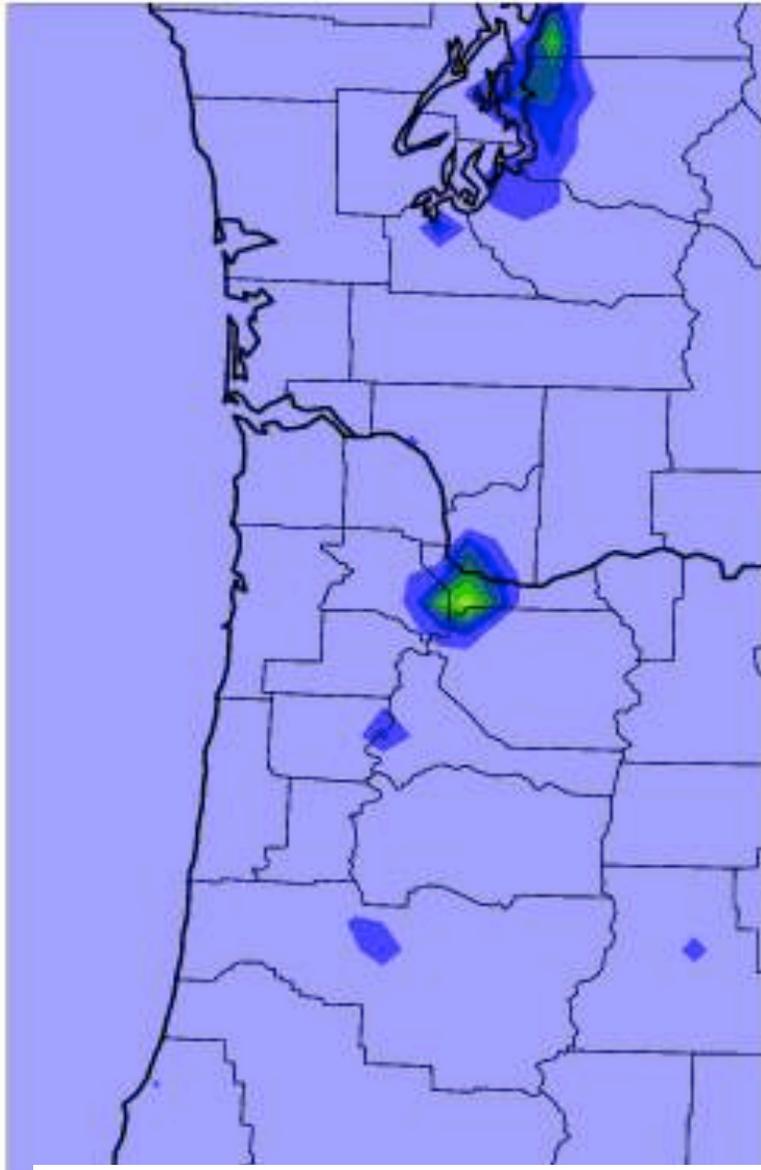


We can already see differences

12 Km

4 Km

1 Km

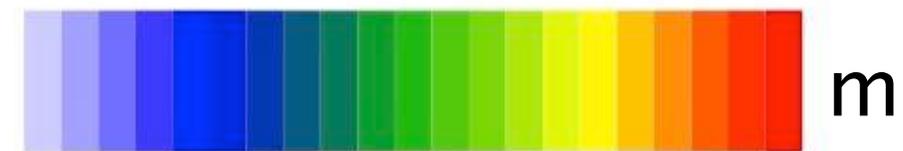
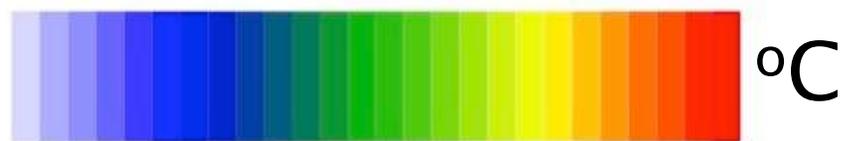
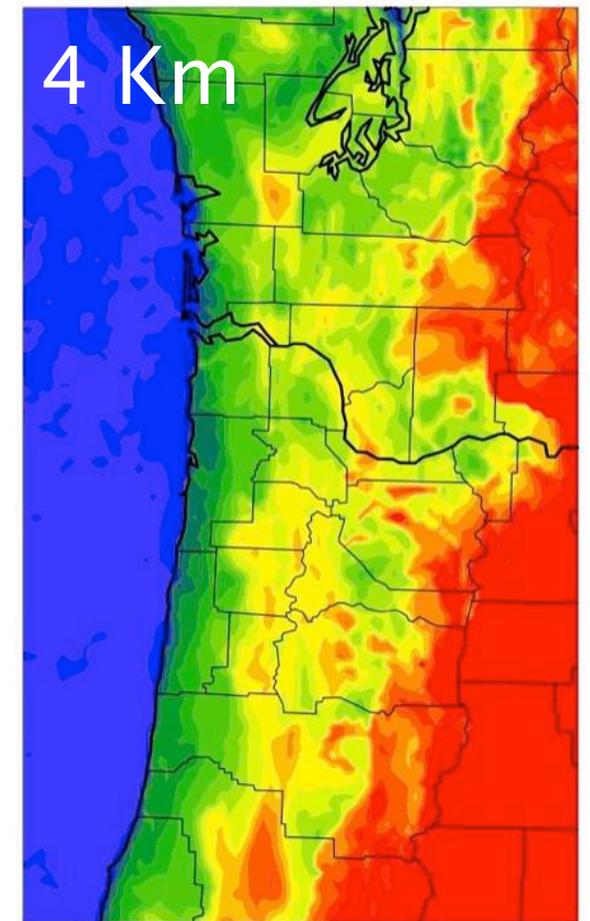
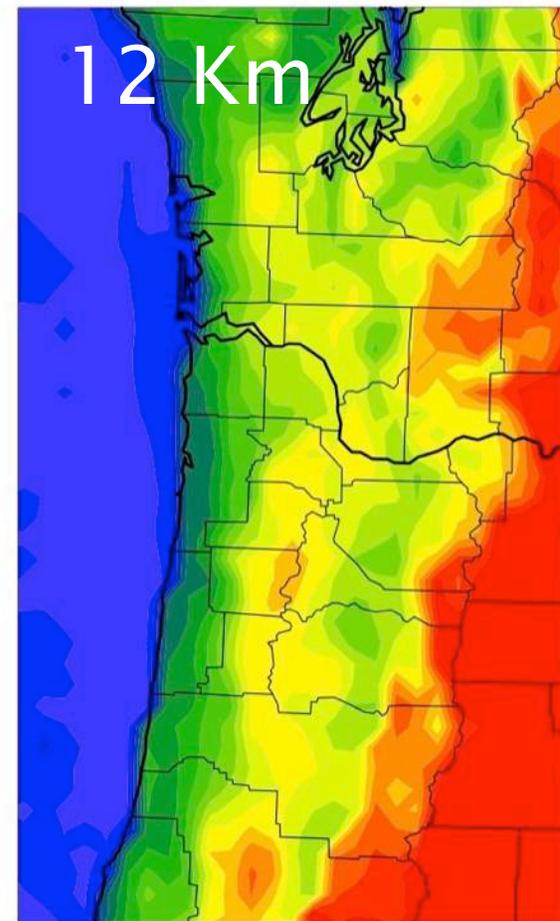
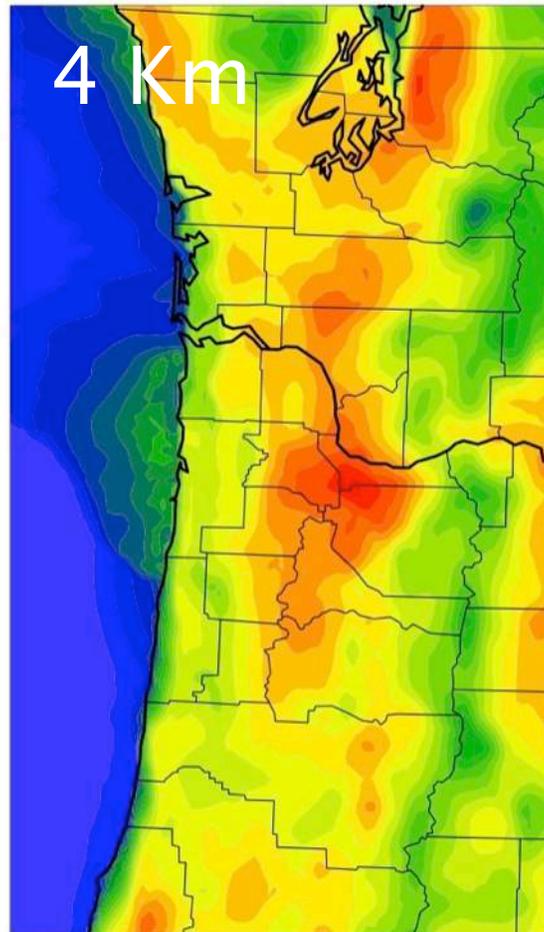
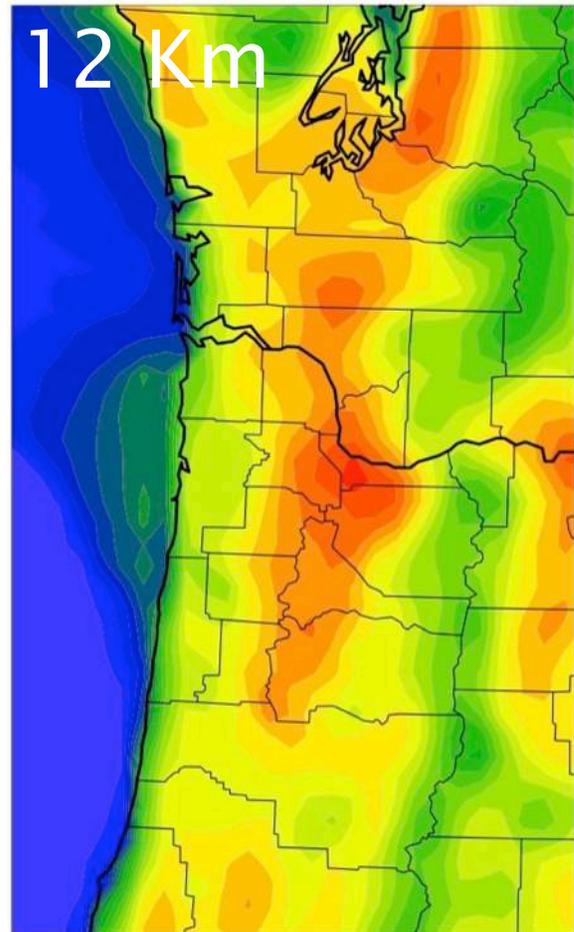


0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1

EC ($\text{g s}^{-1} \text{ km}^{-2}$) - Primary Elemental Carbon (Black Carbon) from cookstoves
- Zoom in from two domains

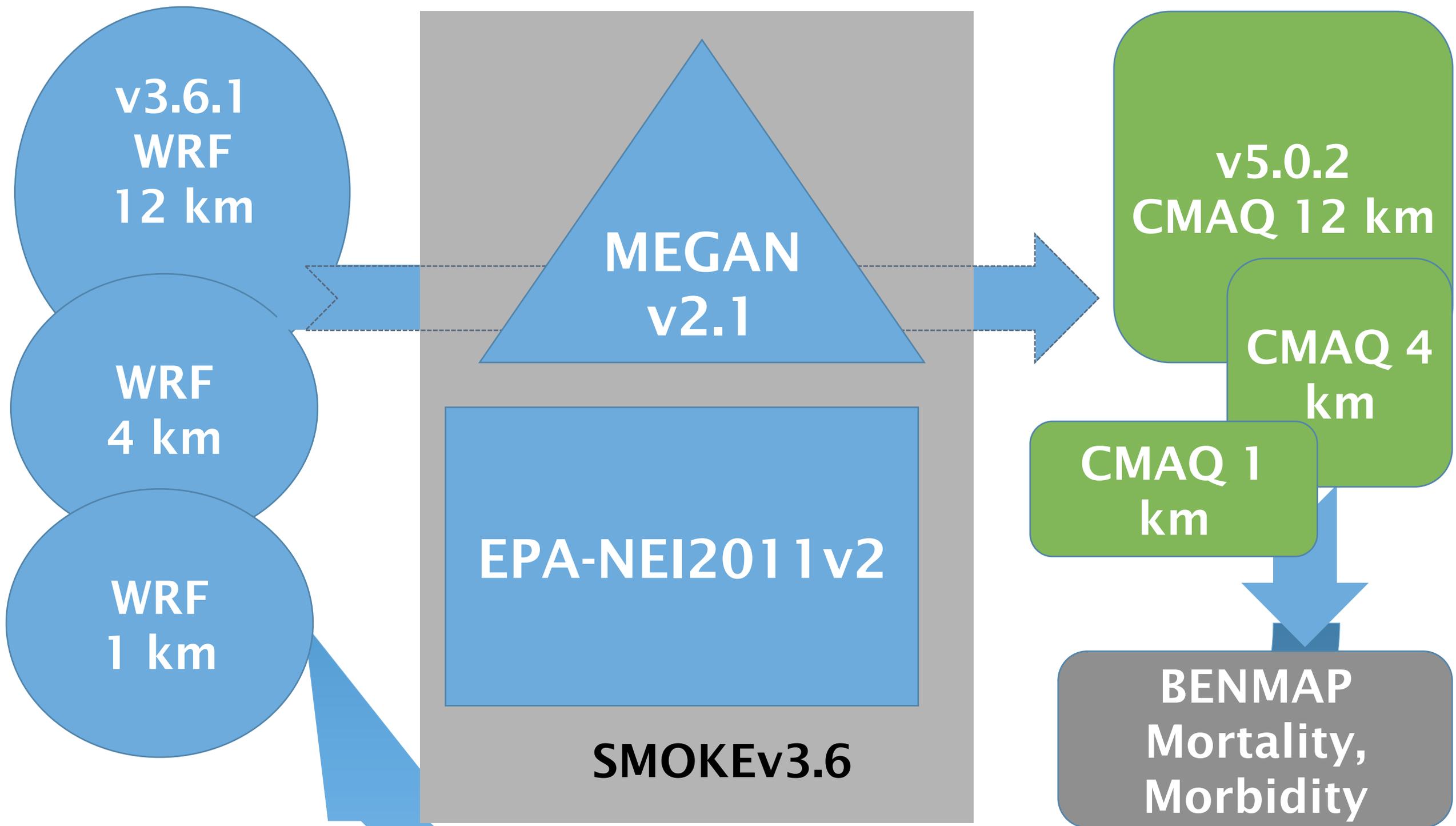
Max Temperature

Planetary Boundary Layer



10 12 14 16 18 20 22 24 26 28 30 32 34

0 300 600 900 1200 1500 1800



How does the resolution affect the BENMAP reports?

How does the resolution of spatial allocation of emissions affects BENMAP reports?



Source: National Geographic | TRAVELER Photo Contest 2013