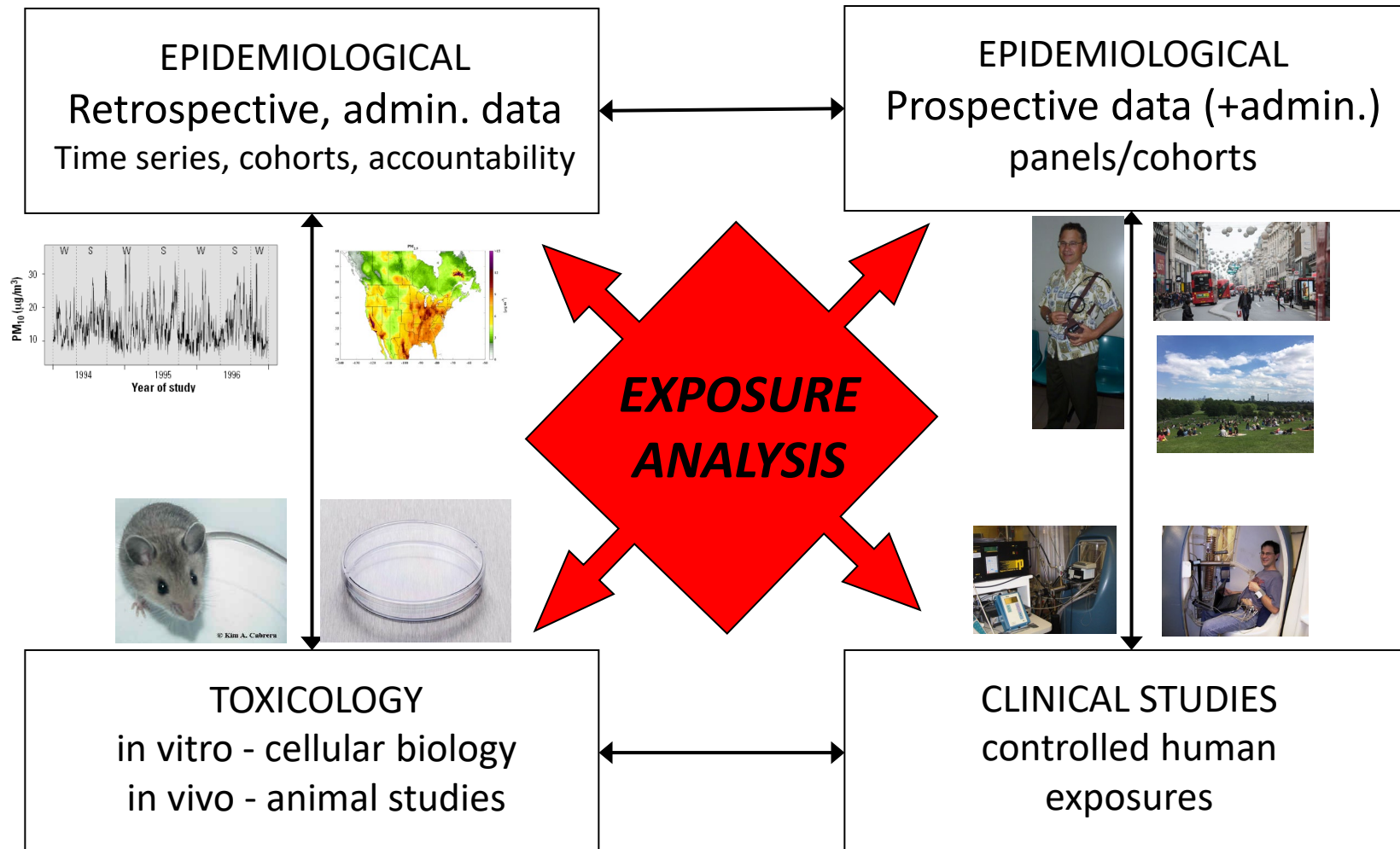


Measuring cumulative exposures to air pollution at the community-level

HEI Annual Conference 2023



Understanding Health Effects starts with Exposure



Exposure: it all happens at the local scale

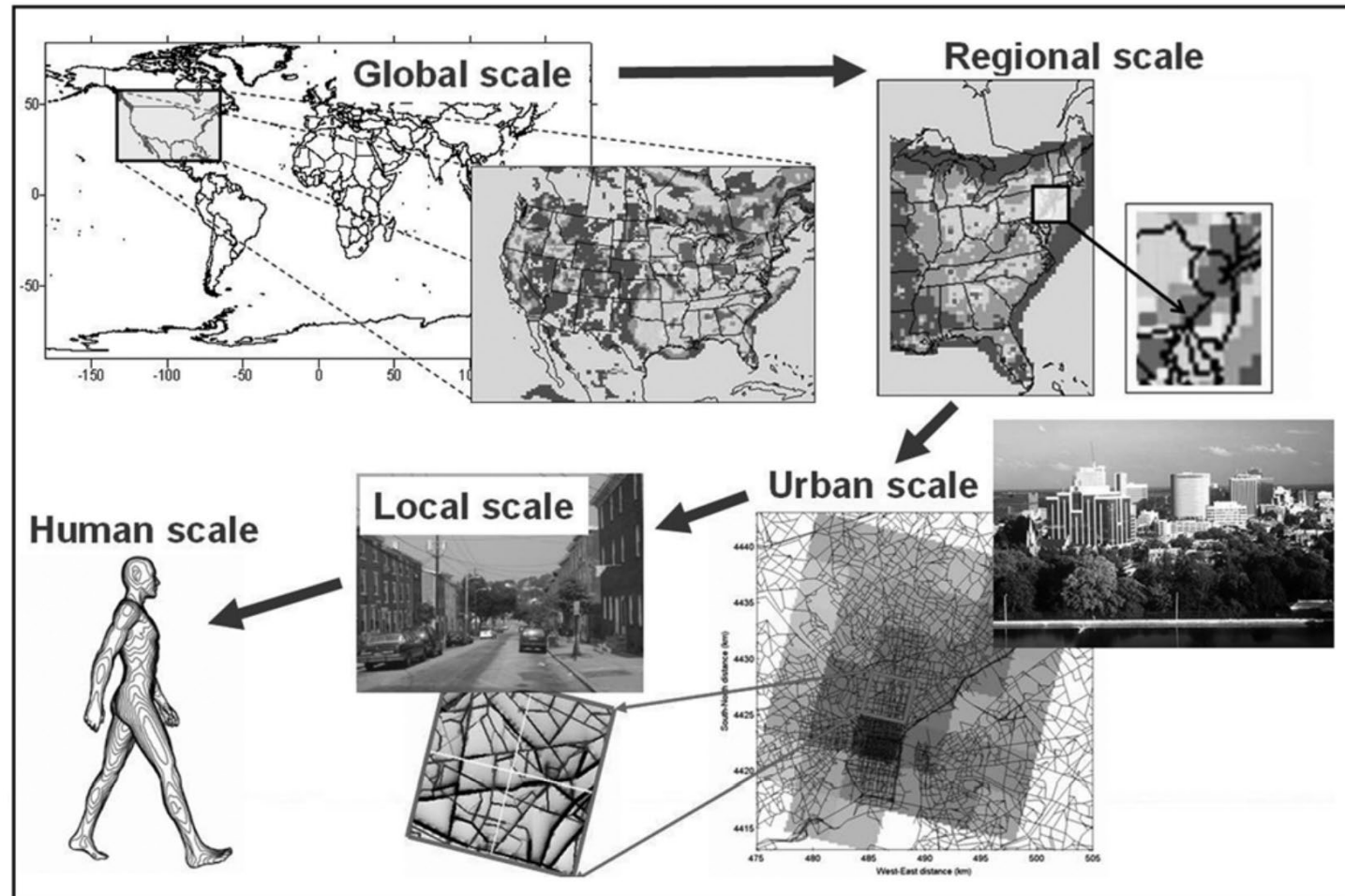
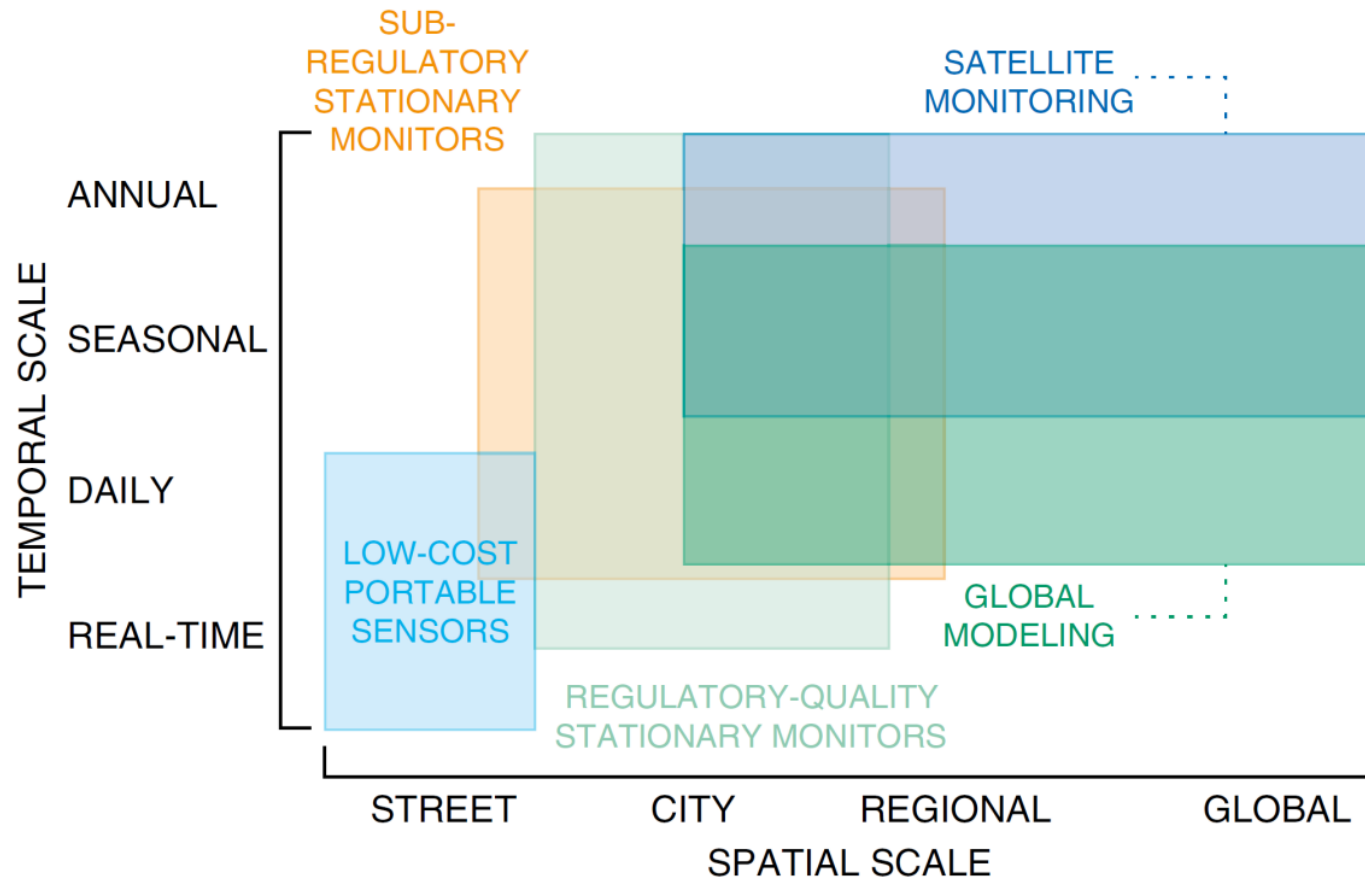


Figure 3.1. Graphic representation of the scales used in modeling emissions from traffic. (Reprinted from Stein et al. 2007, with permission of Elsevier.)

Improved estimates realized across all scales



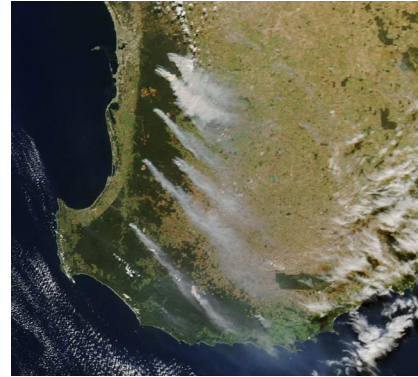
- **For selected pollutants**

- Often focused on independently
- Long-term 'surfaces' most common
- Less able to resolve space and time

From visibility to complete global coverage of PM_{2.5}

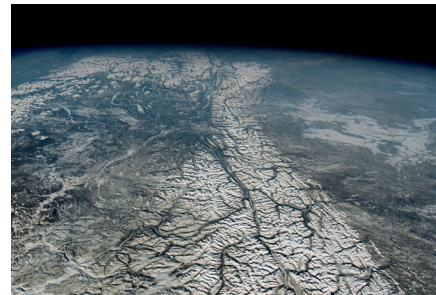


Airport **visibility** to PM relationship under the assumptions of the Koschmieder Formula

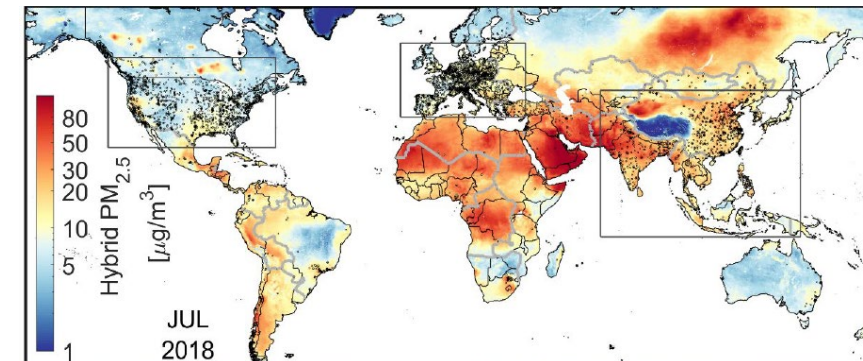
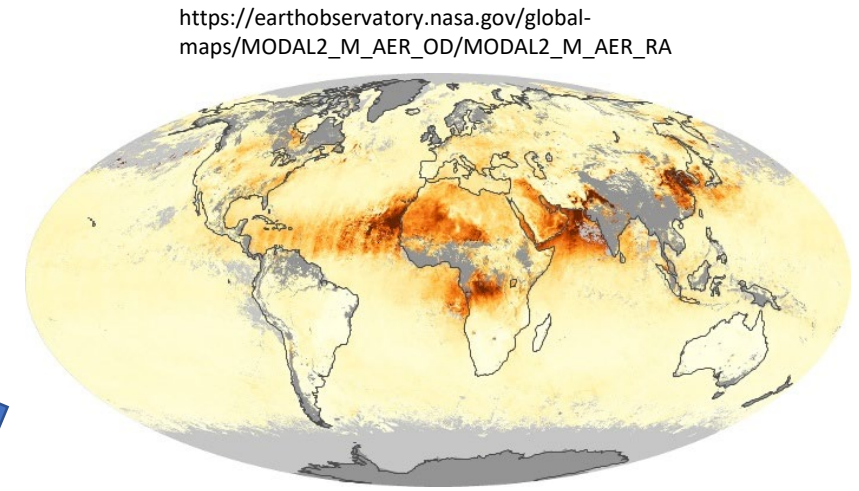


<https://earthobservatory.nasa.gov/images/151251/smoky-skies-in-western-australia>

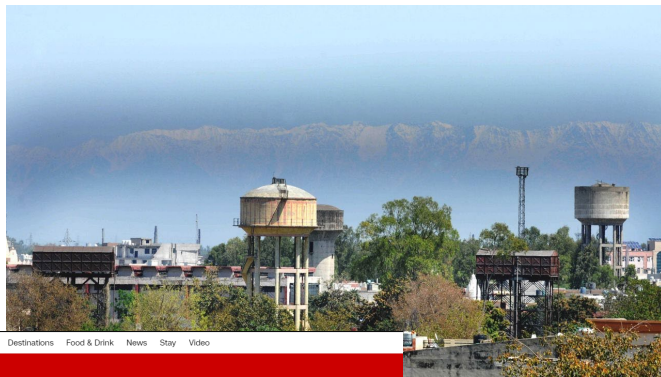
'visibility looking down'



<https://earthobservatory.nasa.gov/images/151248/canadian-rockies>



Von Donkelaar et al., ES&T 2021



People in India can see the Himalayas for the first time in 'decades,' as the lockdown eases air pollution

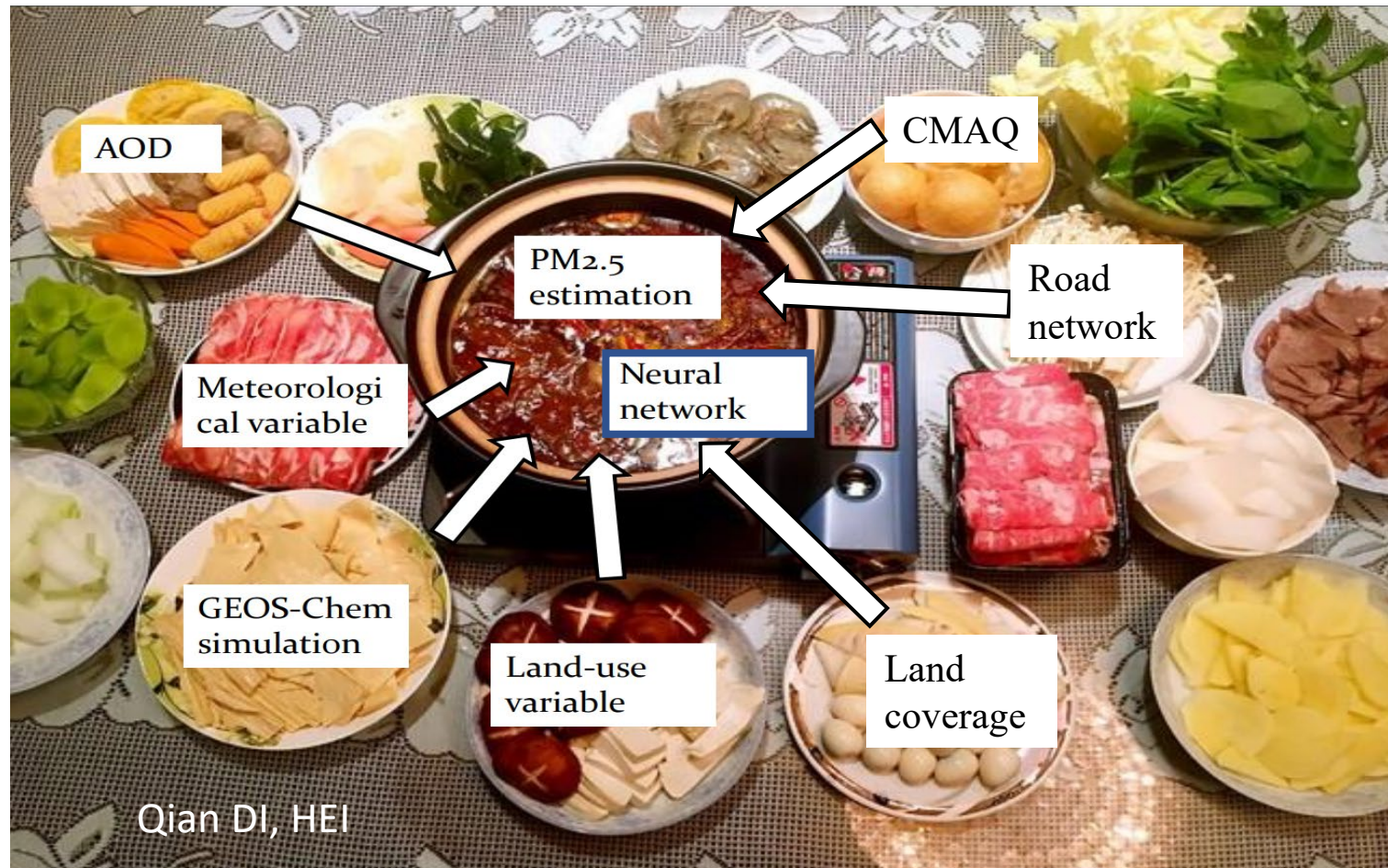
By Rob Picheta, CNN
Updated 8:31 AM EDT, Thu April 9, 2020

Virtual Workshop on Health Applications for Satellite-Derived Air Quality: Opportunities and Potential Pitfalls

<https://www.healtheffects.org/meeting/satellite-derived-air-quality-opportunities>

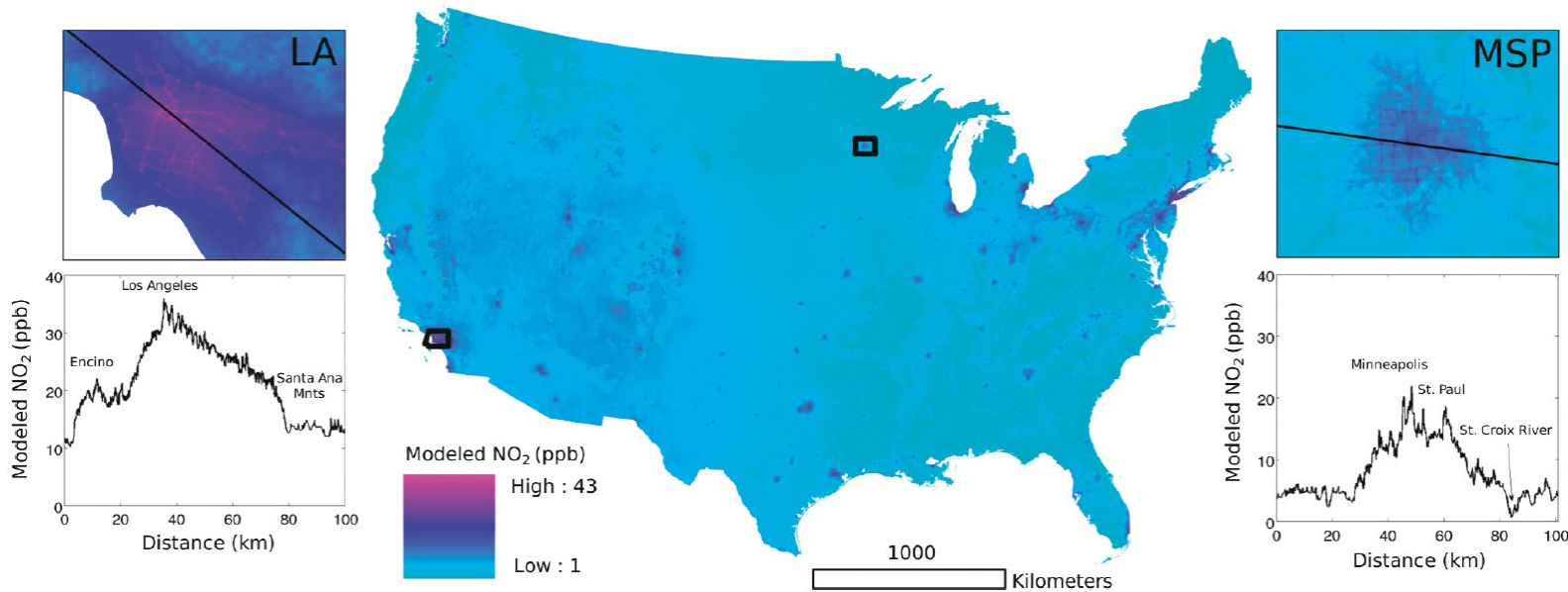
Detailed surfaces for multiple pollutants

PM_{2.5} NO₂ O₃ BC UFP

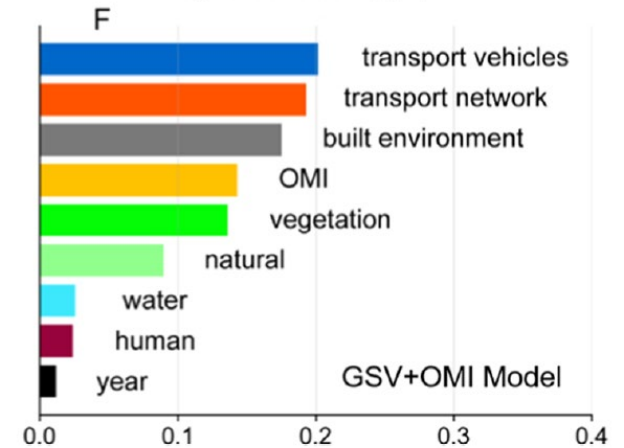
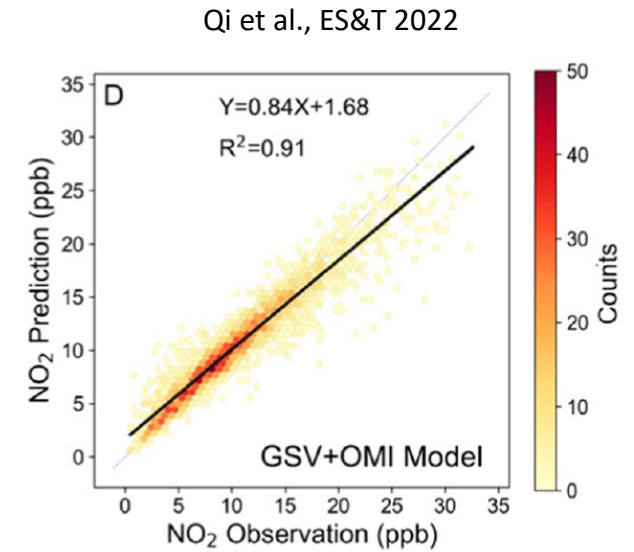


Countless DATA FUSION models combine relevant data into a delicious soup

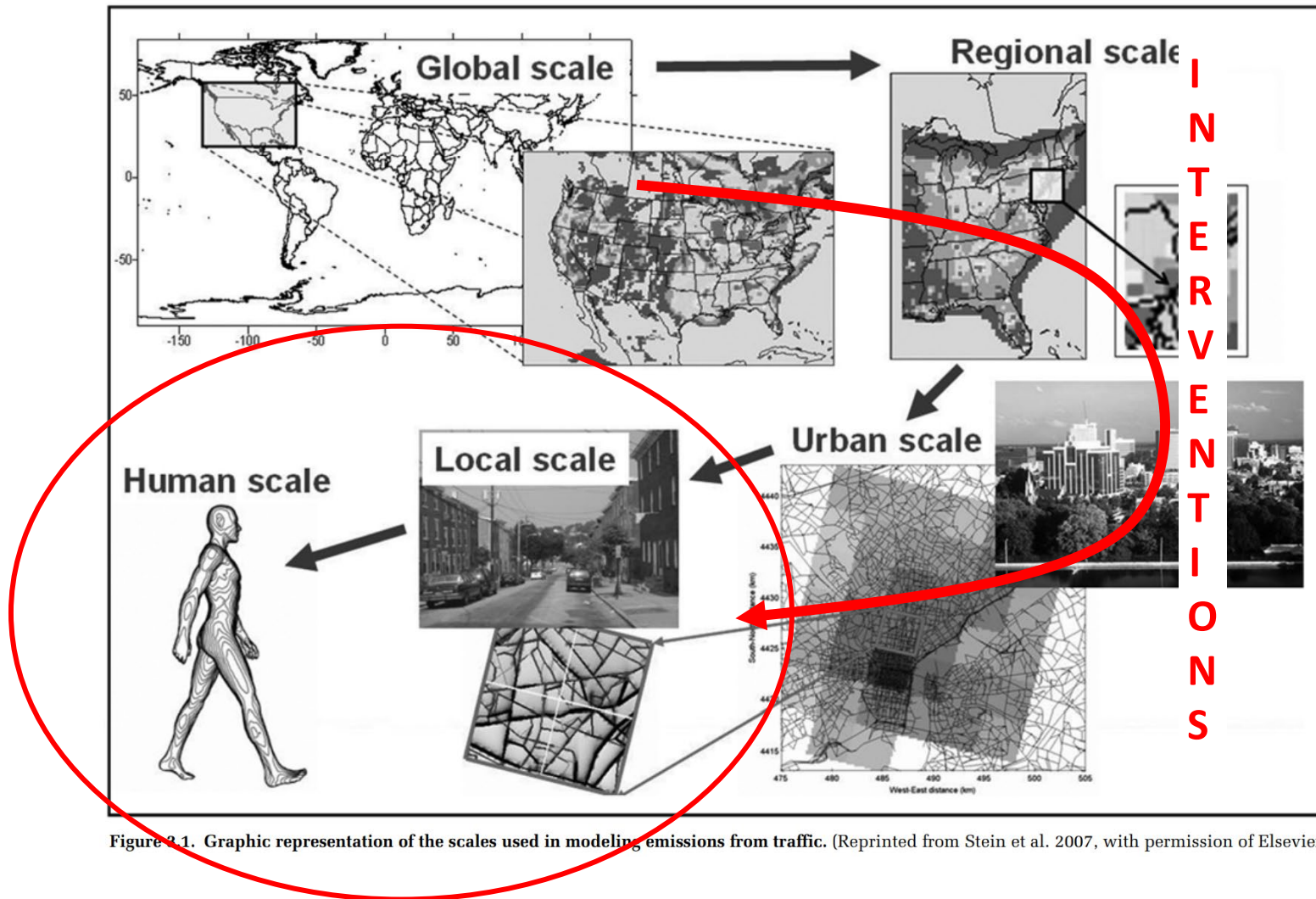
NO₂ from images: on satellites and cars



Novotny et al., ES&T 2011



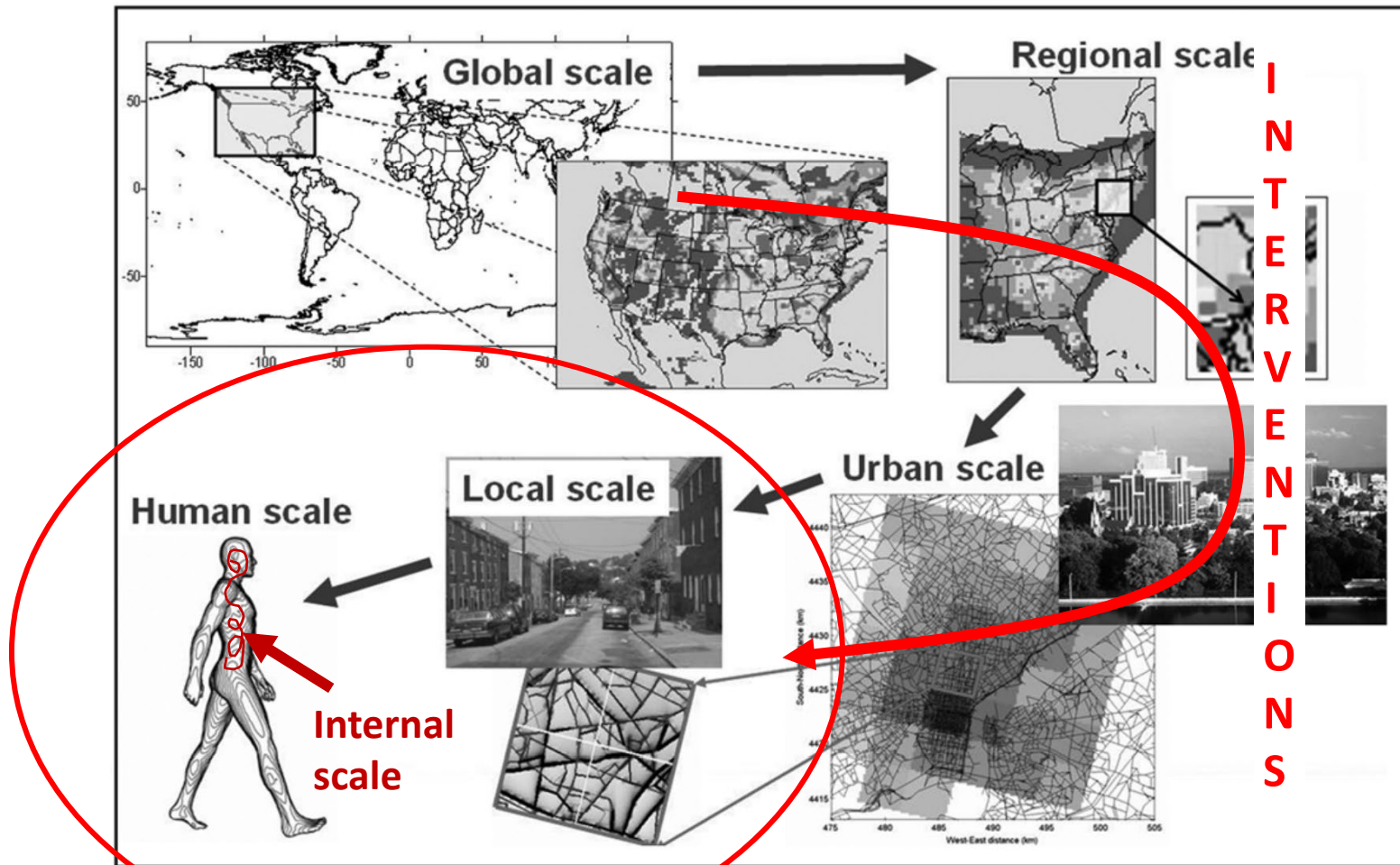
Exposure: opportunities at the community scale



- Increasingly better at estimating exposures at the home address for selected pollutants
- Challenges:
 - *Mixtures*
 - *Mobility*
 - *Lifecourse*

Figure 9.1. Graphic representation of the scales used in modeling emissions from traffic. (Reprinted from Stein et al. 2007, with permission of Elsevier.)

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Figure 9-1. Graphic representation of the scales used in modeling emissions from traffic. (Reprinted from Stein et al. 2007, with permission of Elsevier.)

Community-level work in the context of everyday life = solution-oriented focus (?)

Where next?

Three different directions to be discussed in this session:

- Multipollutant personal and community scale monitoring
- Biomarkers – multi-omics
- Geospatial models of multiple community-scale exposures
- Harnessing our personal mini-assistants (aka smart phones) and big data streams

