

Advances in Simulating the Global Spatial Heterogeneity of Air Quality and Source Contributions

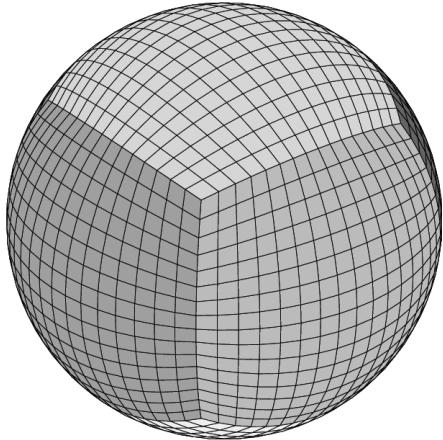
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with contributions from

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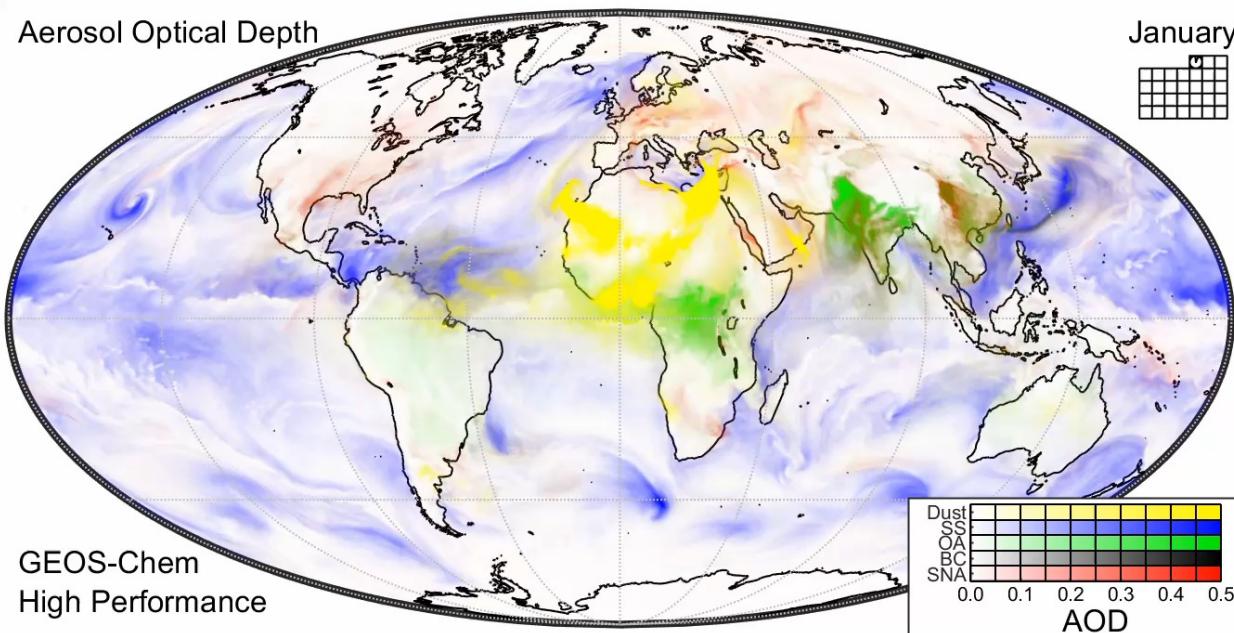
June 9, 2022

Spatial Heterogeneity of Air Quality and Sectoral Contributions



**GEOS
Chem**

Fine resolution (C360, 25 km)
Coarse resolution (C48, 200 km)



Courtesy of Aaron van Donkelaar

Population Exposure Estimate



Courtesy of Yazhen Wu

Sectoral Contributions



Residential
Combustion



Industry

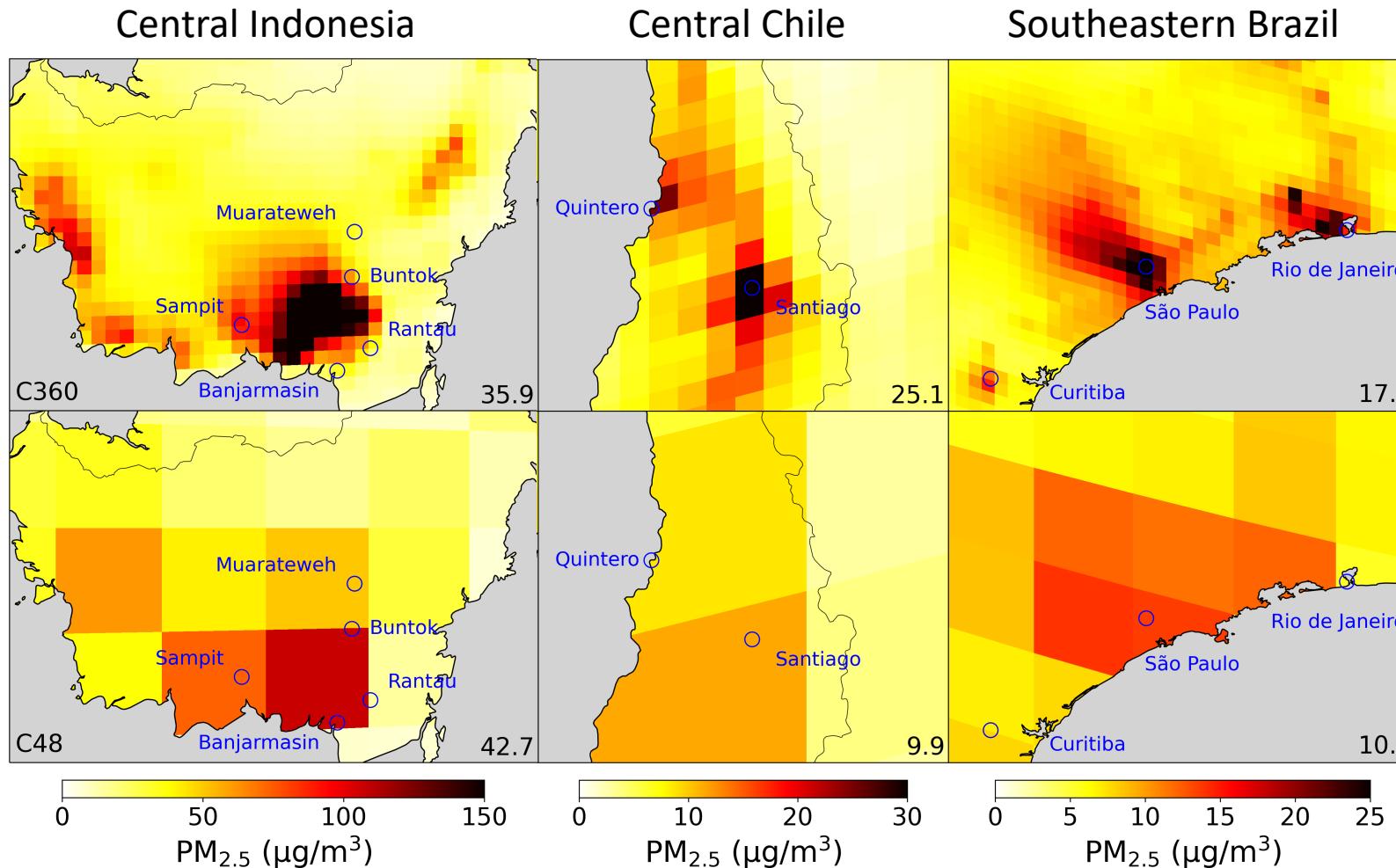


Energy



Transportation

Spatial Heterogeneity of Population Exposure



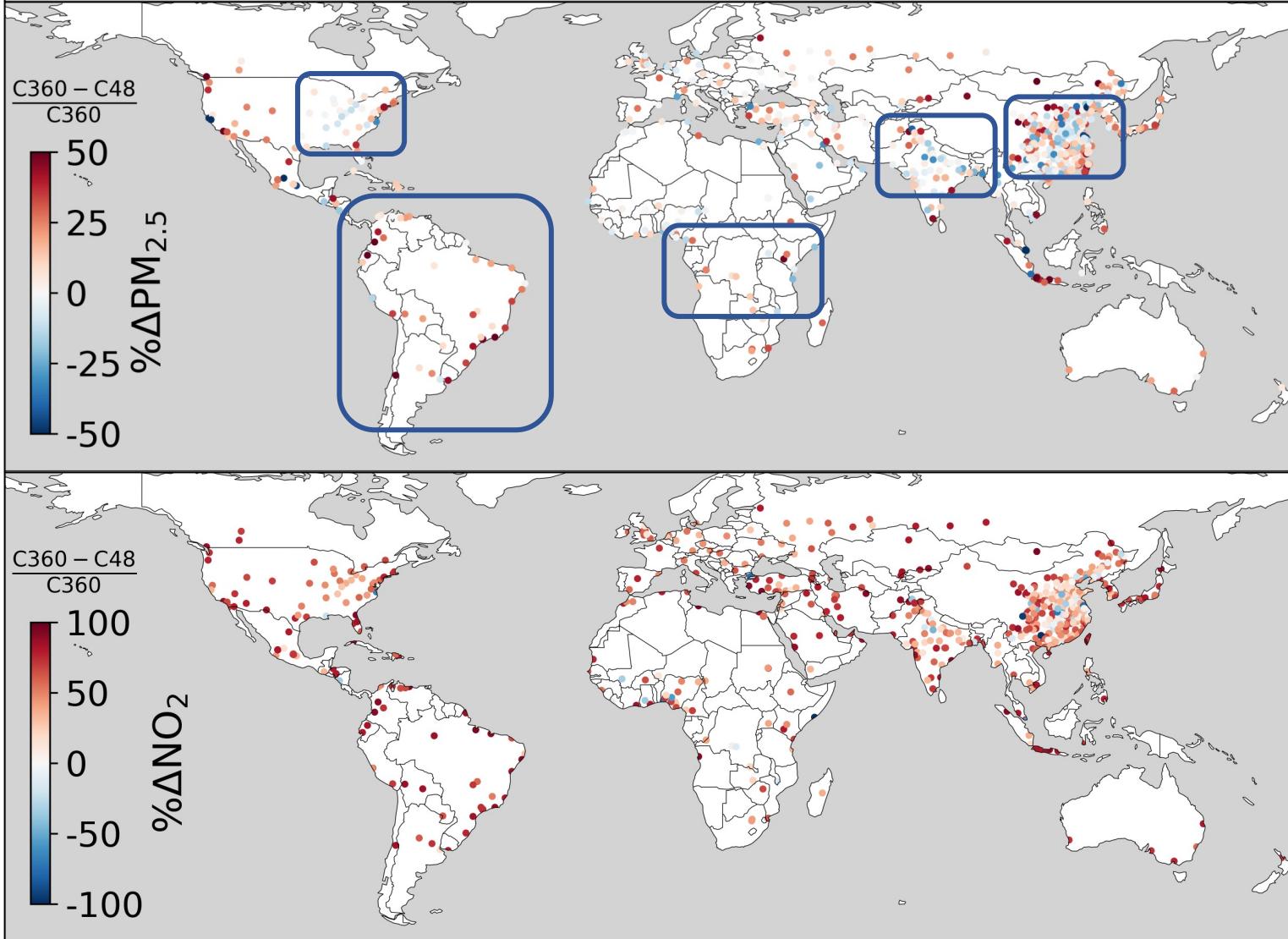
Biomass burning:
Separate fires from adjacent cities

Mountainous regions:
Resolve hotspots in complex terrain

Coastlines:
Resolve gradients against cleaner oceans

Note: Inset values are population weighted PM_{2.5} concentrations

Spatial Heterogeneity of Population Exposure in populous cities



Intensive city clusters:
Cumulative emissions &
enhanced mixing

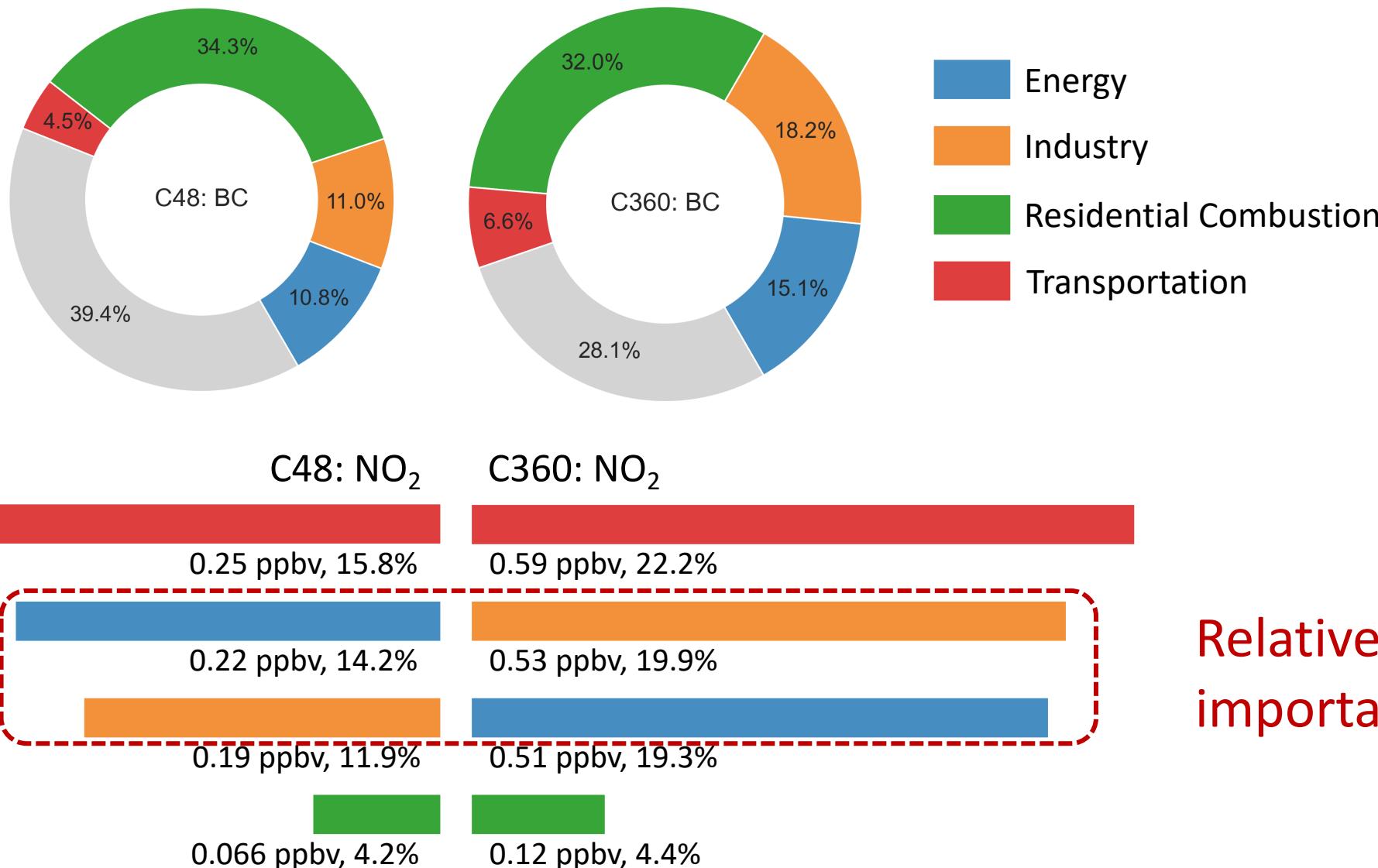
Secondary dominated:
SO₂/NH₃ constraints

Isolated cities:
Gradients/hotspots
resolving

Higher estimation at
fine resolution:
Short NO_x lifetime and
local emissions

Resolution Effect on Sectoral Contributions in the Global South

Enhanced relative importance of the industry to energy emissions





A wide-angle photograph of a university campus during autumn. The foreground is a grassy field covered with fallen red and orange leaves. In the background, there are several large, historic buildings with stone facades and multiple gables. A person wearing a dark jacket and backpack walks away from the camera towards the buildings. The sky is clear and blue. On the right side of the image, there is a graphic overlay consisting of a white rectangular frame containing three white stars at the top, two white squares in the middle, and two white fleur-de-lis symbols at the bottom.

Thank You!