

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

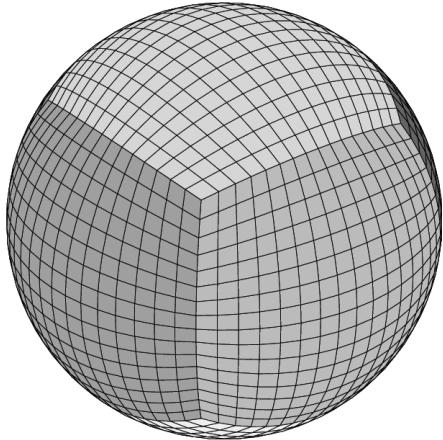
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with contributions from

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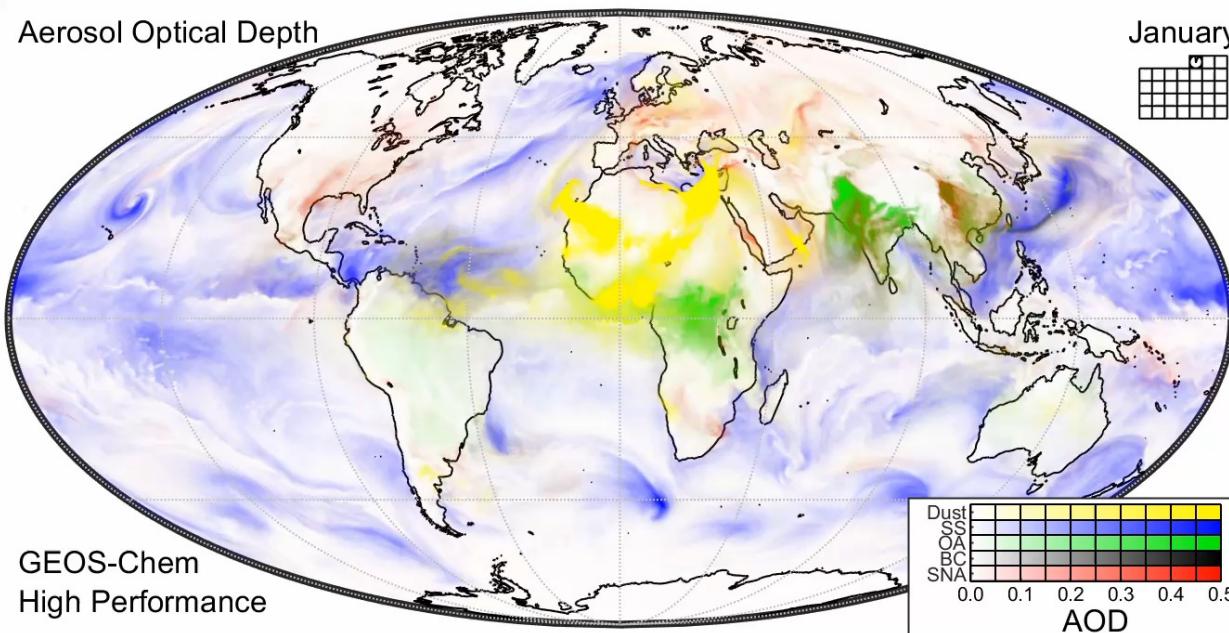
May 31, 2022

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

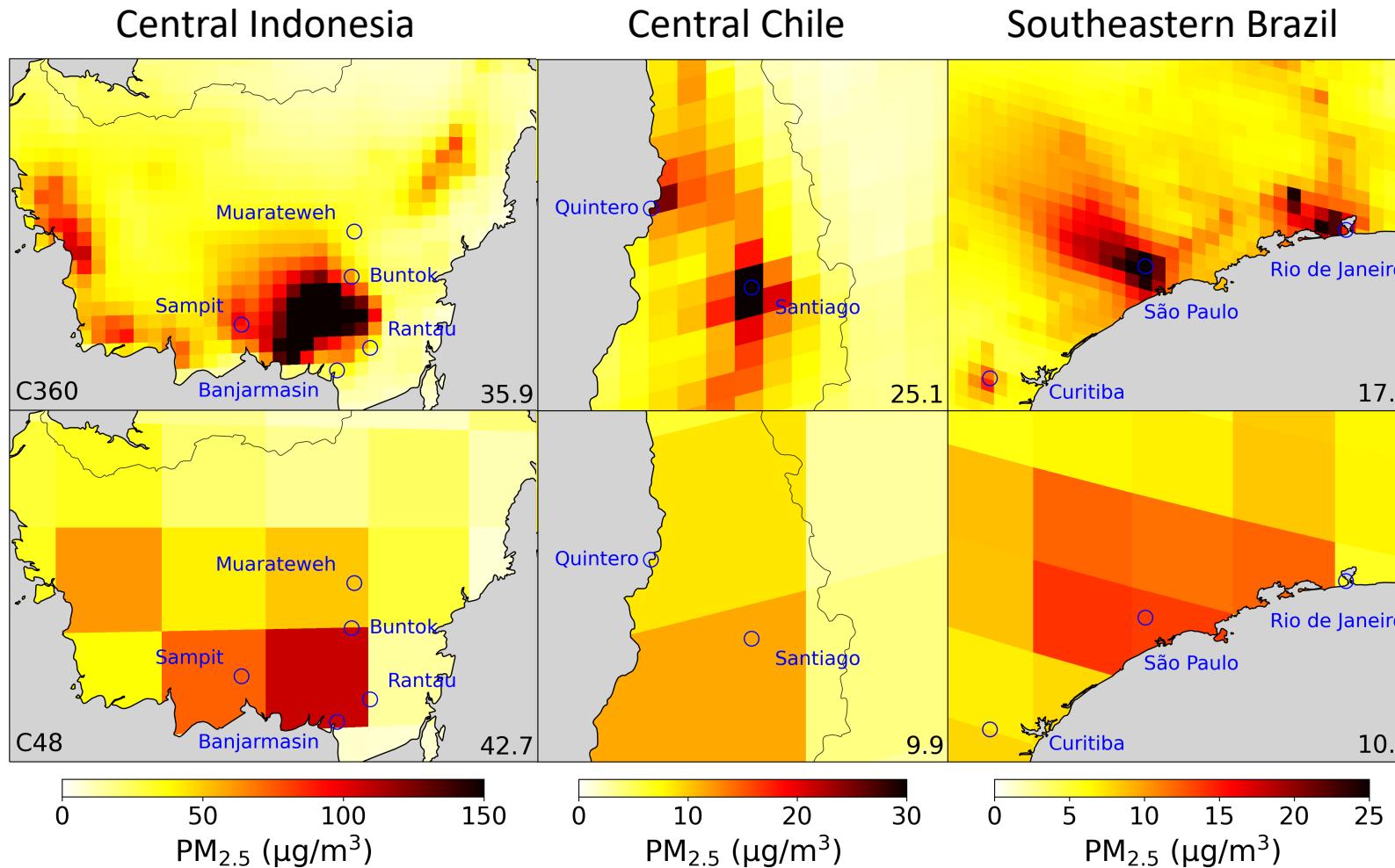


Energy



Transportation

Spatial Heterogeneity of Population Exposure



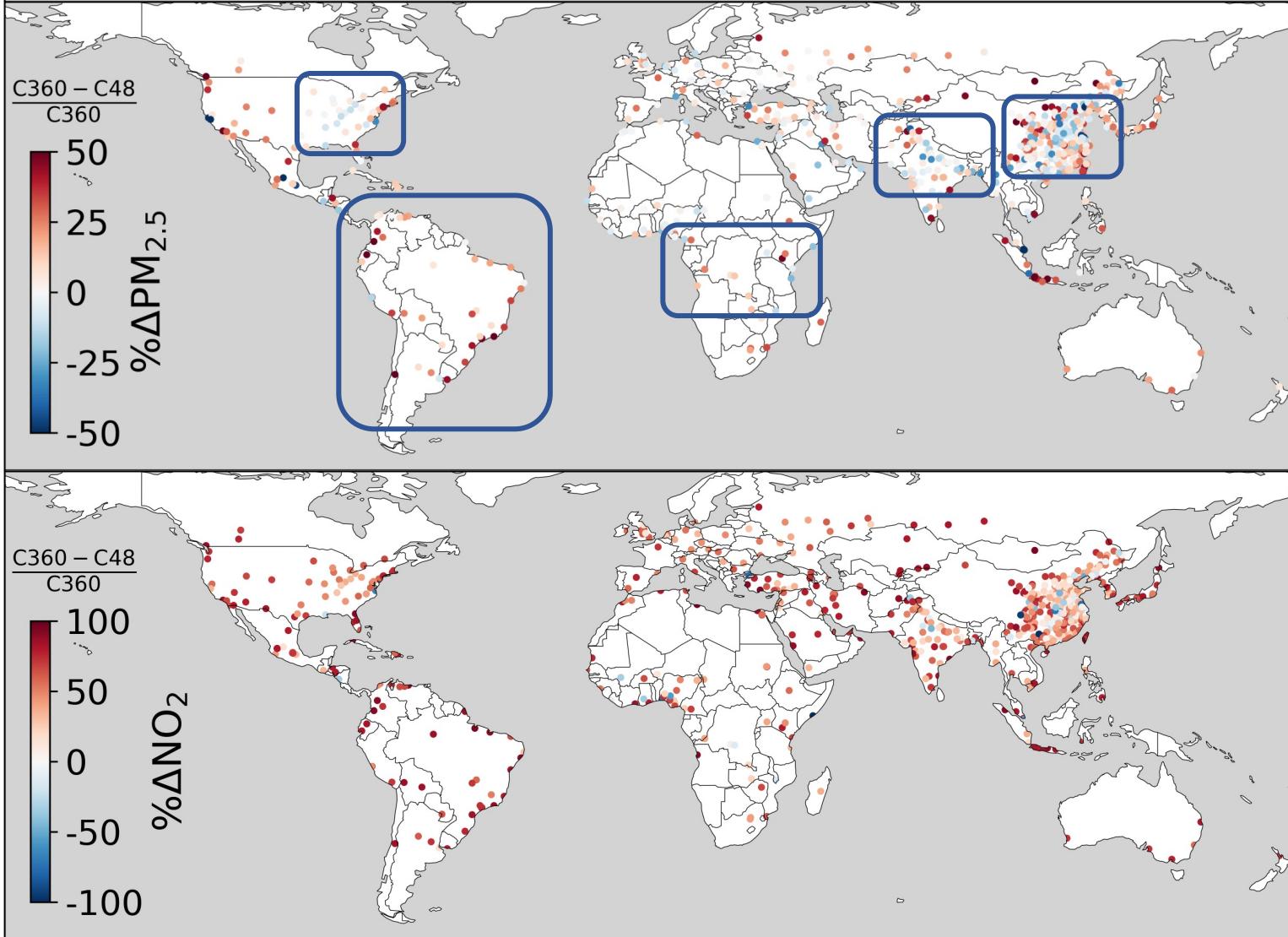
Biomass burning:
Separate fires from adjacent cities

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

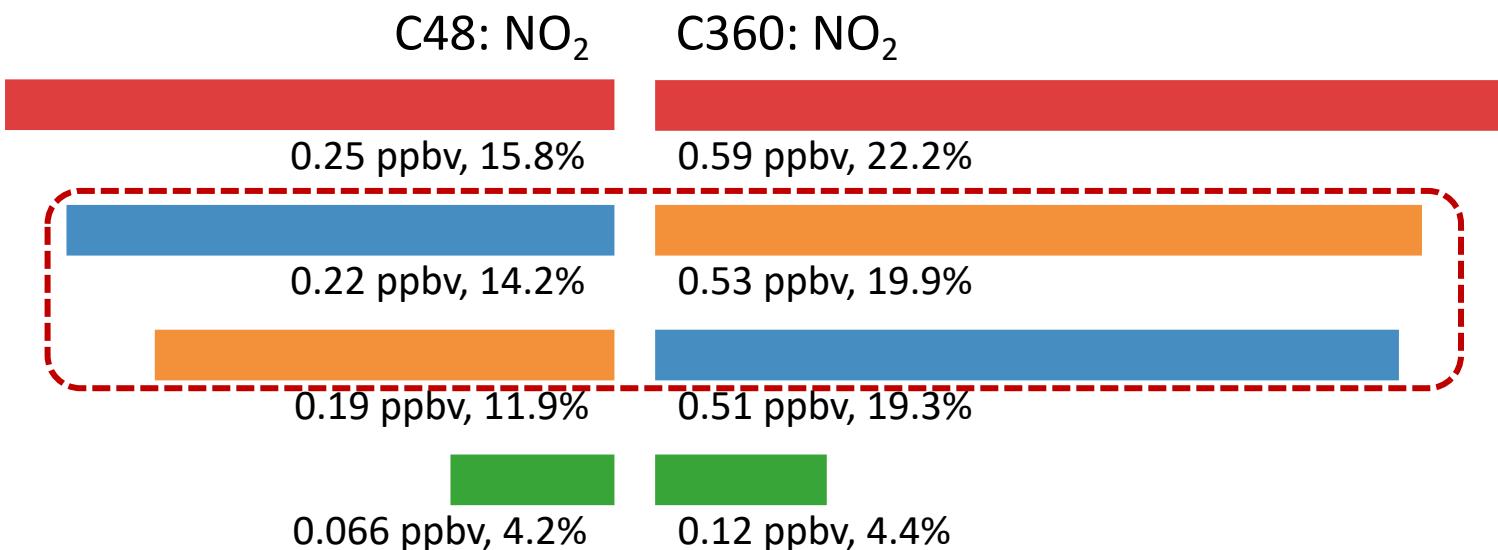
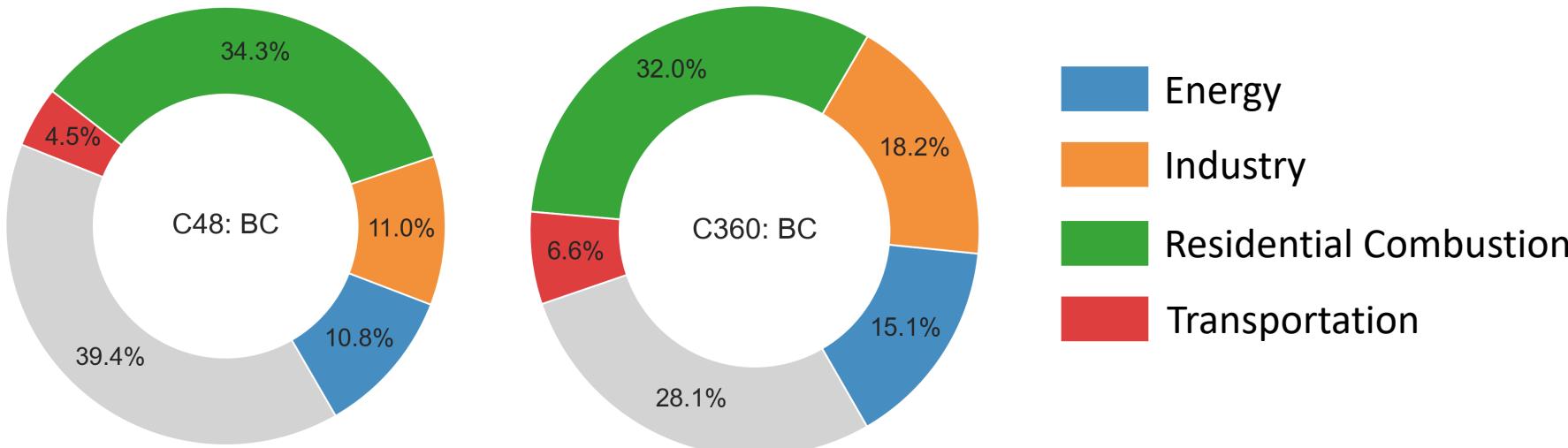
Secondary dominated:
SO₂/NH₃ constraints

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



Relative sectoral
importance changes



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, several large brick buildings with white-framed windows are visible, surrounded by trees whose leaves are in full autumn colors. A person wearing a dark jacket and backpack walks away from the camera on the left side of the frame. The sky is a clear blue with a few wispy clouds.

Thank You!

