Supporting Information: Global Estimates of Fine Particulate Matter using a Combined Geophysical-Statistical Method with Information from Satellites, Models, and Monitors

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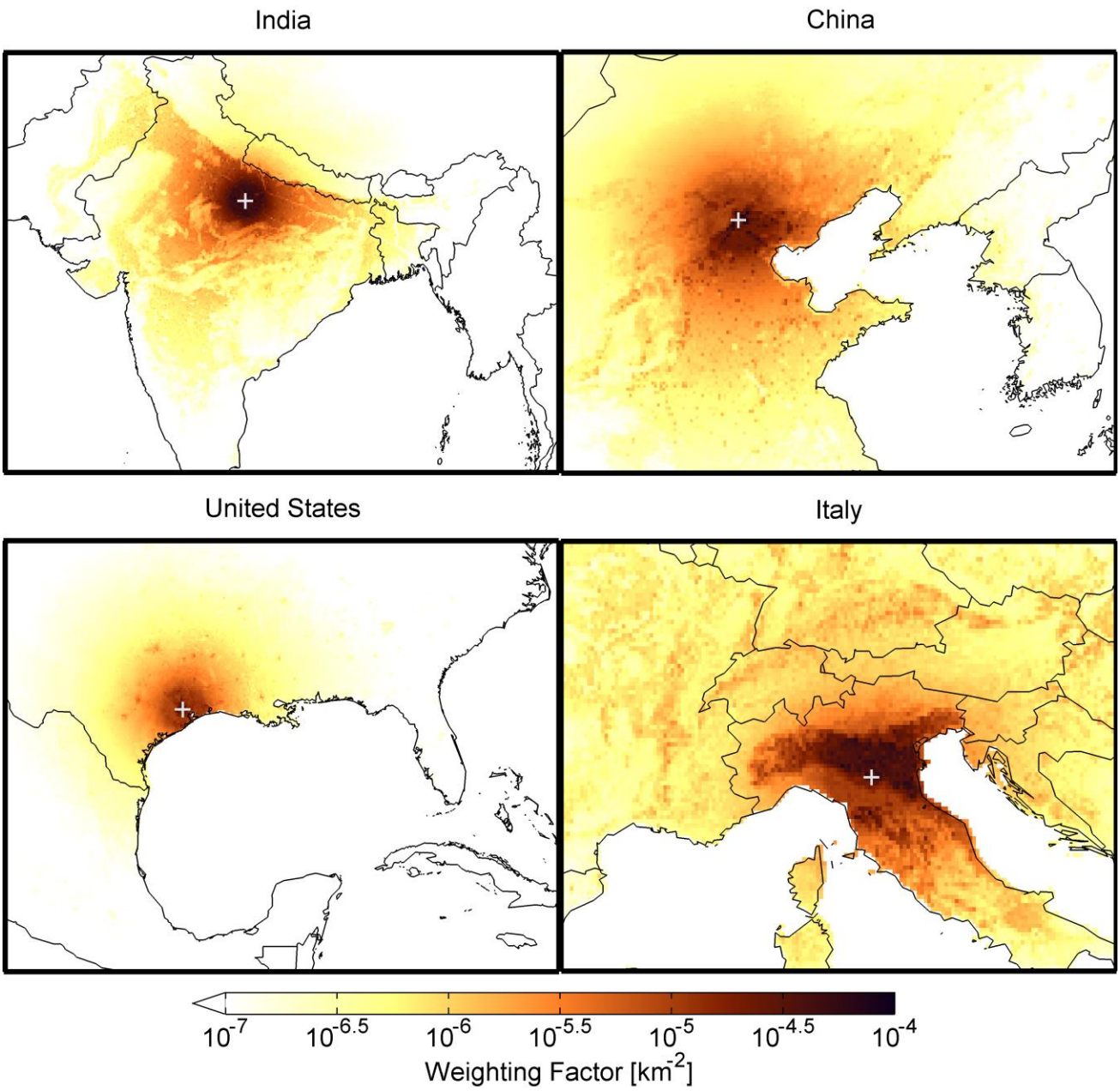
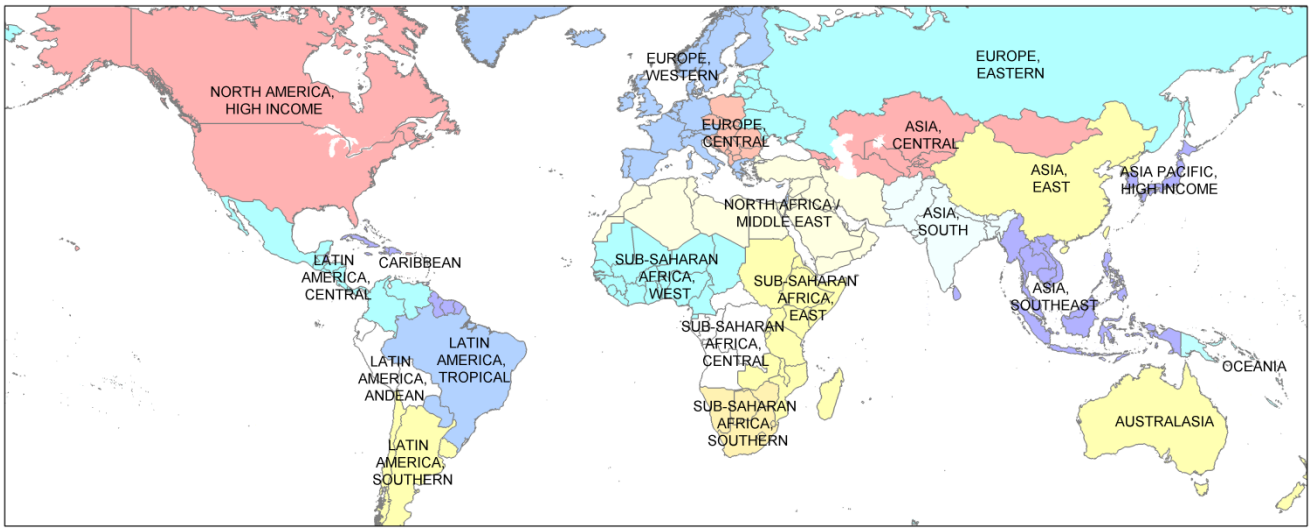
Supporting Information Table S1: Data source summary

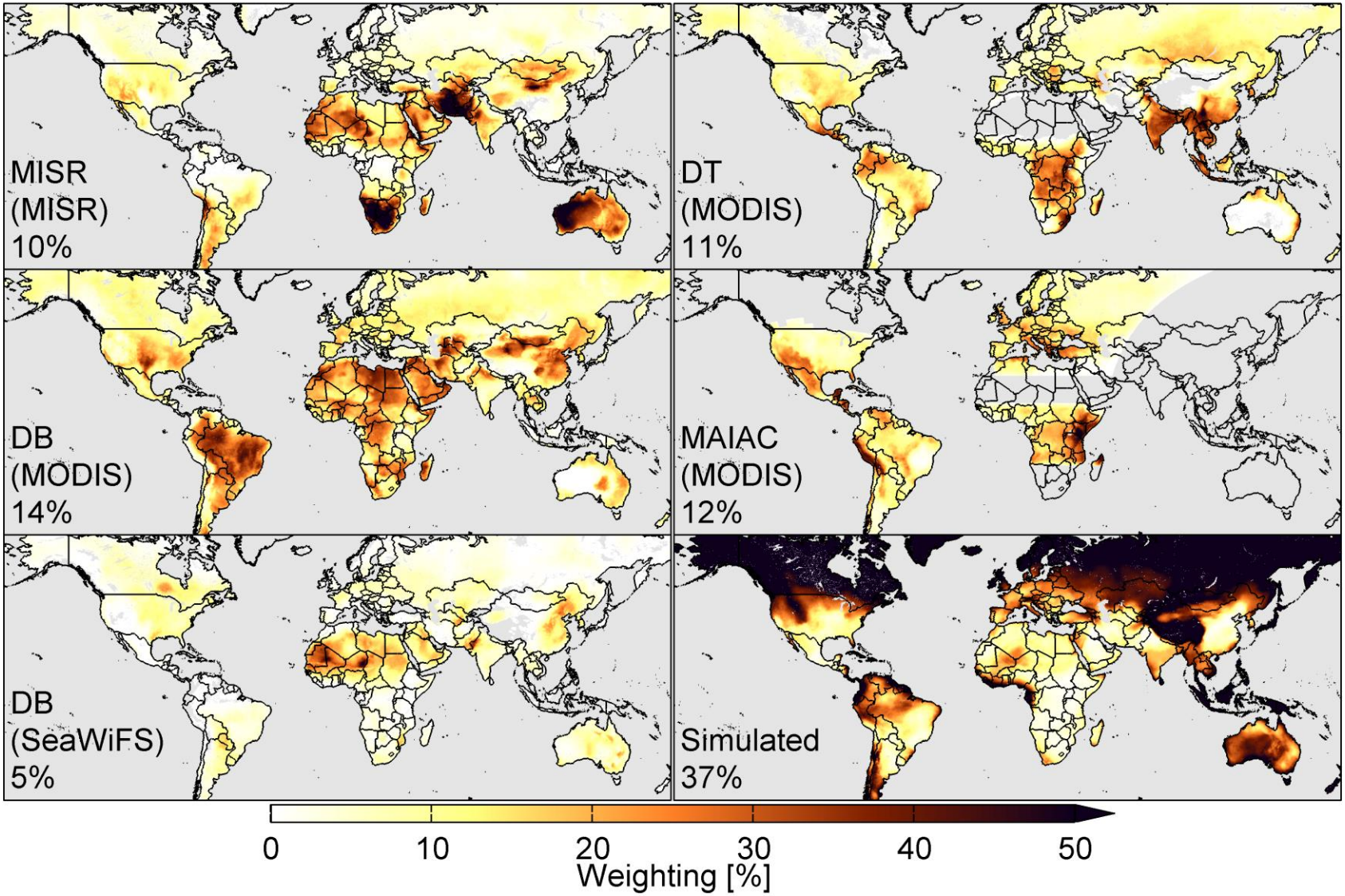
Data Source	Period Used	Spatial Resolution	Temporal Resolution	Usage
MODIS Aqua / MODIS Terra with DT retrieval algorithm	2002-2014 / 2000-2014	10 km × 10 km regridded onto global 0.1° × 0.1° grid.	Daily under viable retrieval conditions	AOD source
MODIS Aqua / MODIS Terra with DB retrieval algorithm	2002-2014 / 2000-2014	10 km × 10 km regridded onto global 0.1° × 0.1° grid.	Daily under viable retrieval conditions	AOD source
MODIS Aqua / MODIS Terra with MAIAC retrieval algorithm	2002-2014 / 2000-2014	1 km × 1 km regridded onto regional 0.1° × 0.1° and 0.01° × 0.01° grids.	Daily under viable retrieval conditions	AOD source
MISR with MISR retrieval algorithm	2000-2014	17.6 km × 17.6 km regridded onto global 0.1° × 0.1° grid.	Weekly under viable retrieval conditions	AOD source
SeaWiFS with DB retrieval algorithm	1998-2010	13.5 km × 13.5 km regridded onto global 0.1° × 0.1° grid.	Daily global under viable retrieval conditions	AOD source
GEOS-Chem	1998-2014	2° × 2.5° (global) and 0.5° × 0.667° over nested regions	10 - 15 min (transport), hourly (chemistry and emissions)	AOD source, AOD to $PM_{2.5}$ relationship, speciated GWR predictors
AERONET	1998-2014	Point observation	15 minutes under cloud-free conditions	AOD uncertainty assessment and calibration
CALIOP	2006-2011	5 km regridded to simulation resolution	16 days	Simulated vertical profile evaluation
MODIS Collection 5 Land Type Percentage (MCD12C1)	2001-2012	0.05° × 0.05° regridded onto global 0.1° × 0.1° grid.	Annual	Global extension of AERONET-observed uncertainty, and GWR predictor (urban landcover)
ETOPO1 Global Relief Model	N/A	1’ × 1’ regridded onto global 0.01° × 0.01° grid.	N/A	GWR predictor
$PM_{2.5}$ and PM_{10} surface monitors	2008-2013	Point observation	Annual	Assessment and GWR calibration



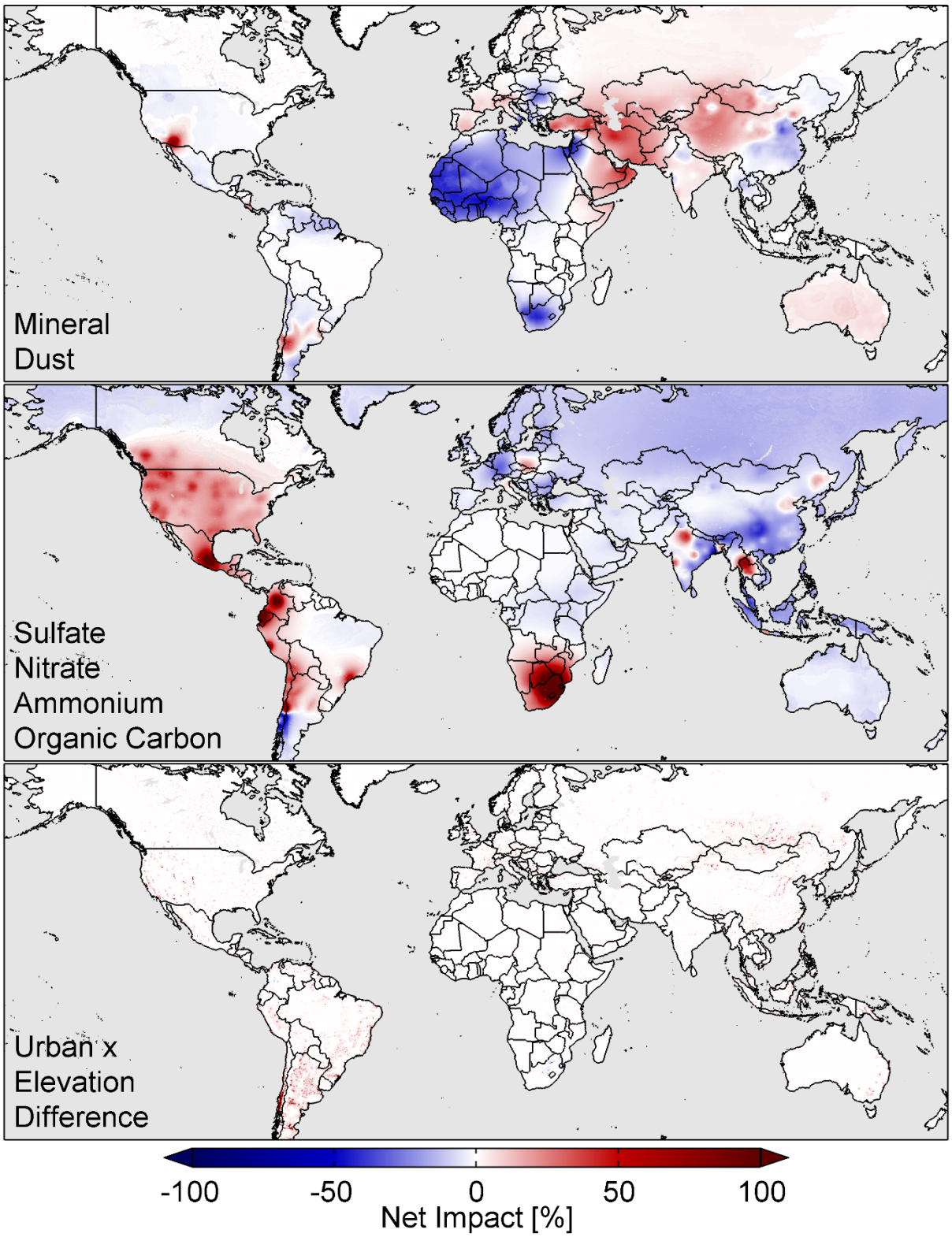
Supporting Information Figure S1: Example weighting factors around four AERONET stations. Crosshairs indicate station locations. Titles denote the country of each station.



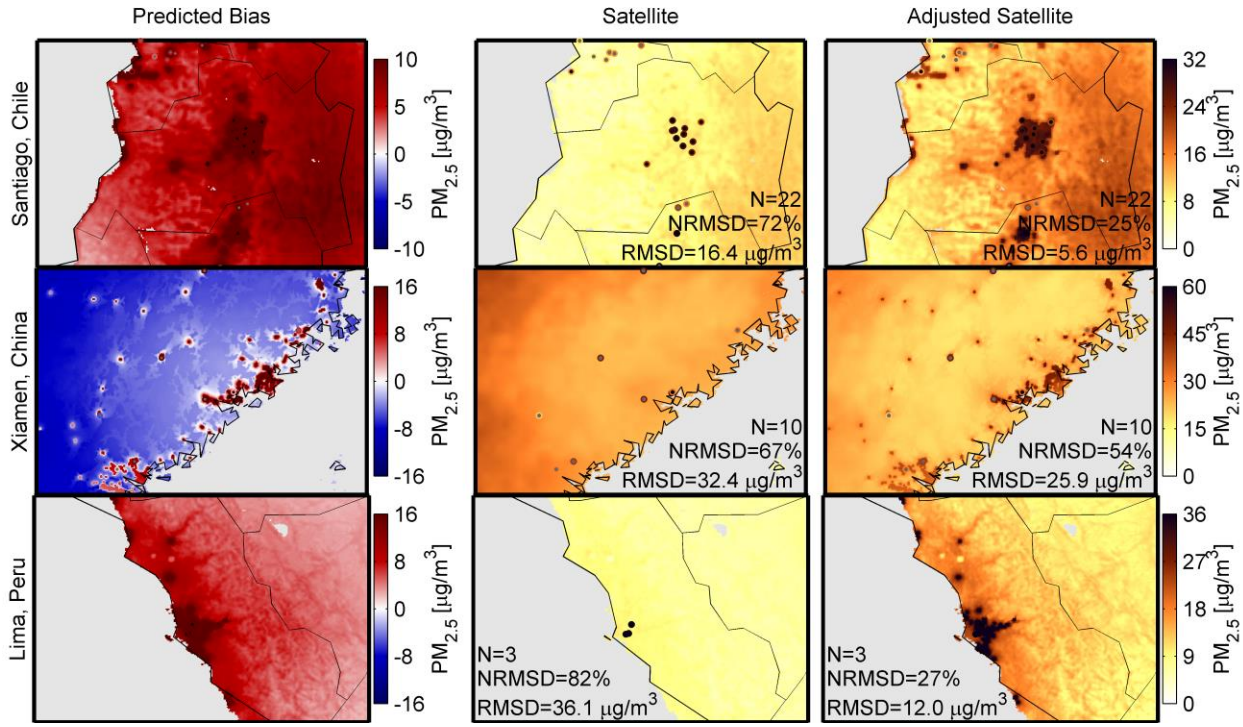
Supporting Information Figure S2: Definition of regions used by the Global Burden of Disease. Colors are for increased visibility.



Supporting Information Figure S3: Mean contribution of each source to the combined PM2.5 estimate from 2001-2010. Retrieval algorithm name, where applicable, is given in the lower left of each panel. Instrument is indicated in brackets, with average weighting of valid retrievals below. Values in the bottom-left of each panel indicate the decade man weighting at locations with available data. MODIS corresponds to Terra-based retrievals only. Grey denotes missing data or water. A version with logarithmic color-scale is available as Figure 2.



Supporting Information Figure S4: Net impact of individual predictors on the geographically weighted regression estimate of bias in satellite-derived $PM_{2.5}$ for 2010. Grey denotes water. Figure 4 plots the absolute impact.



Supporting Information Figure S5: Fine-scale variation of predicted bias (*in situ* – satellite; left), satellite-derived $PM_{2.5}$ (middle), and adjusted satellite-derived $PM_{2.5}$ (right) for 2010. Point locations correspond to individual monitors. Colored outlines of point locations provide observed value. Grey space denotes water. Root Mean Square Difference (RMSD) and number of comparison sites (N) are given.