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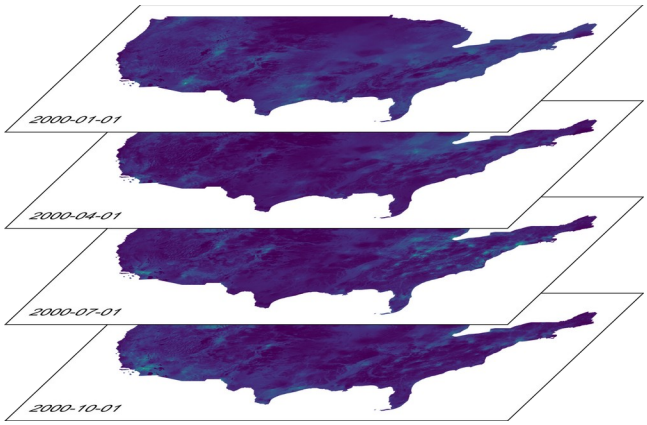
Daily, Monthly, and Annual NO2 Concentrations for the Contiguous United States, 1-km Grid (2000–2016)

This dataset is available at https://doi.org/10.7910/DVN/LUFKYG.



Overview

This dataset contains predicted daily ambient NO_2 concentrations across the contiguous U.S. on a 1-kilometer grid and at monitoring locations, additionally aggregated by month and year. These predictions were produced by a geographically-weighted machine learning ensemble consisting of fitted neural network, random forest, and gradient boosting learners. Overall 10-fold cross-validated R^2 values were 0.79 for daily predictions and 0.84 for annual predictions.

When using this data, please be sure to also cite the following paper, which also details the data sources and processes which resulted in these predictions:

> Di, Q., Amini, H., Shi, L., Kloog, I., Silvern, R., Kelly, J., Sabath, M. B., Choirat, C., Koutrakis, P., Lyapustin, A., Wang, Y., Mickley, L. J., & Schwartz, J. (2019). Assessing NO2 Concentration and Model Uncertainty with High Spatiotemporal Resolution across the Contiguous United States Using Ensemble Model Averaging. In Environmental Science & Technology (Vol. 54, Issue 3, pp. 1372–1384). American Chemical Society (ACS). https://doi.org/10.1021/acs.est.9b03358

Dataset contents

Grid files

The NO_2 prediction grid is provided in two formats: in CSV format (*grid.csv*), for use with statistical programs, and in GeoPackage format (*grid.gpkg*), for geospatial applications. Both files contain 11,196,911 records and include the variable *idx*, which is the ID / row number for that point. The CSV file additionally includes the longitude and latitude in the columns *lon* and *lat*, respectively.

Daily, monthly, and annual predictions

Predicted ambient NO_2 concentrations at daily, monthly, and annual resolutions are available in the *daily-**, *monthly-**, and *annual-** directories, respectively. These predictions are available in two formats: as plain text (in the *daily-dat*, *monthly-dat*, and *annual-dat* directories), and as RDS files (in the *daily-rds*, *monthly-rds*, and *annual-rds* directories). The plain text files are intended for general-purpose use while the RDS files are smaller and optimized for use with the base R programming language.

Each file is a vector of 11,196,911 numeric predictions describing the ambient NO_2 concentrations for the day / month / year indicated by the file name for each of the 11,196,911 points in *grid.csv* / *grid.gpkg*, and the n^{th} item of each prediction file corresponds to the n^{th} point. For example, the 100^{th} record of the file NO2-*2000-01-01.dat* would correspond to the prediction at the 100^{th} point in *grid.csv* / *grid.gpkg* on the 1^{st} of January, 2000.

The units of these predictions are parts per billion (ppb).

Example code

Example code containing routines for reading the data and common merge operations are available in the *example-code* directory along with example spatial data. The file *massachusetts-counties.gpkg* is a subset of the nationwide counties file from the U.S. Census Bureau's TIGER/Line Shapefiles, version 2010[1].

Bulk downloads

To download in bulk, use the page and links generated by the Dataverse API directory index:

> https://dataverse.harvard.edu/api/datasets/:persistentId/dirindex?persistentId=doi:10.7910/DVN/LUFKYG

For example, using wGet:

> *wget --recursive --execute robots=off --no-host-directories --span-hosts --content-disposition 'https://dataverse.harvard.edu/api/datasets/:persistentId/dirindex?persistentId=doi:10.7910/DVN/LUFKYG'*

1 The original file is available for download at:
https://www.census.gov/geographies/mapping-files/2010/geo/tiger-line-file.html