**Overall notes:**

Docker containers are available for most of the necessary libraries/packages. For MAIAC, NED, NLCD, NDVI, and Active Fires, you can use either the estimate-pm25 docker or the spatial-python docker. For NAM, you can use r-reidgroup. (<https://hub.docker.com/u/earthlab>)

To make buffers (for active fires and NLCD), you can use either the script

“~/1-General\_Project\_Functions/Make\_buffers.R” or a program such as ArcGIS or QGIS.

**Key:**

Italics = action

Normal text = on command line (in docker)

1. **Active fires (MODIS Thermal Anomalies):**

*Download zip file: Navigate to the* [*NASA EarthData FIRMS Archive Download site*](https://firms.modaps.eosdis.nasa.gov/download/)*. Select "Create new Request". In the dropdown for region, select "Custom Region" and draw a bounding box around study area. In the dropdown for fire data source, select "MODIS C6". Select dates for study time-period. In the dropdown for file type, select "Shapefile (.shp)". Enter your email address. You will get an email with a download link containing a zip-file with the data. Extract locally. Run active\_fire.py script locally. Ensure that necessary column names are all in the resulting shapefile.*

*Make buffers around each location of interest -- these are in regular NAD83 Lat, Lon.*

*For 25km, 50km, 100km and 500km buffers, run a command such as:*

python buffers\_prediction\_set.py --buffer\_shp /home/jovyan/buffers/*[25km buffer]*.shp --buffer\_csv /home/jovyan/*[Locations\_file]*.csv --fire\_shp /home/jovyan/*[fire\_archive\_file, after timezone adjustment]*.shp --output\_csv\_file /home/jovyan/new\_output/fire\_modis\_25km\_extract\_final\_predictions.csv

*OR:*

python buffers\_observation\_set.py --buffer\_shp /home/jovyan/buffers/*[25km buffer]*.shp --buffer\_csv /home/jovyan/*[Locations\_dates\_file]*.csv --fire\_shp /home/jovyan/*[fire\_archive\_file, after timezone adjustment]*.shp --output\_csv\_file /home/jovyan/new\_output/fire\_modis\_25km\_extract\_final\_observations.csv

1. **Aerosol Optical Depth (MAIAC):**

*Change start\_year, end\_year, keyID and sKeyID in download\_from\_https.py and then run to download the HDF files with MAIAC data:*

python download\_from\_https.py

*Obtain Lat-Lon HDF files for these tiles: 'h08v04', 'h08v05', 'h08v06', 'h09v04', 'h09v05', 'h09v06', 'h10v04', 'h10v05'.*

*Create average-value CSVs for each day in the study period:*

python maiac\_main.py

*Change the names of the input and output CSVs in k\_nearest\_neighbors.py (use the locations\_dates file as the input CSV). Then run the script:*

python k\_nearest\_neighbors.py

1. **Chemical transport model simulations (CMAQ):**

*Obtain data files (2008-2012, 2013, 2014, 2015, 2016) from the US EPA Center for Public Health and Environmental Assessment, Office of Research and Development.*

*Run the scripts:*

Merge\_early\_CMAQ.R

Merge\_later\_CMAQ.R

1. **Elevation (NED):**

*Navigate to the* [*National Map Viewer*](https://viewer.nationalmap.gov/basic/?basemap=b1&category=ned,nedsrc&%20title=3DEPView) *site and find products for Elevation Products (3DEP), 1 arc-second DEM, IMG file format. Once results are returned, select "Save as Text", which will download a text file containing server links to each NED tile.*

*Download the data using the download\_tiles.py script, which will access the text file that you just downloaded.*

*Run the script to extract elevation values at all locations of interest:*

python extract\_values\_to\_points.py --NED\_directory "/home/jovyan/NED/data/" --input\_csv\_file "/home/jovyan/*[Locations\_file]*.csv" --output\_csv\_file "/home/jovyan/ned\_extracted.csv"

1. **Highways (NHPN):**

*Download shapefile from the* [*National Highways Planning Network website*](https://www.fhwa.dot.gov/planning/processes/tools/nhpn/index.cfm)*.*

*Process using R\_highways.R (this can be done locally). Note: first change names of input and output files in this script.*

1. **Land cover (NLCD):**

*Navigate to the* [*National Map Viewer*](https://viewer.nationalmap.gov/basic/) *and find products for "National Land Cover Database (NLCD)" at the National extent. From the search results, download "NLCD 2011 Land Cover (2011 Edition, amended 2014)". This will download a zip-file with the data.*

*Make 1km, 5km and 10km buffers around each location of interest -- make sure these are in the same projection as the land cover raster file you downloaded.*

*For 1km, 5km and 10km buffers, run a command such as:*

python nlcd\_process.py --buffer\_shp /home/jovyan/NLCD/NLCD\_buffer\_1km.shp --nlcd\_raster\_tif /home/jovyan/NLCD/nlcd\_reclass2.tif --input\_csv\_file /home/jovyan/NLCD/*[Locations\_file]*.csv --output\_csv\_file nlcd\_1km\_extract.csv

1. **Meteorological variables (NAM):**

*Run the following scripts:*

Process\_NAM\_data\_step1.R

Process\_NAM\_data\_step2\_parallel.R

Process\_NAM\_data\_step3.R

Process\_NAM\_data\_step4\_lower\_RAM.R

Process\_NAM\_data\_step5\_ lower\_RAM.R

1. **Population density (US Census):**

*Download data from the 2010 Census. (We used the* [*Social Explorer website*](https://www.socialexplorer.com/tables/C2010)*.)*

*Run Get\_population\_density.R. Note: this is easy to do locally (does not require cloud computing).*

1. **Vegetation index (NDVI):**

*Download data using MODIS\_HTTPS\_download.py and run translate\_mosaic\_reproject.py.*

*Ensure that your locations\_dates file has the columns ‘Easting’ and ‘Northing’ (the ESRI 102003 projected coordinates).*

*Run the extraction script:*

python extract\_to\_values.py --NDVI\_directory /home/jovyan/NDVI/ --input\_csv\_file /home/jovyan/*[Locations\_dates\_file]*.csv --output\_csv\_file /home/jovyan/ndvi\_extract.csv