ARSET

Applied Remote Sensing Training

http://arset.gsfc.nasa.gov
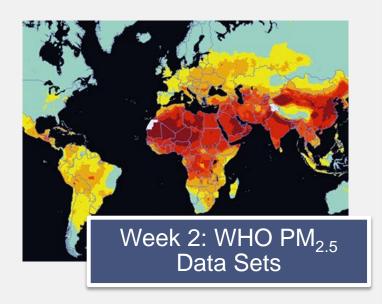
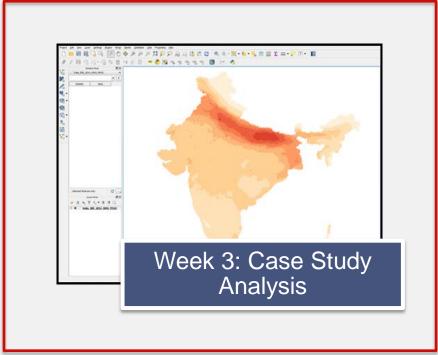@NASAARSET

WHO PM$_{2.5}$ Data Set
Case Study Analysis

March 15-29, 2017

Melanie Follette-Cook, Pawan Gupta

Webinar Series Agenda

Week 1: ARSET, Remote Sensing, and SDGs

Week 2: WHO PM$_{2.5}$ Data Sets

Week 3: Case Study Analysis

Session 3: Outline

1. Brief review of where to obtain data files

2. Viewing and analyzing the WHO estimates with the QGIS software

3. Reviewing other relevant data portals and websites

Today's Instructor: Melanie Follette-Cook, Ph.D.
GESTAR/Morgan State University, Code 614
NASA Goddard Space Flight Center
Greenbelt, MD 20771, USA
melanie.cook@nasa.gov
http://arset.gsfc.nasa.gov/people/melanie-follette-cook

Today's Instructor: Pawan Gupta, Ph. D.
GESTAR/USRA, Code 614
NASA Goddard Space Flight Center
Greenbelt, MD 20771, USA
pawan.gupta@nasa.gov
http://arset.gsfc.nasa.gov/people/pawan-gupta-0

Learning Objectives

1. Learn how to obtain, display, and analyze the WHO $PM_{2.5}$ estimates using the QGIS software

2. Learn about other data portals and informative websites

Review of Sessions 1 & 2

UN Sustainable Development Goals (SDGs)

Transforming Our World: The 2030 Agenda for Sustainable Development

UN Sustainable Development Goals (SDGs)

Transforming Our World: The 2030 Agenda for Sustainable Development

Target 3.9

By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination

Target 11.6

By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management

One indicator for both Targets is annual mean levels of fine particulate matter ($PM_{2.5}$)

Text adapted from "Transforming our world: the 2030 Agenda for Sustainable Development"

Global PM$_{2.5}$ estimates

- Van Donkelaar et al. 2016

  – Annual mean estimates of PM$_{2.5}$ (1998-2012)

  – Available at: http://sedac.ciesin.columbia.edu/data/set/sdei-global-annual-avg-pm2-5-modis-misr-seawifs-aod-1998-2012

  – Or at: http://fizz.phys.dal.ca/~atmos/martin/?page_id=140

- WHO and the University of Bath - Data Integration Model for Air Quality (DIMAQ)

  – Model developed to estimate PM$_{2.5}$ incorporating many sources of data

  – Estimates PM$_{2.5}$ along with associated measures of uncertainty

  – Annual mean estimates of PM$_{2.5}$ (2014 only)

  – Available at: http://www.who.int/phe/health_topics/outdoorair/databases/modelled-estimates/en/

  – Or by country at: http://avdc.gsfc.nasa.gov/pub/tmp/WHO_PM25_2014_COUNTRY_DATA/

Data Integration Model for Air Quality (DIMAQ)

Population Data
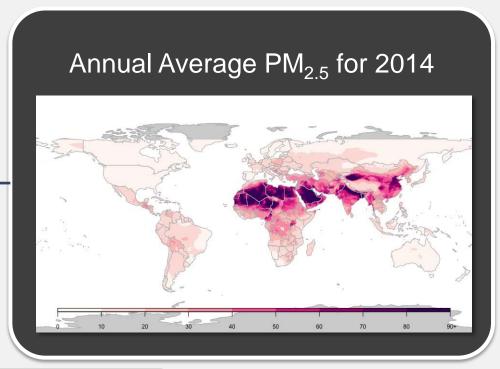
Ground Monitor Information & Data

Satellite-Based Estimate

Simulated Aerosols

Topography & Land Use

Bayesian Hierarchical Framework
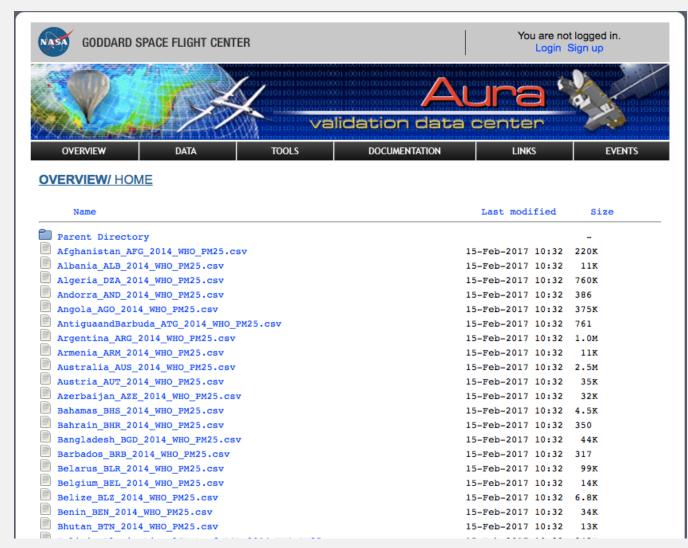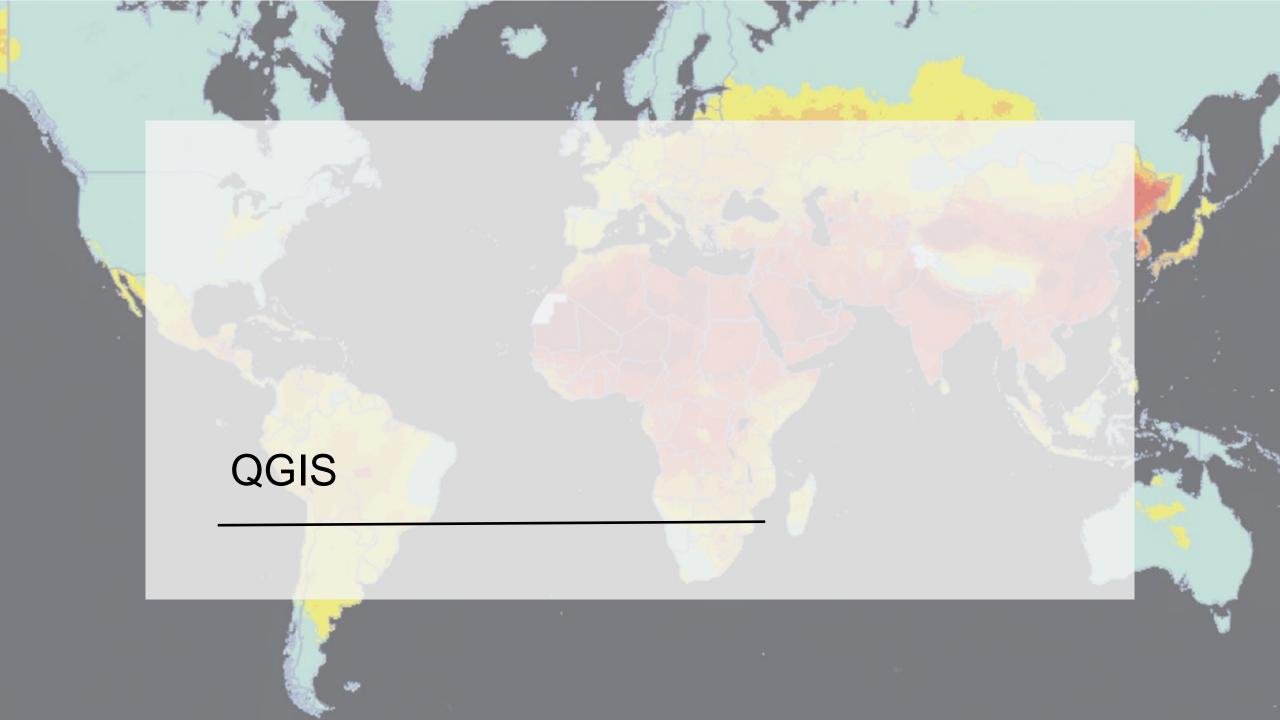
Estimates $PM_{2.5}$ as well as measures of uncertainty

Annual Average $PM_{2.5}$ for 2014

Shaddick et al. 2016, submitted, Figure 7 (top)

Estimates on a 0.1° x 0.1° grid

WHO PM$_{2.5}$ gridded data – By country

- http://avdc.gsfc.nasa.gov/pub/tmp/WHO_PM25_2014_COUNTRY_DATA/

QGIS

QGIS

- QGIS is an open source Geographic Information System (GIS) licensed under the GNU general public license
- This software offers many common GIS functions:
  - Visualize data
  - Create maps
  - Analyze, manage, export data

- For more information see: https://www.qgis.org/en/site/about/
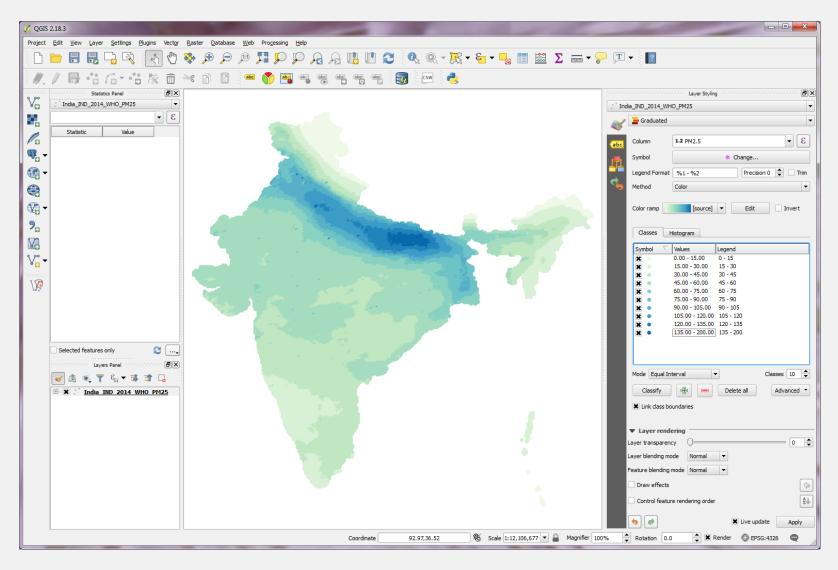- QGIS user guide for v2.14: http://docs.qgis.org/2.14/en/docs/index.html

https://www.qgis.org/en/site/about/

QGIS

- By now you should have:
  - Downloaded and installed the QGIS software
  - Downloaded at least some or all of the individual country files
- In this section we will walk you through how to….

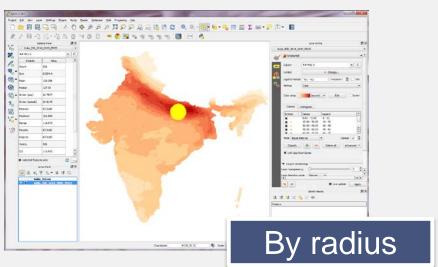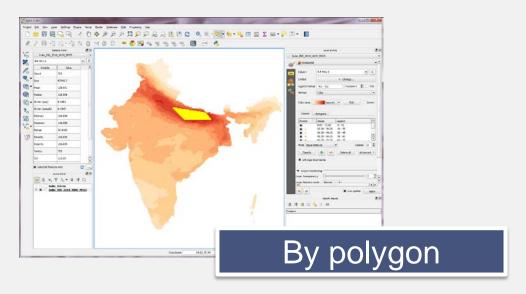# Upload and view the PM$_{2.5}$ estimates
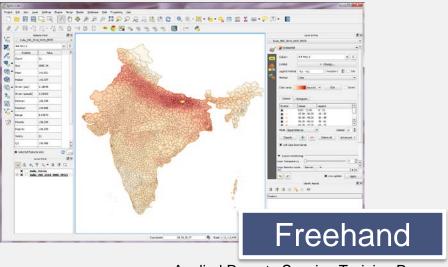
Change the color and color scale
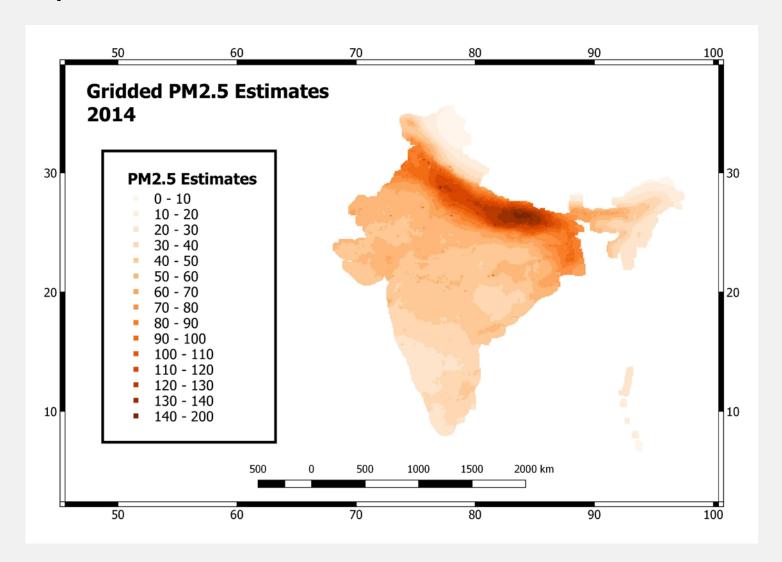
Create/Save a subset, and calculate basic statistics
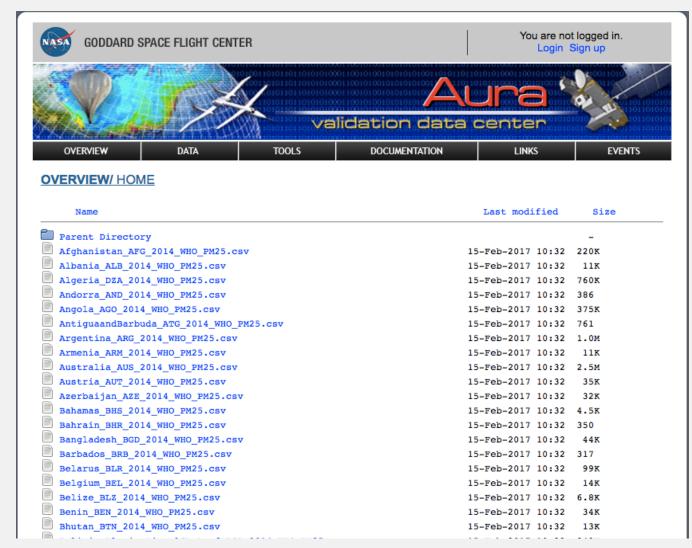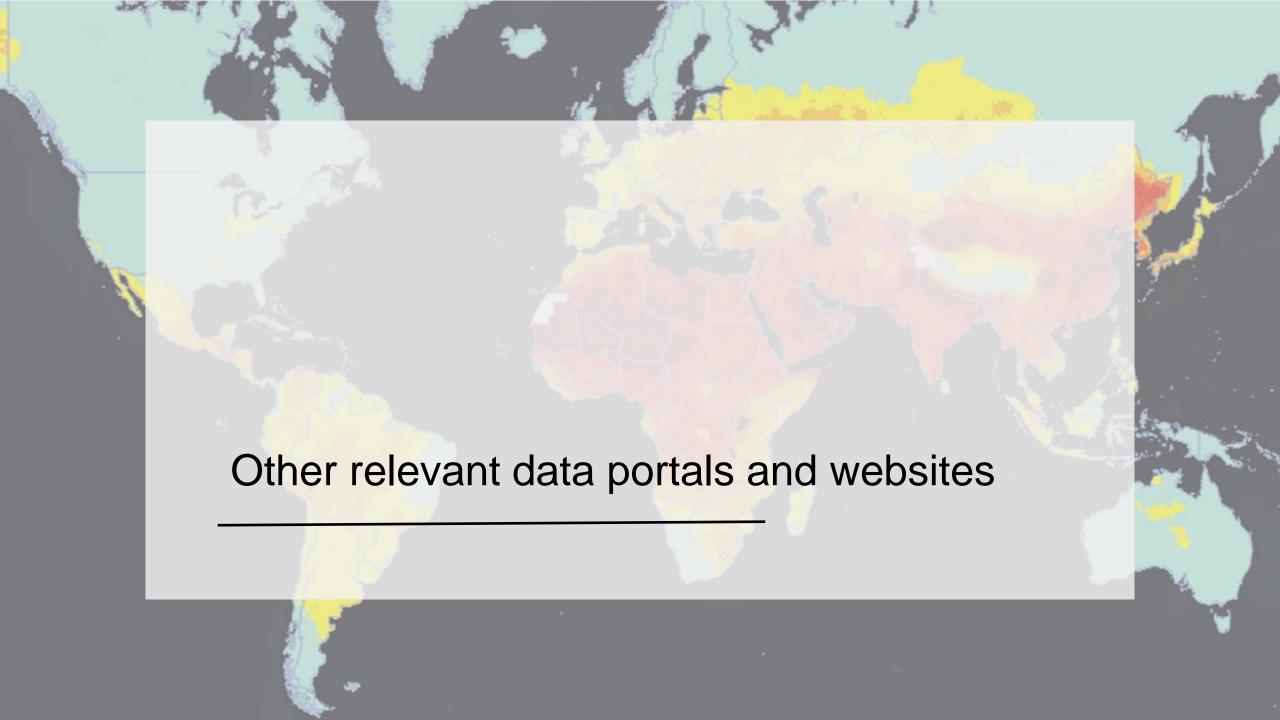

Select features

By polygon

By radius

Freehand

Create a map

WHO PM$_{2.5}$ gridded data – By country

- http://avdc.gsfc.nasa.gov/pub/tmp/WHO_PM25_2014_COUNTRY_DATA/

Other relevant data portals and websites
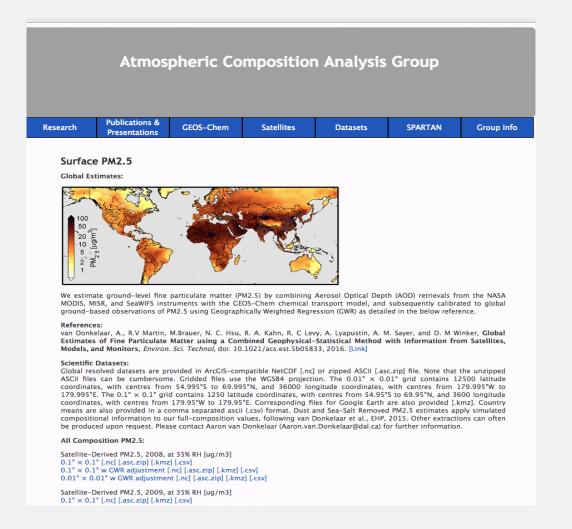
Socioeconomic Data and Applications Center (SEDAC)
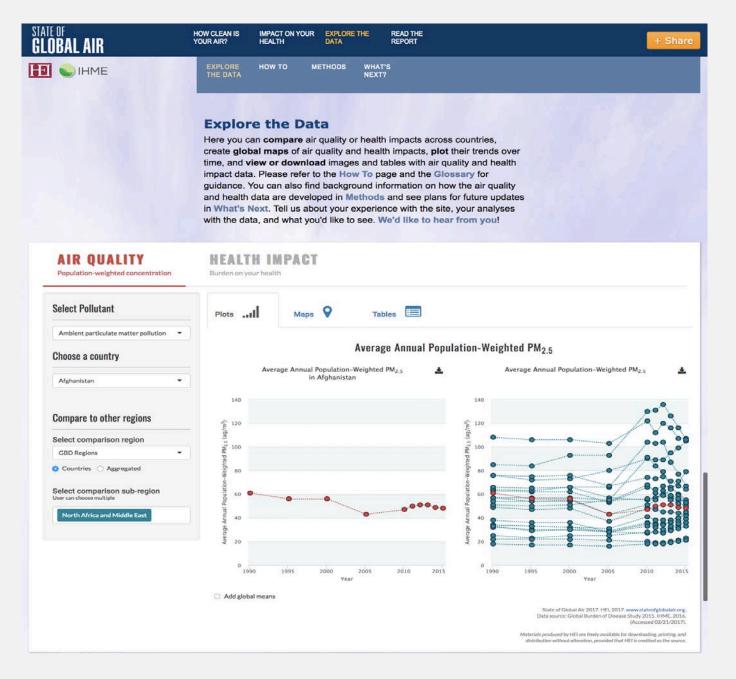
http://sedac.ciesin.columbia.edu/mapping/viewer/#

Satellite Derived Surface PM$_{2.5}$ Data Sets

http://fizz.phys.dal.ca/~atmos/martin/?page_id=140

State of Global Air

https://www.stateofglobalair.org/

NASA Air Quality

https://airquality.gsfc.nasa.gov/

NASA H-AQAST

https://haqast.org