# Lab 2: Quantifying Environment

- Temperature, a key input into mosquito-borne disease risk:

ECOLOGY LETTERS

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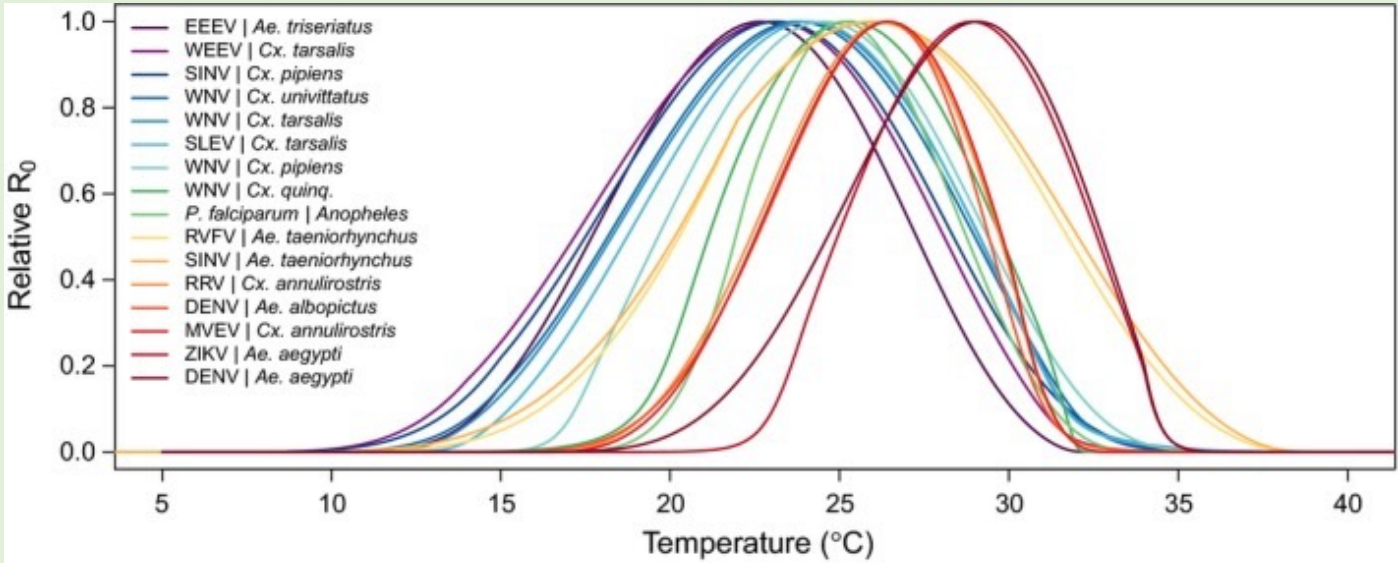
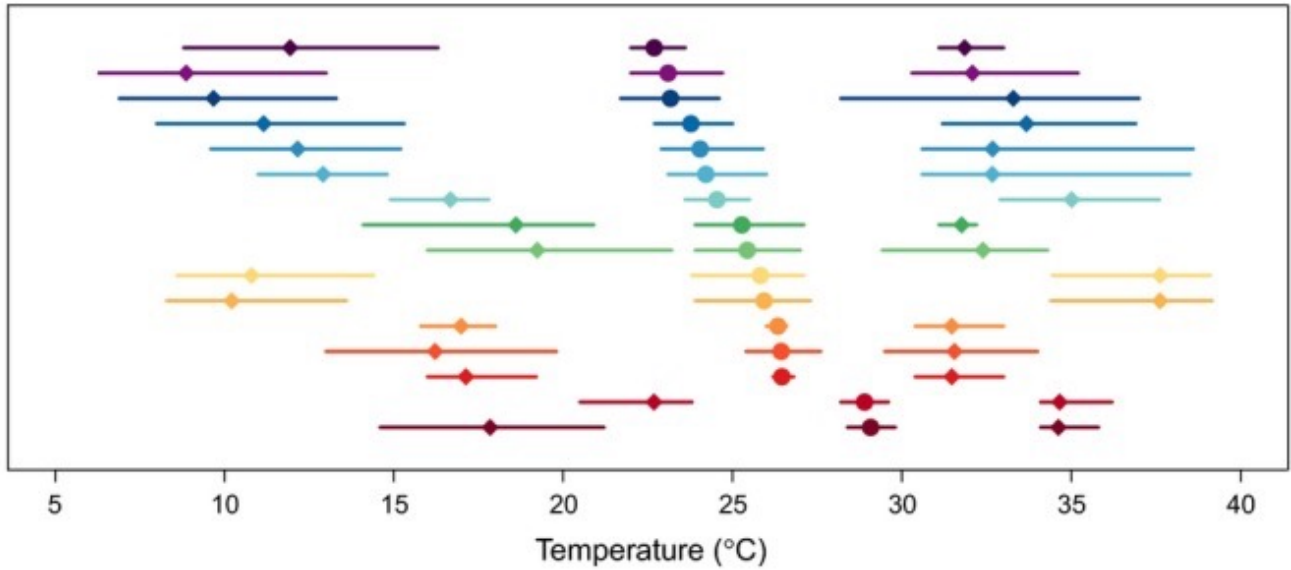
**Thermal biology of mosquito-borne disease**

Erin A. Mordecai, Jamie M. Caldwell, Marissa K. Grossman, Catherine A. Lippi, Leah R. Johnson, Marco Neira, Jason R. Rohr, Sadie J. Ryan, Van Savage, Marta S. Shocket, Rachel Sippy ... See all authors

First published: 08 July 2019 | https://doi.org/10.1111/ele.13335 | Citations: 260



# Lab 2: Quantifying Environment

## Global expansion and redistribution of *Aedes*-borne virus transmission risk with climate change

Sadie J. Ryan, Colin J. Carlson, Erin A. Mordecai, Leah R. Johnson

Published: March 28, 2019 • https://doi.org/10.1371/journal.pntd.0007213

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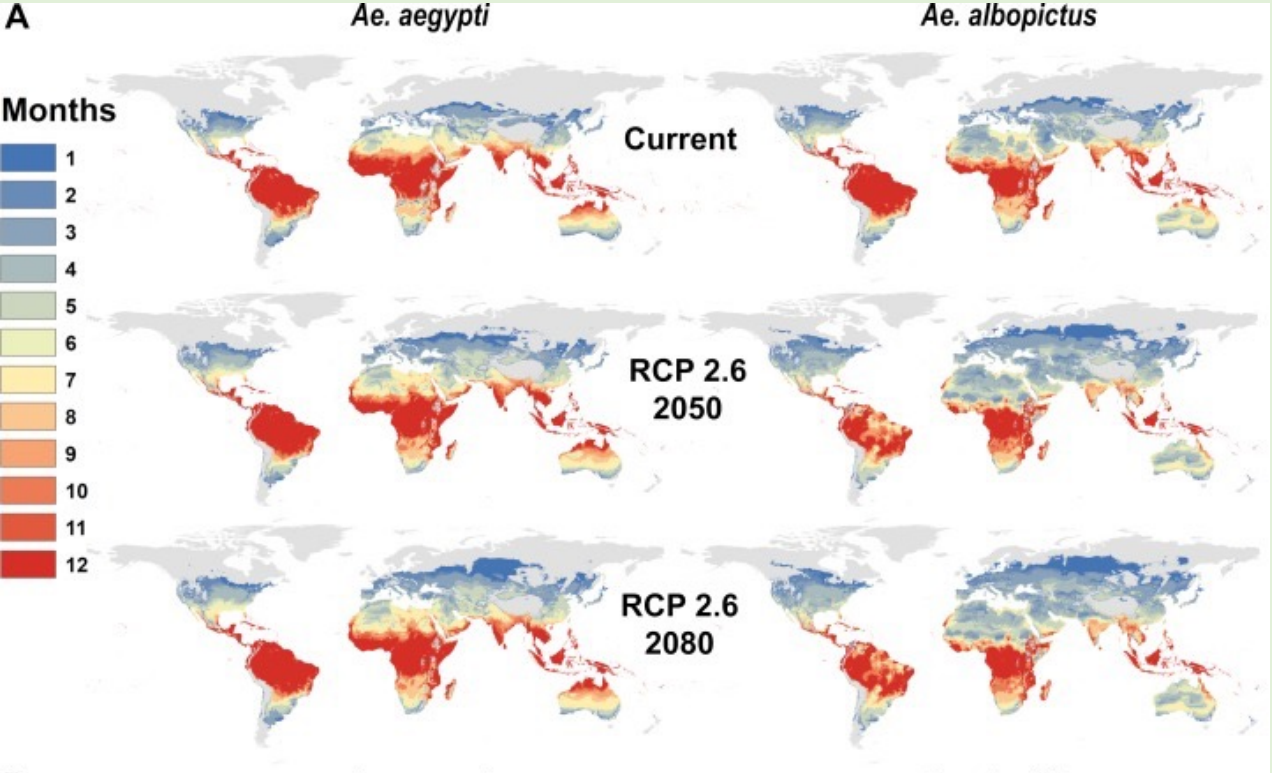


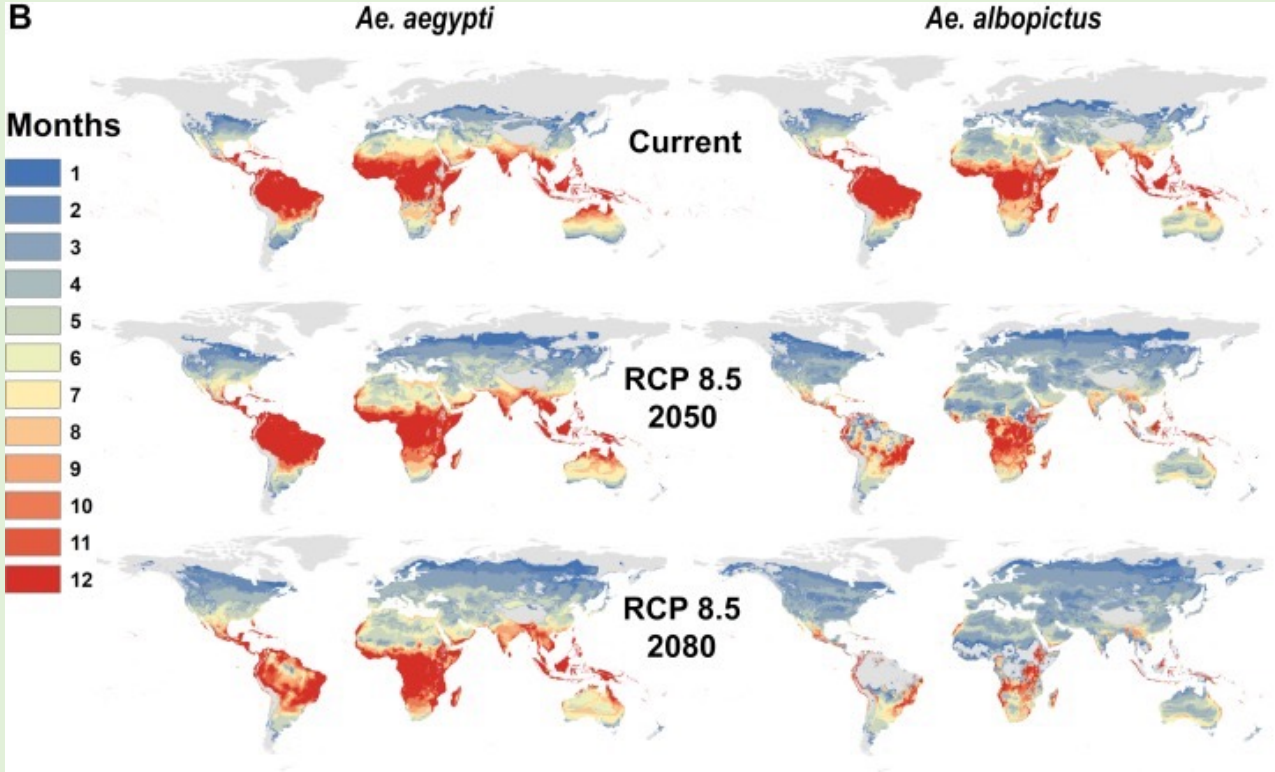

Google Earth Engine

ELSEVIER

Remote Sensing of Environment

Volume 202, 1 December 2017, Pages 18-27

# Google Earth Engine: Planetary-scale geospatial analysis for everyone

Noel Gorelick [a], Matt Hancher [b], Mike Dixon [b], Simon Ilyushchenko [b], David Thau [b], Rebecca Moore [b]

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# What is (not) google earth engine

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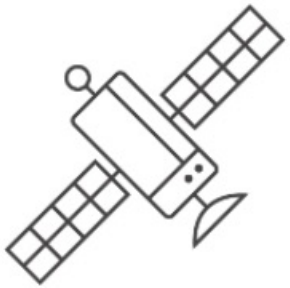
# What is (not) google earth engine

## Meet Earth Engine

Google Earth Engine combines a multi-petabyte catalog of satellite imagery and geospatial datasets with planetary-scale analysis capabilities and makes it available for scientists, researchers, and developers to detect changes, map trends, and quantify differences on the Earth's surface.



SATELLITE IMAGERY

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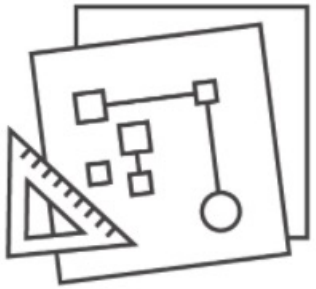

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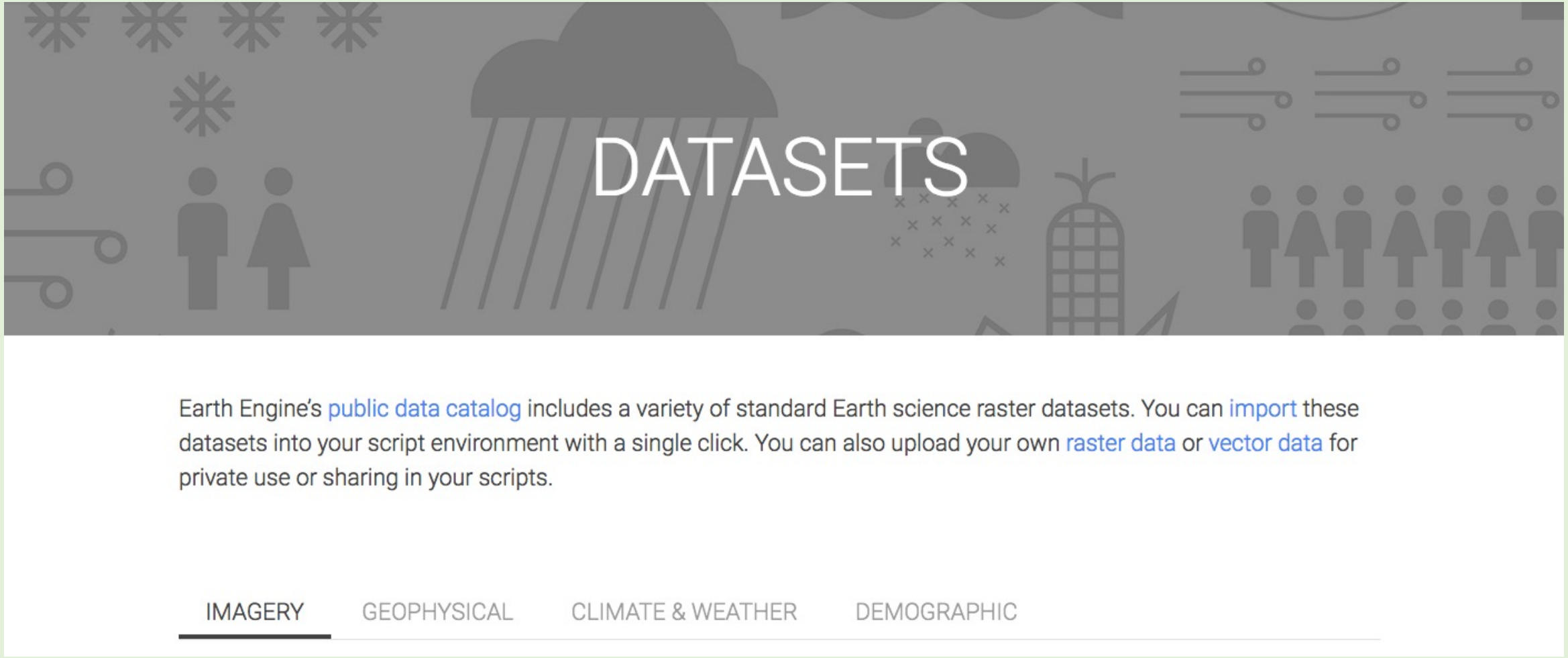


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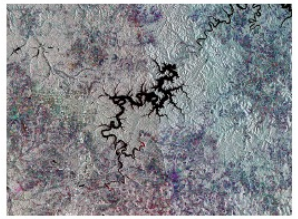
# Datasets, stored in google cloud

## Landsat

Landsat, a joint program of the USGS and NASA, has been observing the Earth continuously from 1972 through the present day. Today the Landsat satellites image the entire Earth's surface at a 30-meter resolution about once every two weeks, including multispectral and thermal data. Earth Engine makes this data available in its raw form, as TOA-corrected reflectance, and in various ready-to-use computed products such as NDVI and EVI vegetation indices.

Search Landsat data in Earth Engine.



## Sentinel

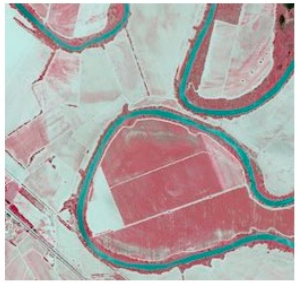
ESA's Sentinel-1 mission uses radar to image the Earth in all weather conditions, even at night.The satellites capture C-band synthetic aperture radar (SAR) image data at 30- to 120-meter resolution in several polarization modes. Earth Engine includes a growing collection of Sentinel-1 data preprocessed using the Sentinel 1 Toolbox.

View Sentinel data in Earth Engine.

## MODIS

The Moderate Resolution Imaging Spectroradiometer (MODIS) sensors on NASA's Terra and Aqua satellites have been acquiring images of the Earth daily since 1999. The Earth Engine catalog includes a variety of data products that NASA produces from MODIS data, including daily imagery, 16-day BRDF-adjusted surface reflectance, and derived products such as vegetation indices and snow cover.

Search MODIS data in Earth Engine.



## High-Resolution Imagery

High-resolution imagery captures the finer details of landscapes and urban environments. The US National Agriculture Imagery Program (NAIP) offers aerial image data of the US at one-meter resolution, including nearly complete coverage every several years since 2003. Earth Engine includes this data as well as sample imagery from several commercial providers.

Search high-resolution imagery in Earth Engine.

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# Datasets, stored in google cloud

## Other Imagery Data

Data from other satellite image sensors is available in Earth Engine as well, including night-time imagery from the Defense Meteorological Satellite Program's Operational Linescan System (DMSP-OLS), which has collected imagery of night-time lights at approximately 1-kilometer resolution continuously since 1992.

Search other imagery in Earth Engine.

# Upload your own adventure!

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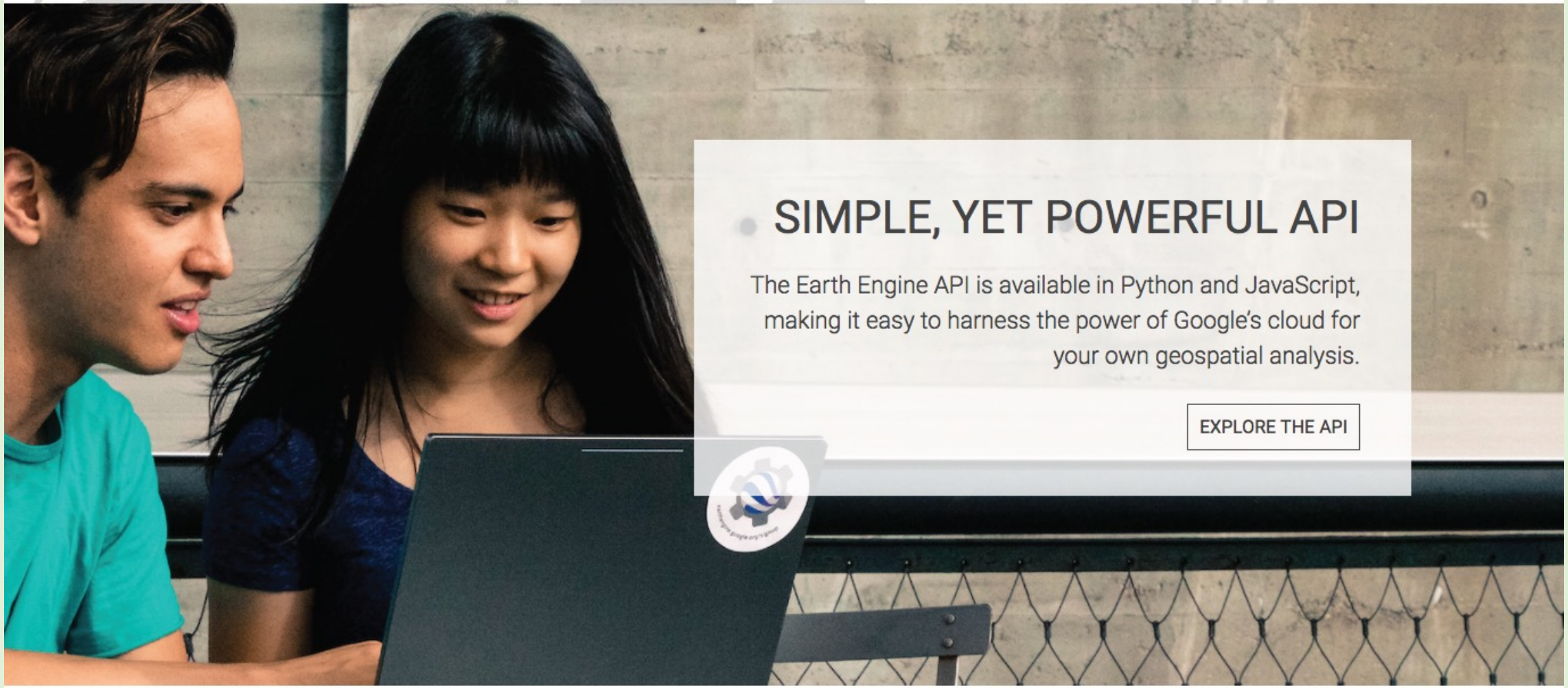


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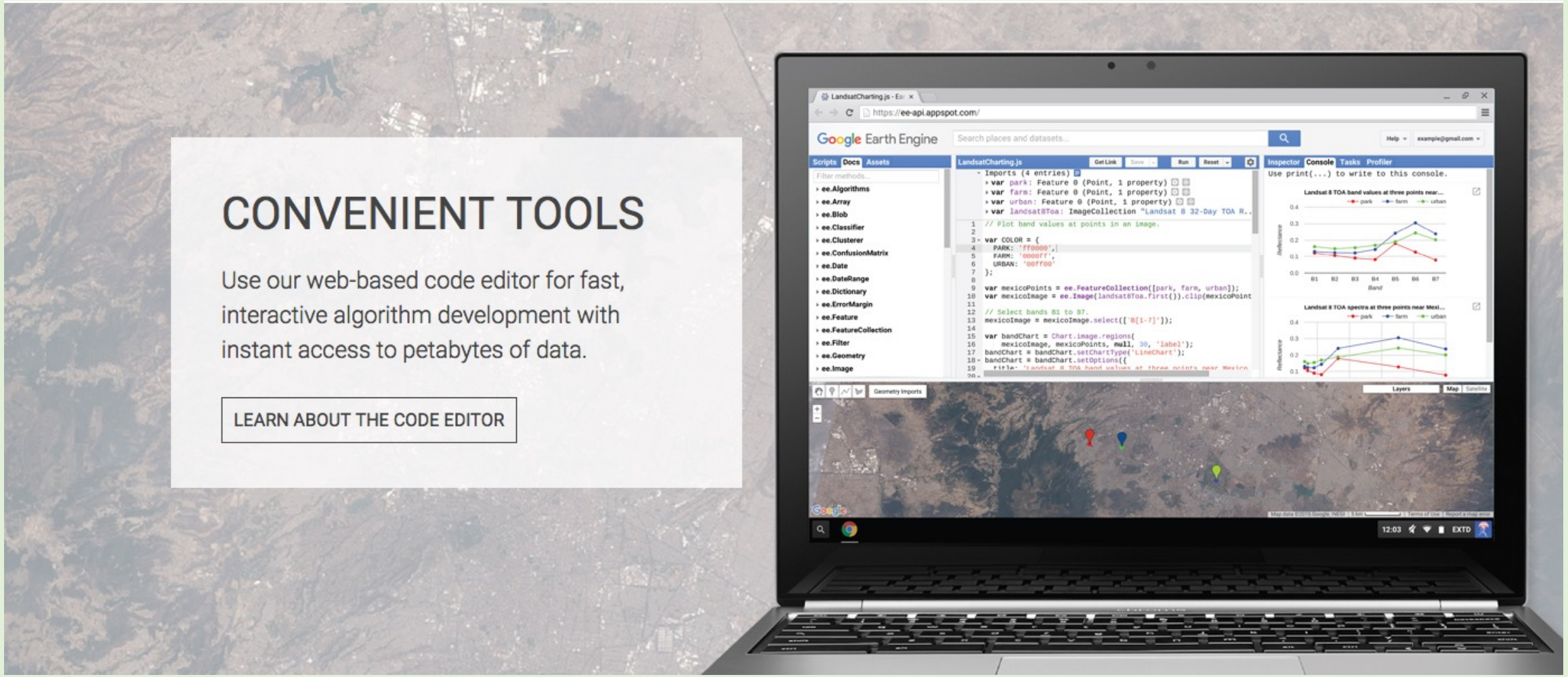


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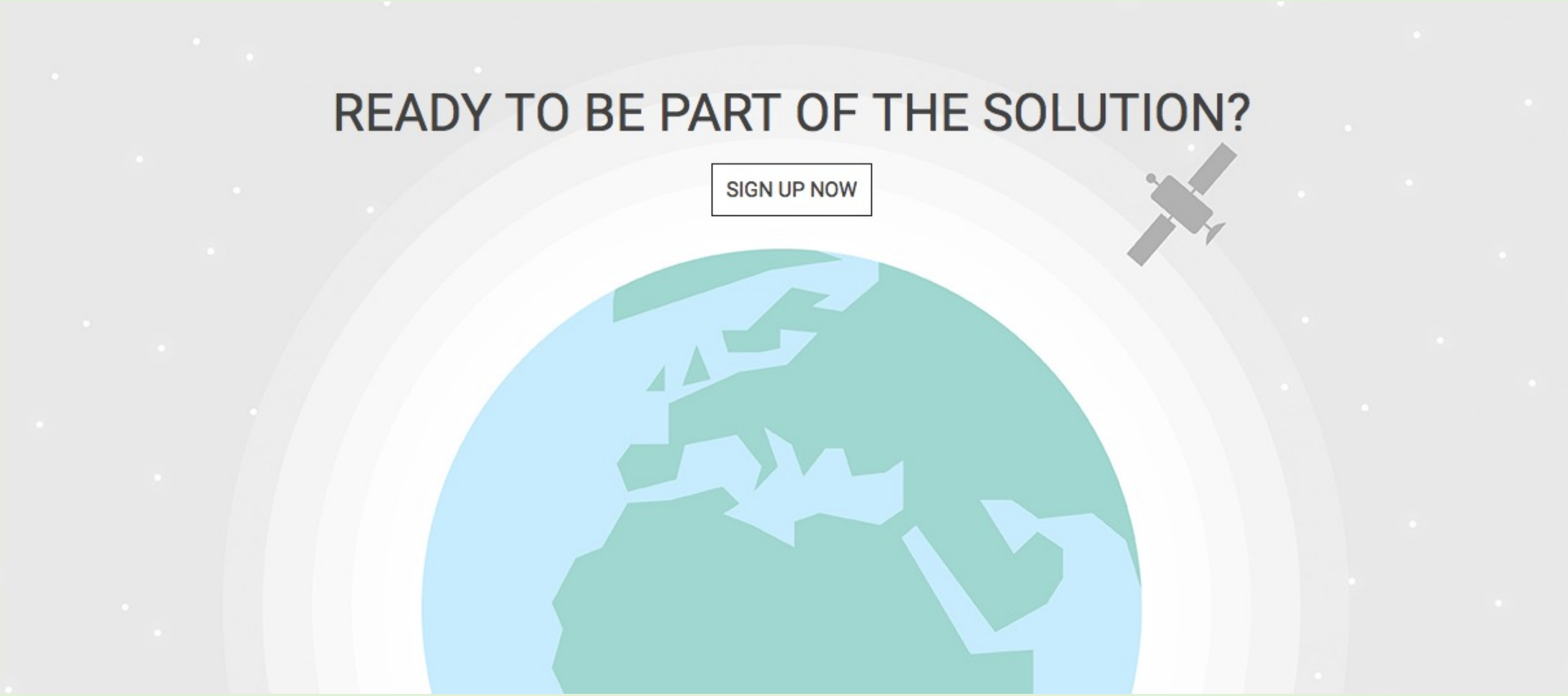


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# Lab 2: Quantifying Environment

- Google Earth Engine:
  - Reducers for summarizing (climate, land cover, PM2.5, human population and more) by regions of interest in which you have disease reporting (e.g., US counties)
    - Or by points where you have occurrences of species of interest (e.g., mosquitos from GBIF)
    - Or by census designated places where you have sociodemographic information (racial/ethnic groups) you want to pair with high-risk environmental conditions (heat, PM2.5, urban green spaces)