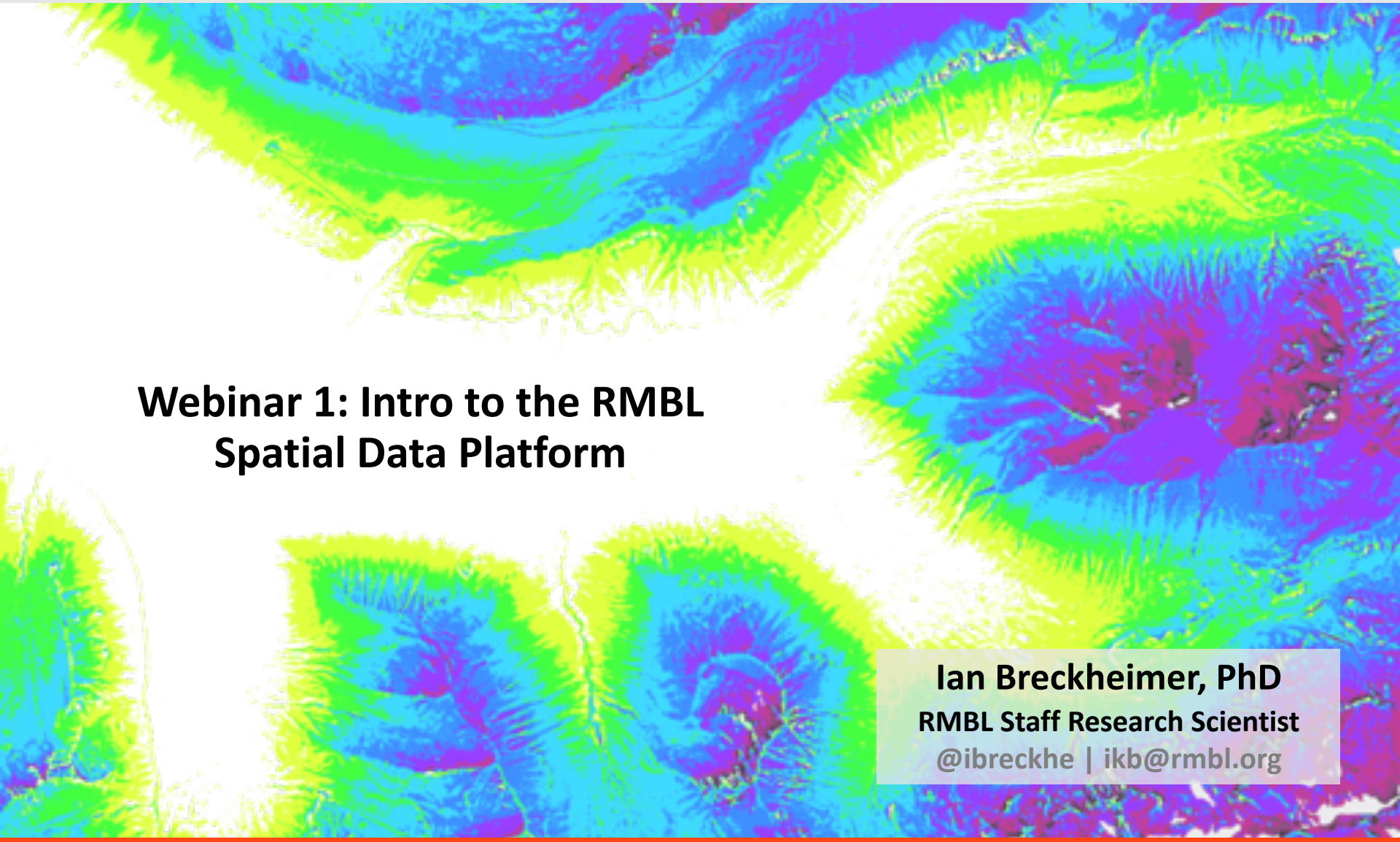

Webinar 1: Intro to the RMBL Spatial Data Platform

Ian Breckheimer, PhD
RMBL Staff Research Scientist
@ibreckhe | ikb@rmbl.org

Webinar Schedule

Tuesday September 22nd 2020
Introduction to the RMBL Spatial Data Platform,
How to access RMBL SDP data in GIS and programming environments, and where we are going with the platform.

Tuesday October 20th 2020 *Designing Robust Field Studies using Geospatial Tools*
How to optimize site selection using GIS and the RMBL SDP.

Tuesday January 26th, 2021 *Successful UAV Data Collection in Mountain Environments*
How to design and execute UAV flights for high-quality scientific data in challenging environments.

Tuesday February 23rd, 2021 *Leveraging Point Cloud Data from Lidar and UAV Photogrammetry*
Mapping vegetation structure and function using 3D data from lidar and drones.

Tuesday March 23rd, 2021 *Linking Field Data with Remote Sensing for Spatial Prediction*
How to leverage high-resolution remote sensing from imaging spectroscopy and lidar to map species, traits, and processes.

Tuesday April 20th, 2021 *What's New in the RMBL Spatial Data Platform*
Introduction to new snow and phenology datasets that form part of the SDP Release 2 and Release 3.

Outline

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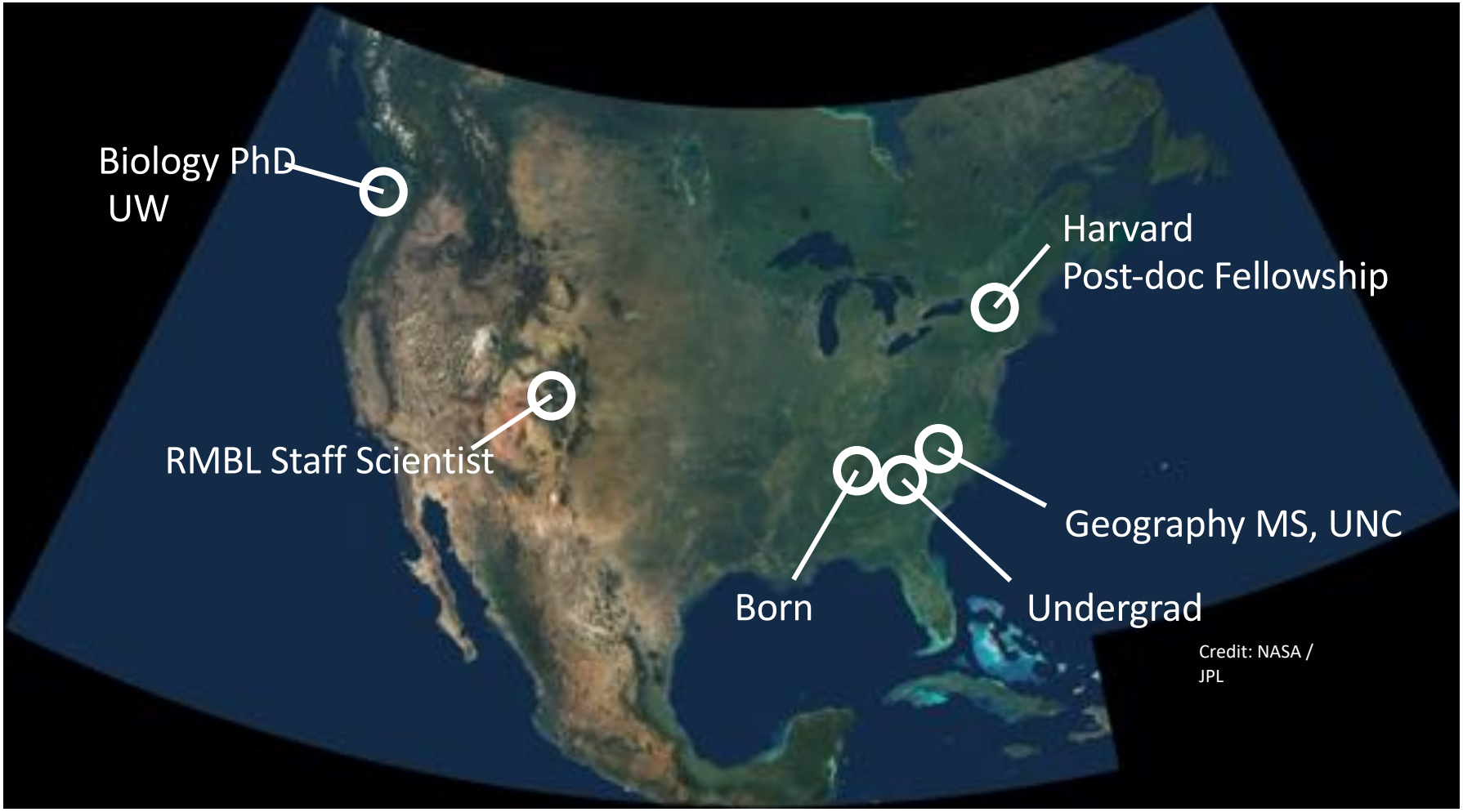
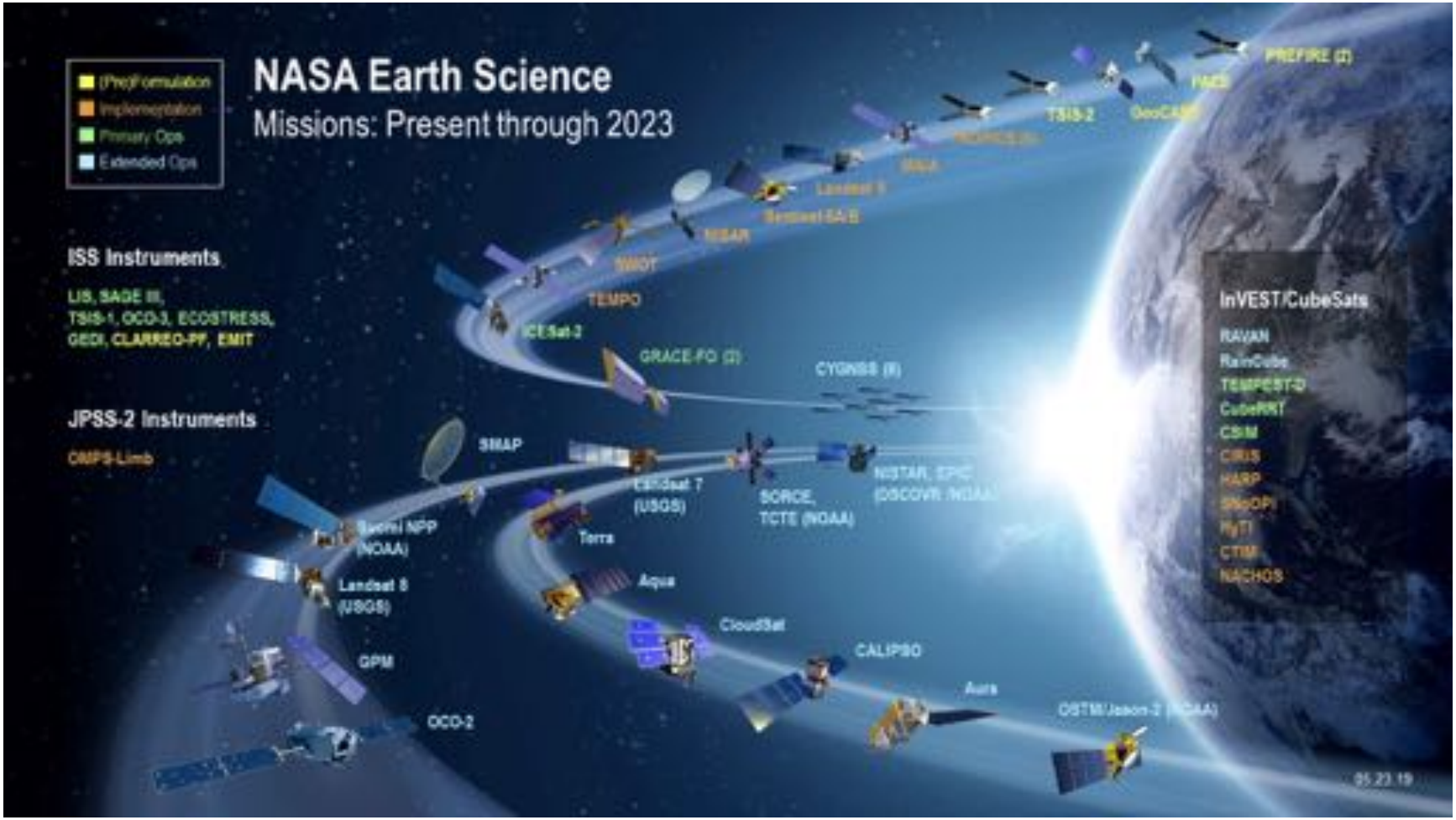
About me:


Biology PhD
UW
Harvard
Post-doc Fellowship
RMBL Staff Scientist
Geography MS, UNC
Born
Undergrad
Credit: NASA / JPL

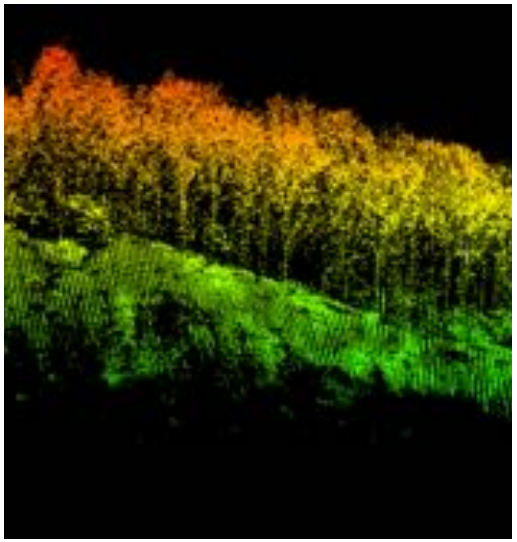
Remote sensing: an inflection point



https://www1.grc.nasa.gov/

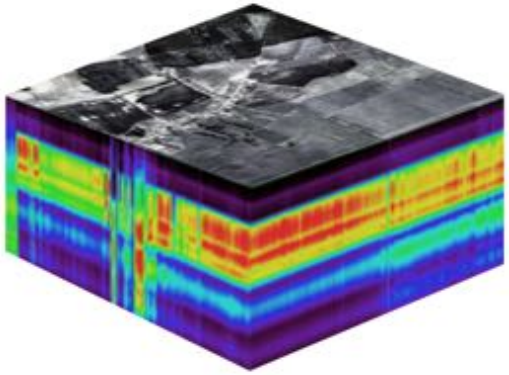
Remote sensing: an inflection point

LiDAR



https://geolabforest.blog/

Imaging Spectroscopy



https://eo-college.org/

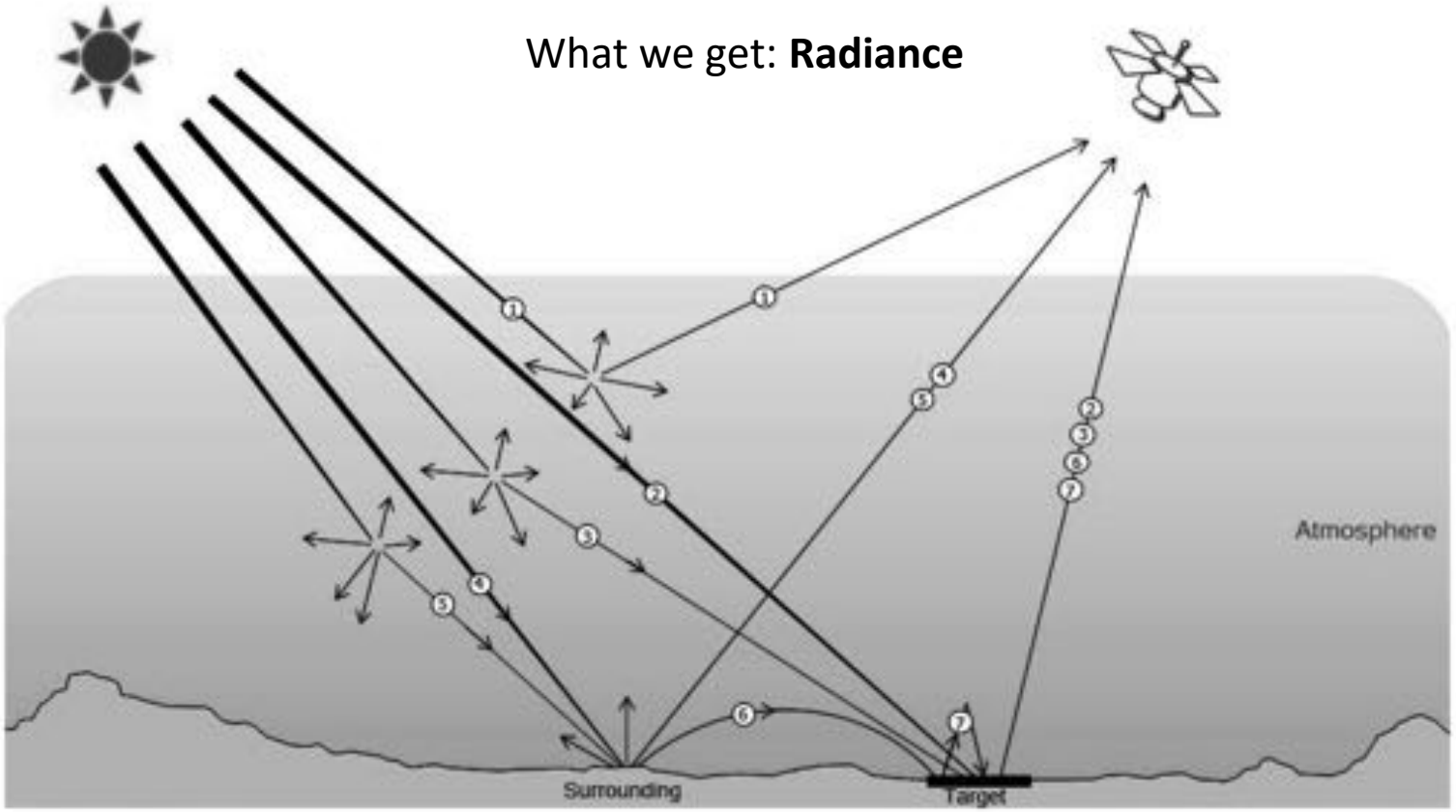
Drone Imaging

http://mapir.camera

Some of this data is at the same scale as field data

Automated processing makes lots of observations analysis-ready

What we get: **Radiance**



What we want: **Reflectance**

New computational tools make it feasible to wrangle big spatial datasets

Core Technologies

Languages / Software

Cloud Platforms

There are still “last mile” problems

Phil Price / Wikimedia Commons

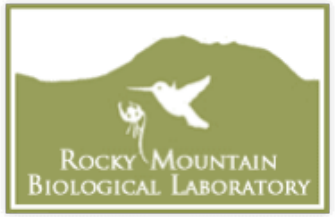
Translating remote measurements into environmentally relevant data.

Making it as seamless as possible to extract measurements where you need them.

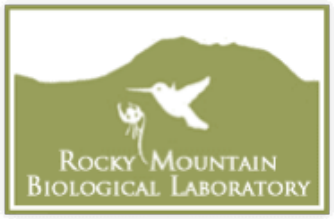
Efforts to cross the last mile

OPEN DATA CUBE

Climate Engine



Spatial
Data
Platform



Spatial
Data
Platform

Design Principles

- ***Reproducibility*** *– Full processing pipeline and source data publicly available.*

- ***Open Access*** *– Permissive license that allows redistribution with acknowledgement.*

- ***Quantifying Uncertainty*** *– Mapping what we don't know*

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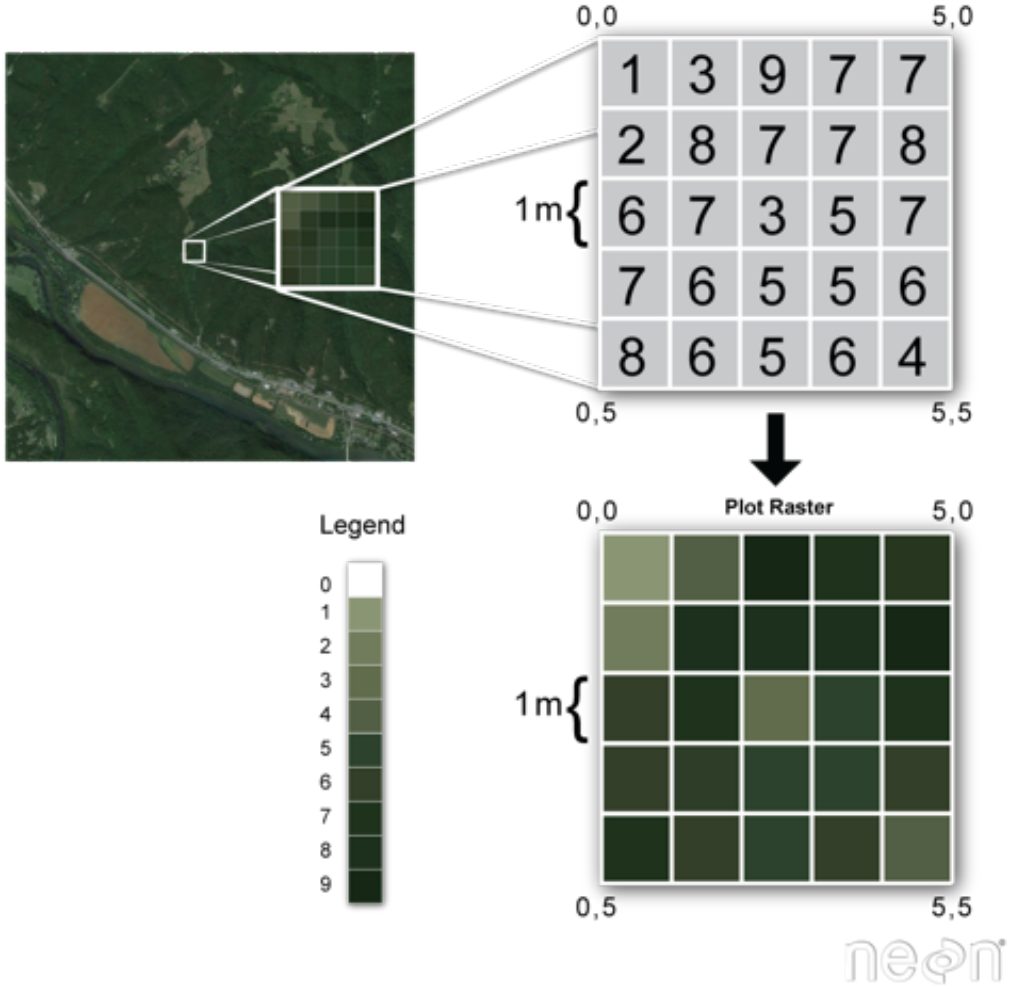
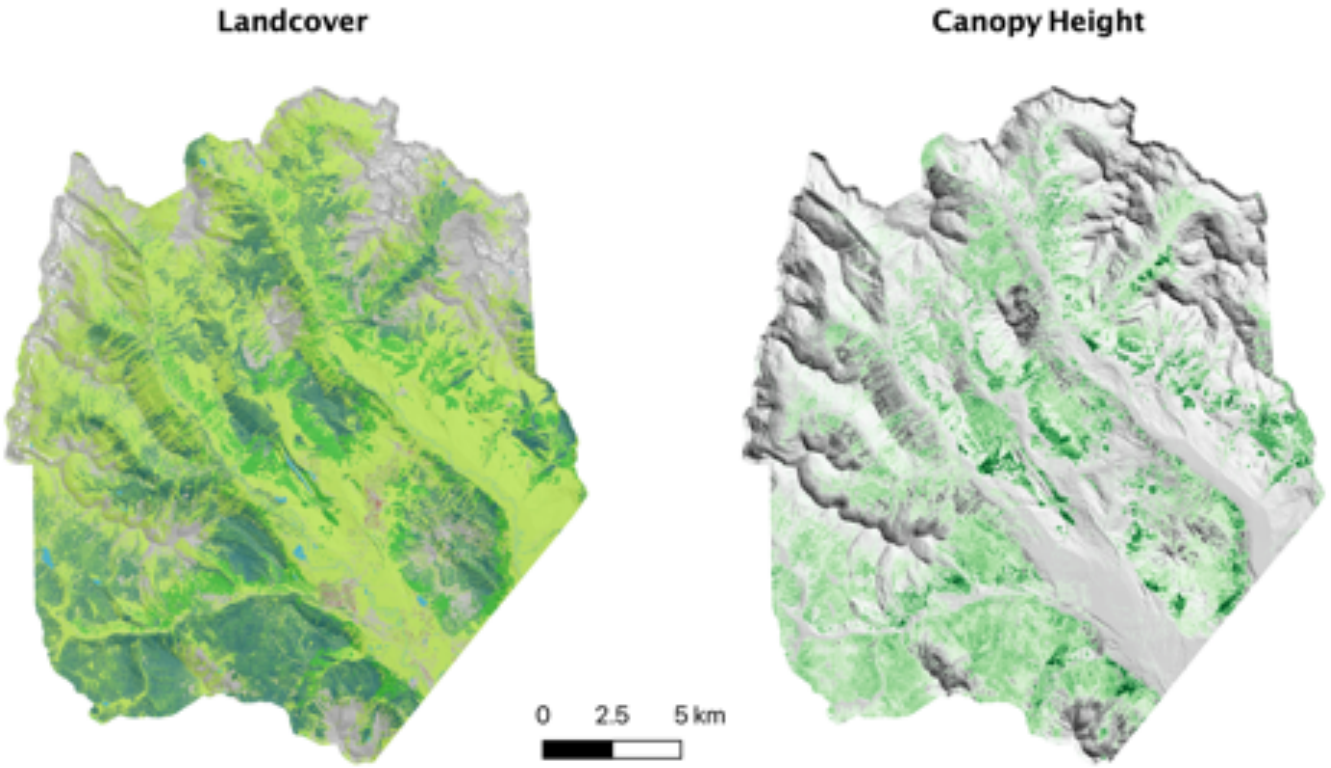
Raster Data


0,0
5,0
1 3 9 7 7
2 8 7 7 8
1m
6 7 3 5 7
7 6 5 5 6
8 6 5 6 4
0,5
5,5
Plot Raster
0,0
5,0
1m
0,5
5,5
Legend
0
1
2
3
4
5
6
7
8
9

Example Raster Datasets



https://www.rmbl.org/scientists/resources/spatial-data-platform/

4 Key Concepts for Raster Data

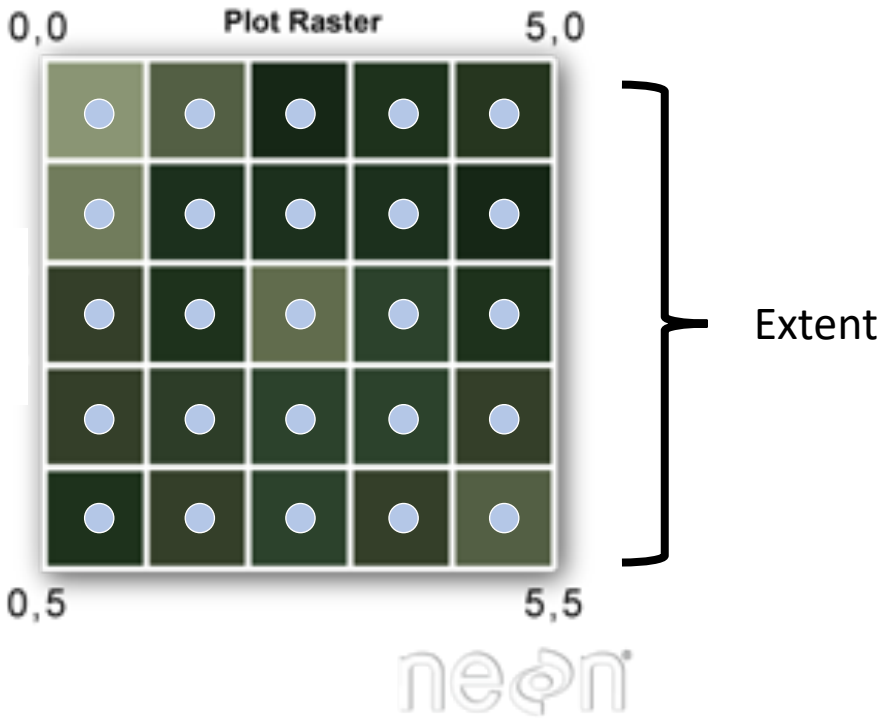
- ***Extent and Grain*** *- Is the data I've got at an appropriate scale to be useful?*

- ***Spatial Autocorrelation*** *– How spatially "smooth" is the attribute I'm trying to represent?*

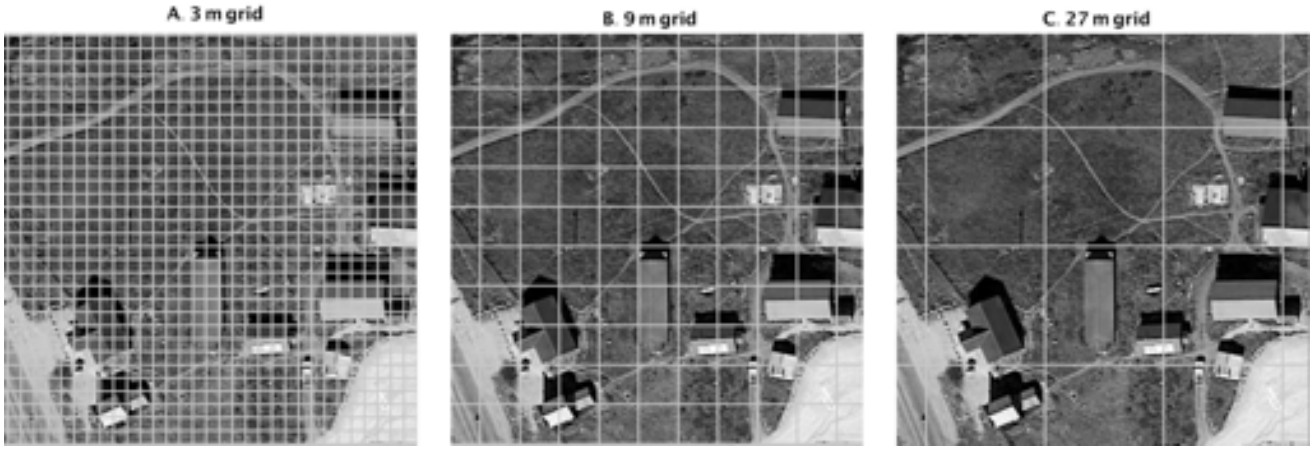
- ***Sampling and Resampling*** *- How do I extract useful data from a raster at my field sites?*

- ***Projections and Coordinate Systems*** *– What is a good 2D system for a 3D world?*

Extent and Spatial Grain



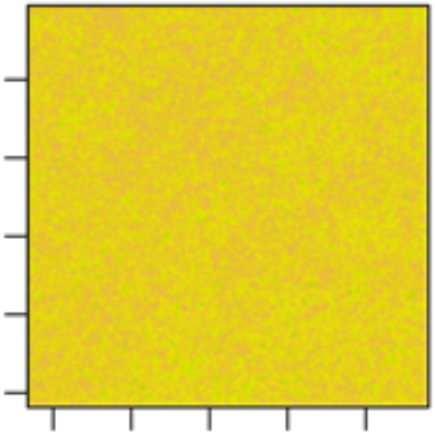
Grain and Extent in the SDP



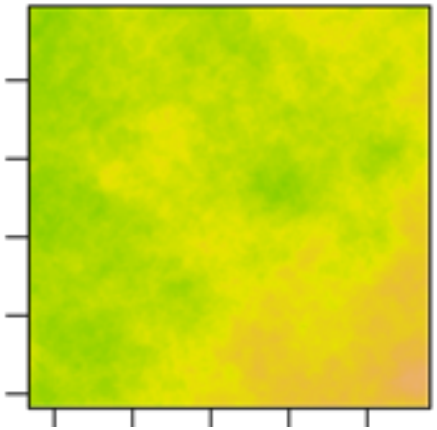
Not shown: nested 1m, 81m grids

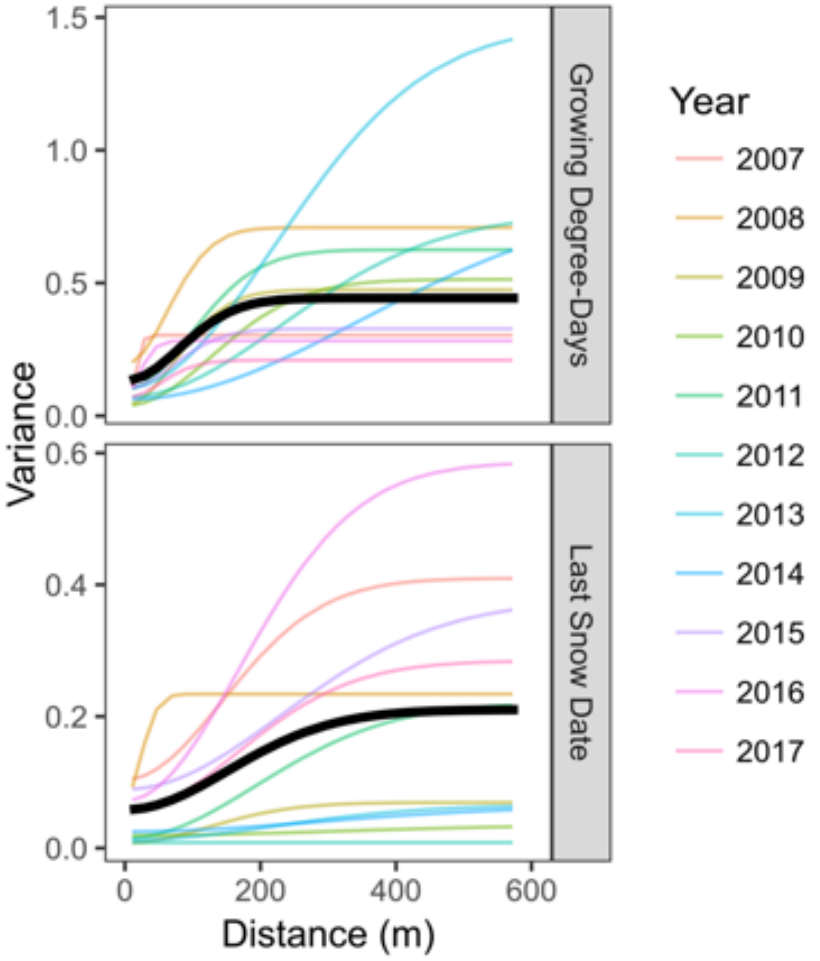
Spatial Autocorrelation (smoothness)

Growing Degree-Days



Last Snow Date

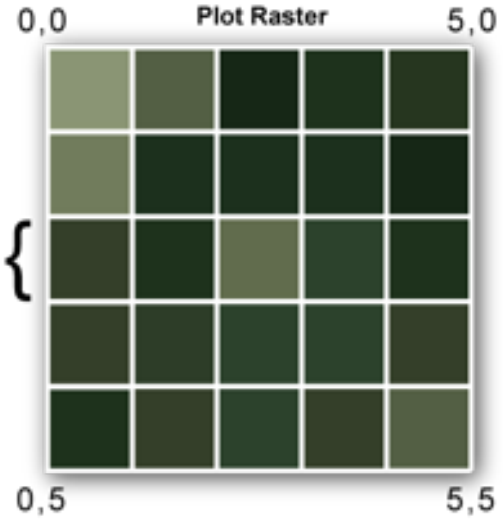


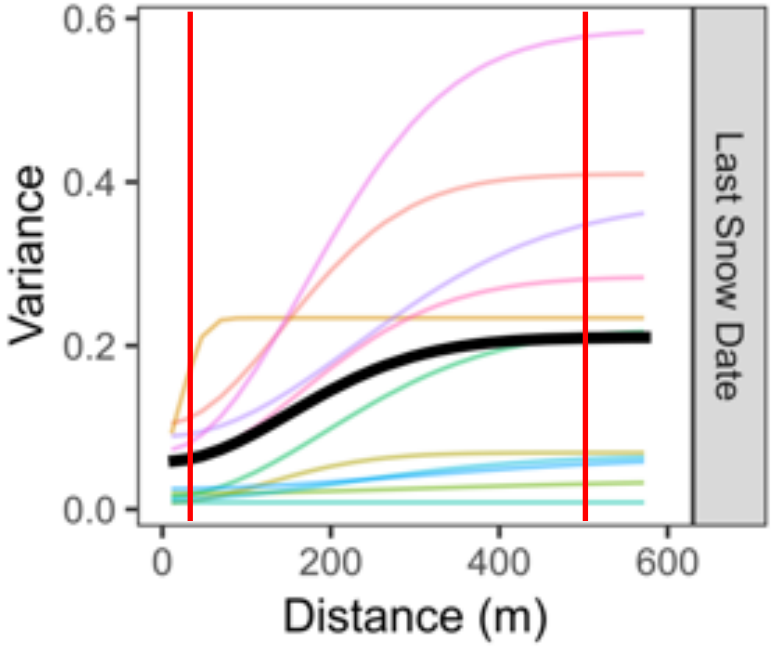


Is the Data at the Right Scale?

1m

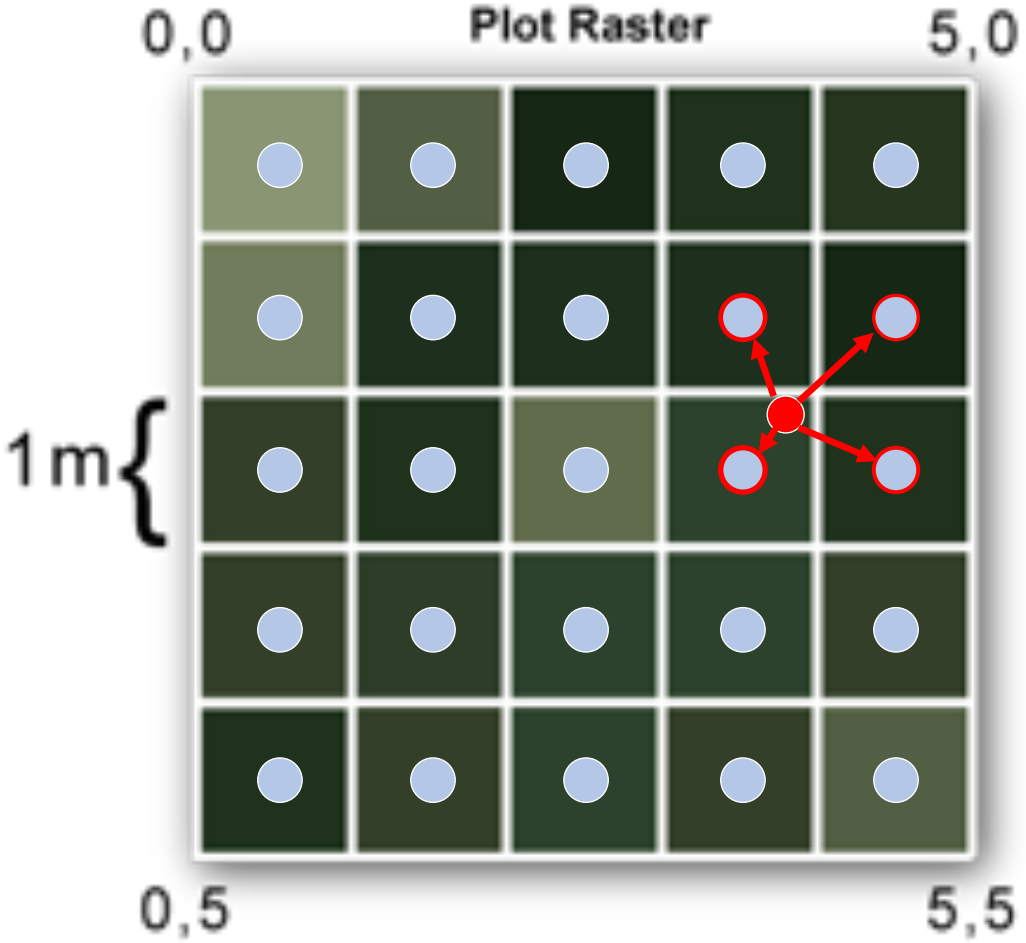
500m





Rule of thumb: is there more than a 25% difference in variance between the scale of field sampling and raster data I want to use?

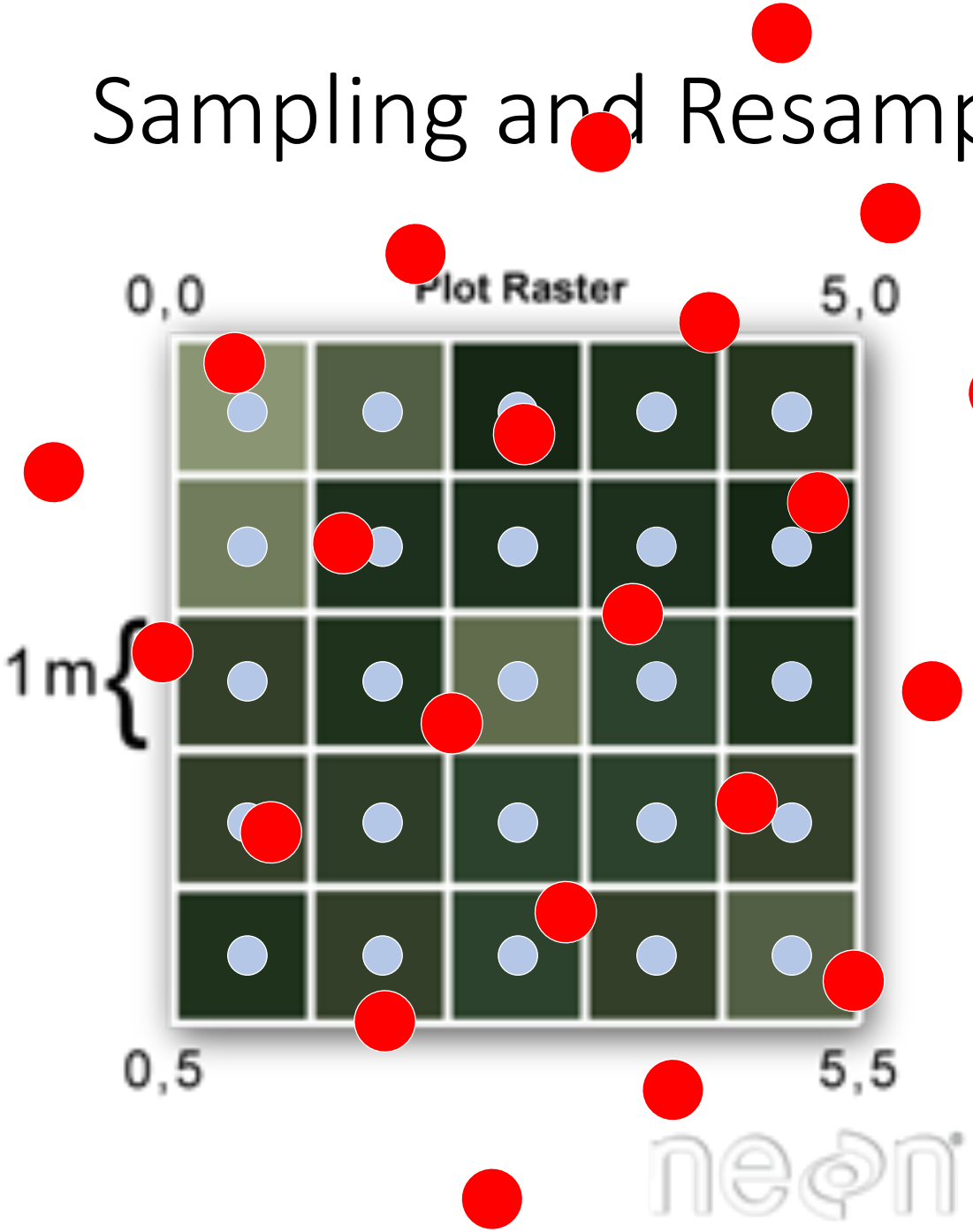
Sampling and Resampling



Simplest:
nearest neighbor sampling

Better for continuous data:
Bilinear interpolation

Sampling and Resampling



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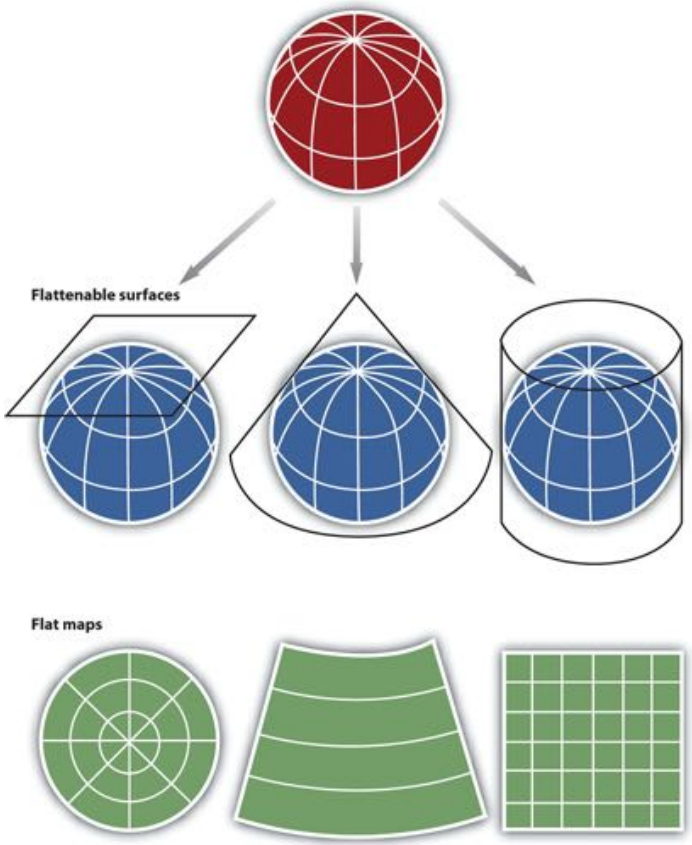
Projections and Coordinate Systems



https://2012books.lardbucket.org

Usually: re-project data to a common projection and coordinate system

Beware: some systems do not allow correct area and / or distance calculations

For local scale work:
UTM systems are usually a good choice

https://spatialreference.org

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Discovering Environmental Datasets

- Earth Engine Data Catalog — Global
- USGS Earth Explorer — Continental
- RMBL Data Catalog — Local

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Demo: Exploring and sampling SDP Datasets in QGIS

SDP Data Format

Cloud
Optimized
Geotiff

Demo: Accessing SDP datasets using R

Additional Resources

- Earth Observations for Biodiversity – recent papers
  - https://doi.org/10.1016/j.rse.2019.111218
  - https://doi.org/10.1111/geb.12887

- NASA Decadal Survey
  - https://www.nationalacademies.org/our-work-decadal-survey-for-earth-science-and-applications-from-space

- Working with Raster Data in R
  - https://www.neonscience.org/raster-data-r

- RMBL SDP Implementation Plan
  - https://www.rmbl.org/scientists/resources/spatial-data-platform/

Thanks!

Contact Me:

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Twitter, Github: @ibreckhe