

Tom Gulbransen

OOI DDCI 27Oct20



neon  
Operated by Battelle

# NEON Data Services for Open Science



# NEON Data Services

175 products, 81 Sites, 20 Regions, 250-400 staff in 1 plan  
STEAC advisors and 25 Technical Working Groups (volunteer)  
Controlled vocabulary, varied degrees of ontology maps  
FAIR Cyberinfrastructure with provenance  
Interactive Portals, API, Utilities, & 6 Partners Hosting  
V1.0 2008-2016; V1.5 2017-2018; V2.0 2019-present;  
CI DevOps; Observatory Data Scientists; External additions

# National Ecological Observatory Network

NEON provides a coordinated national system for monitoring critical ecological and environmental properties at multiple spatial and temporal scales.

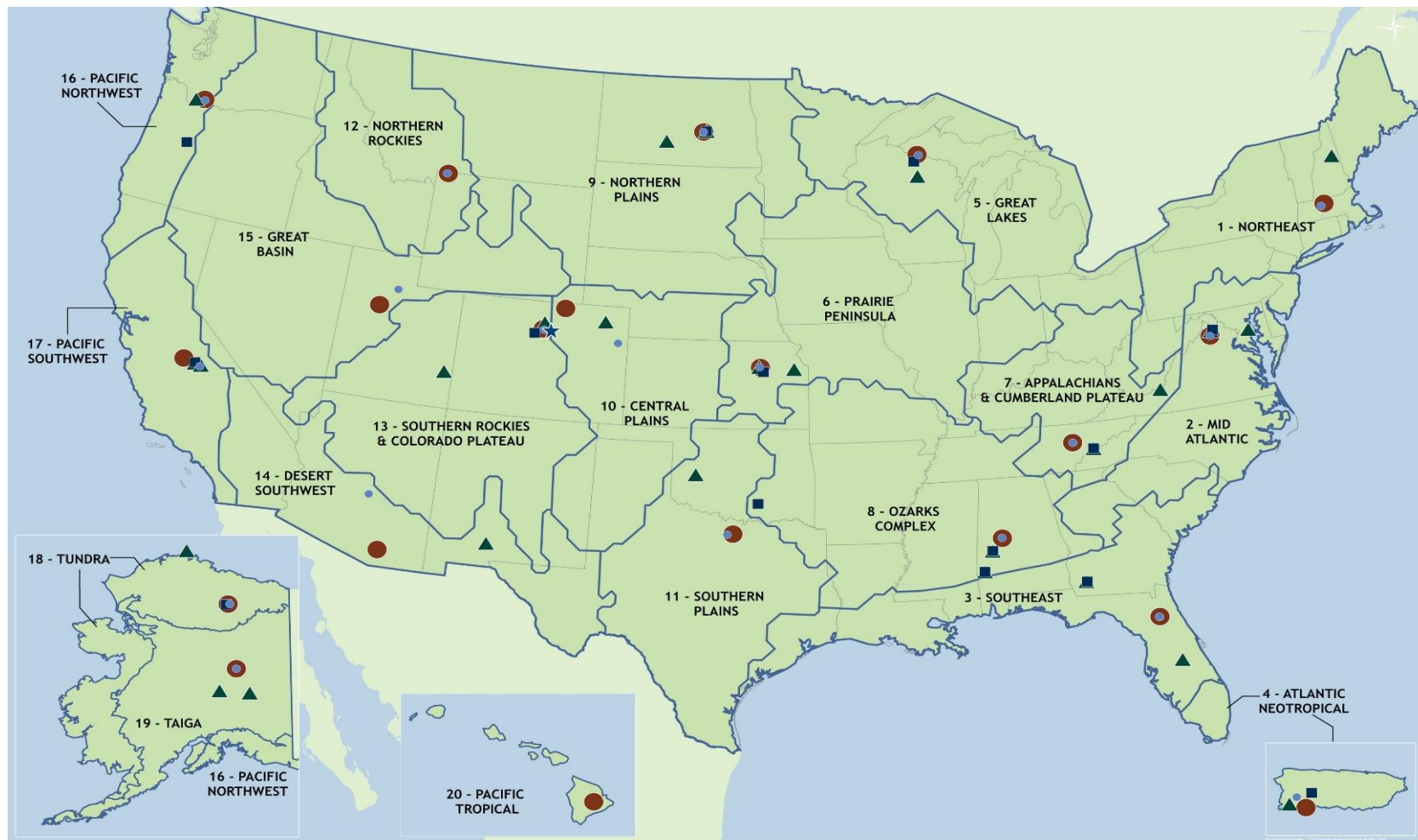
...transformative science

...workforce development



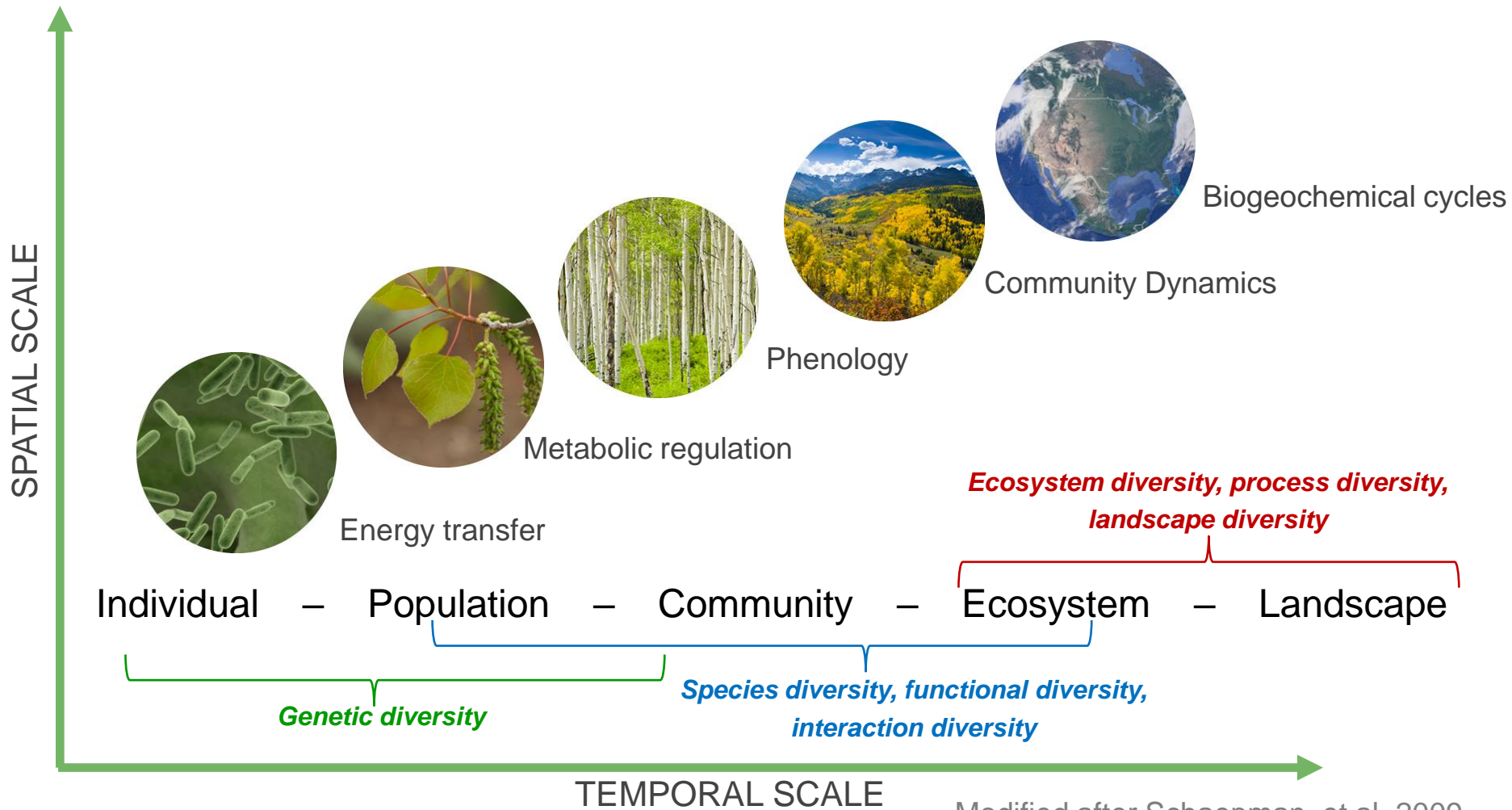
***diverse user communities' diverse access preferences***

# NEON Domains & Sites



***Continental & local scales over 30 years***

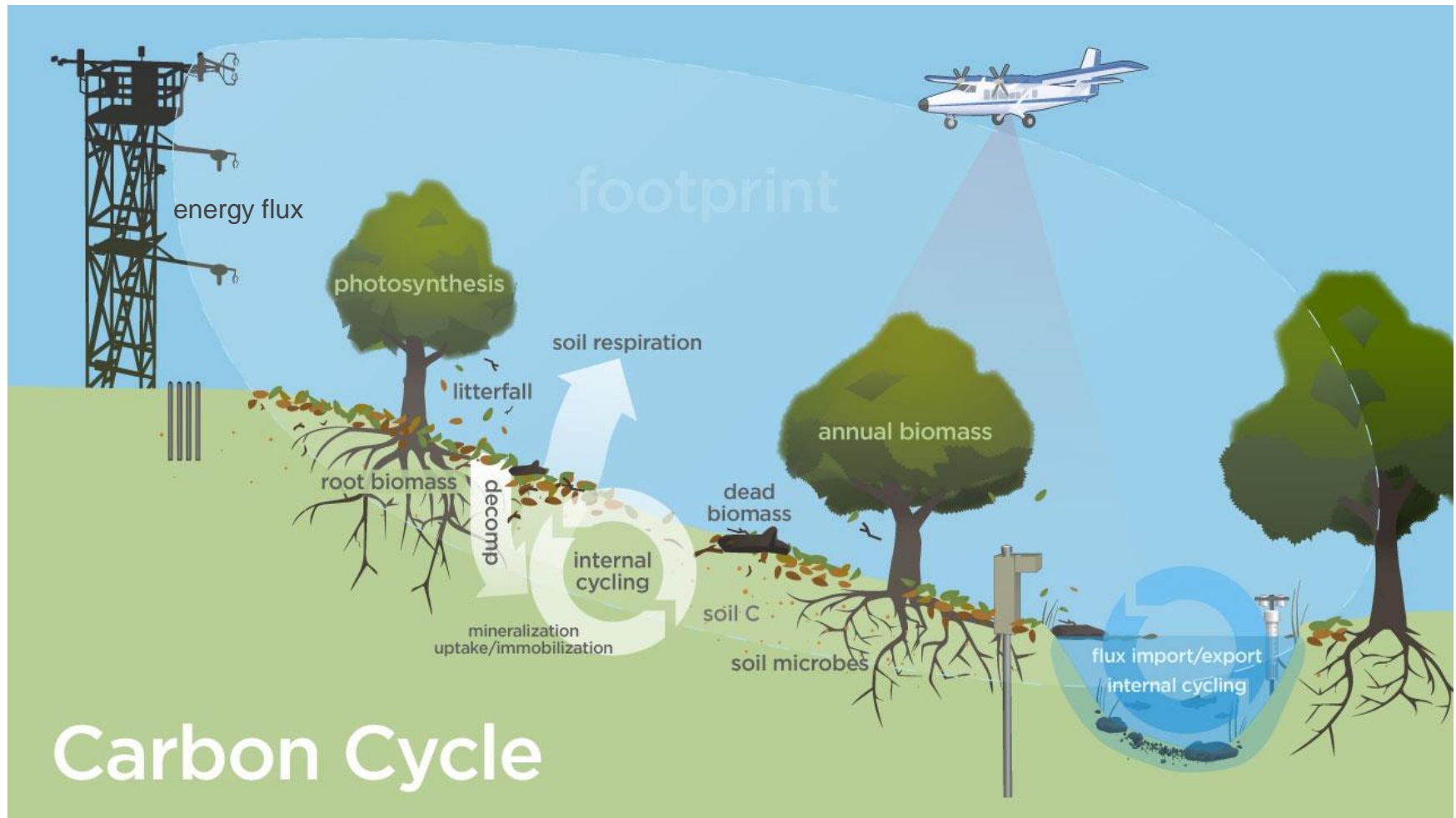
# Integration of Ecological Scales



Modified after Schaepman, et al. 2009

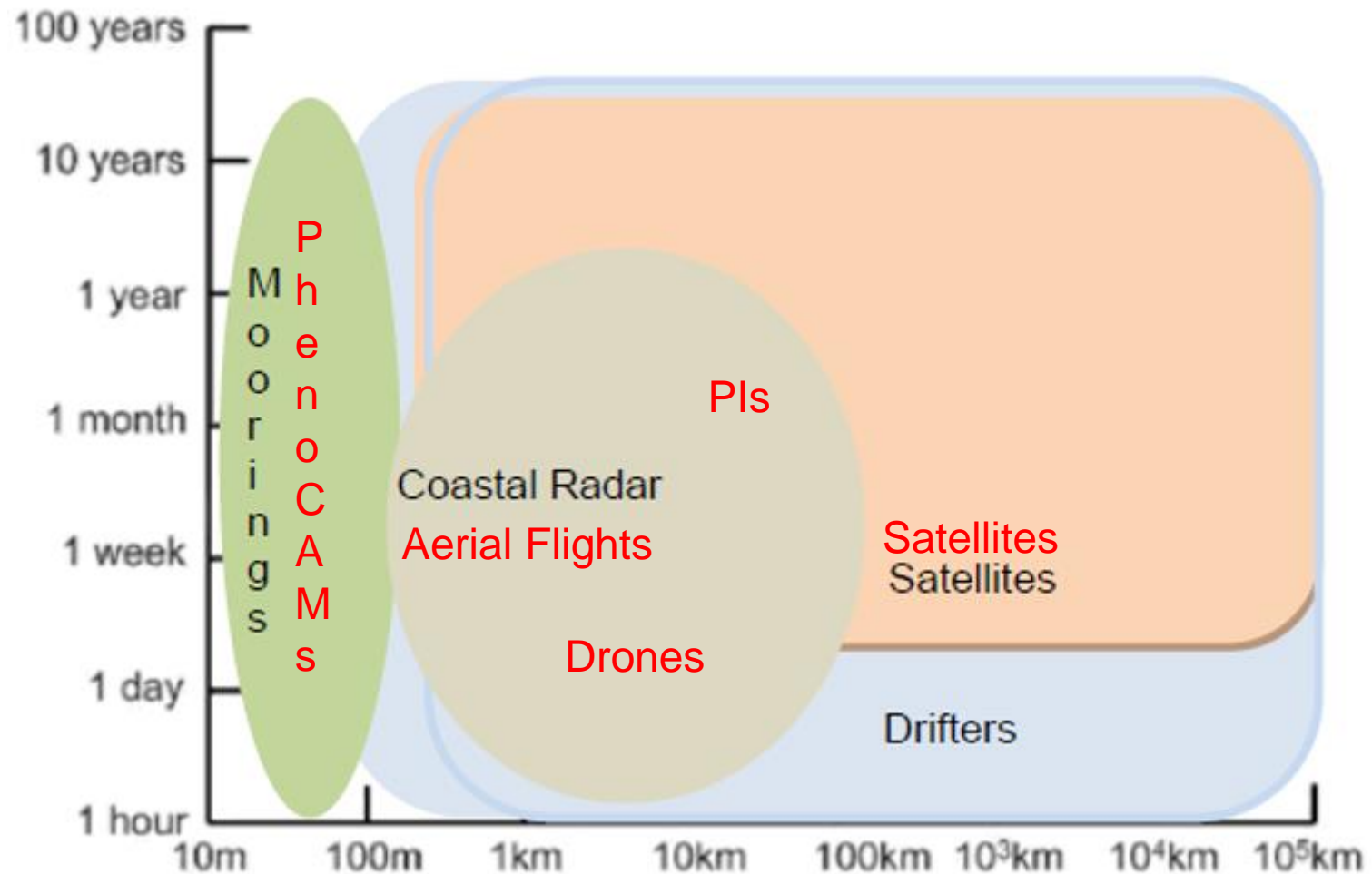


# Coordinated Sampling Across Disciplines

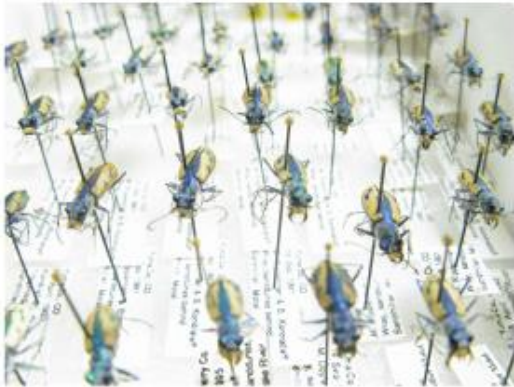


*Open platform for transformative science by all*

# Scale Similarity – Ocean Currents & NEON Phenology



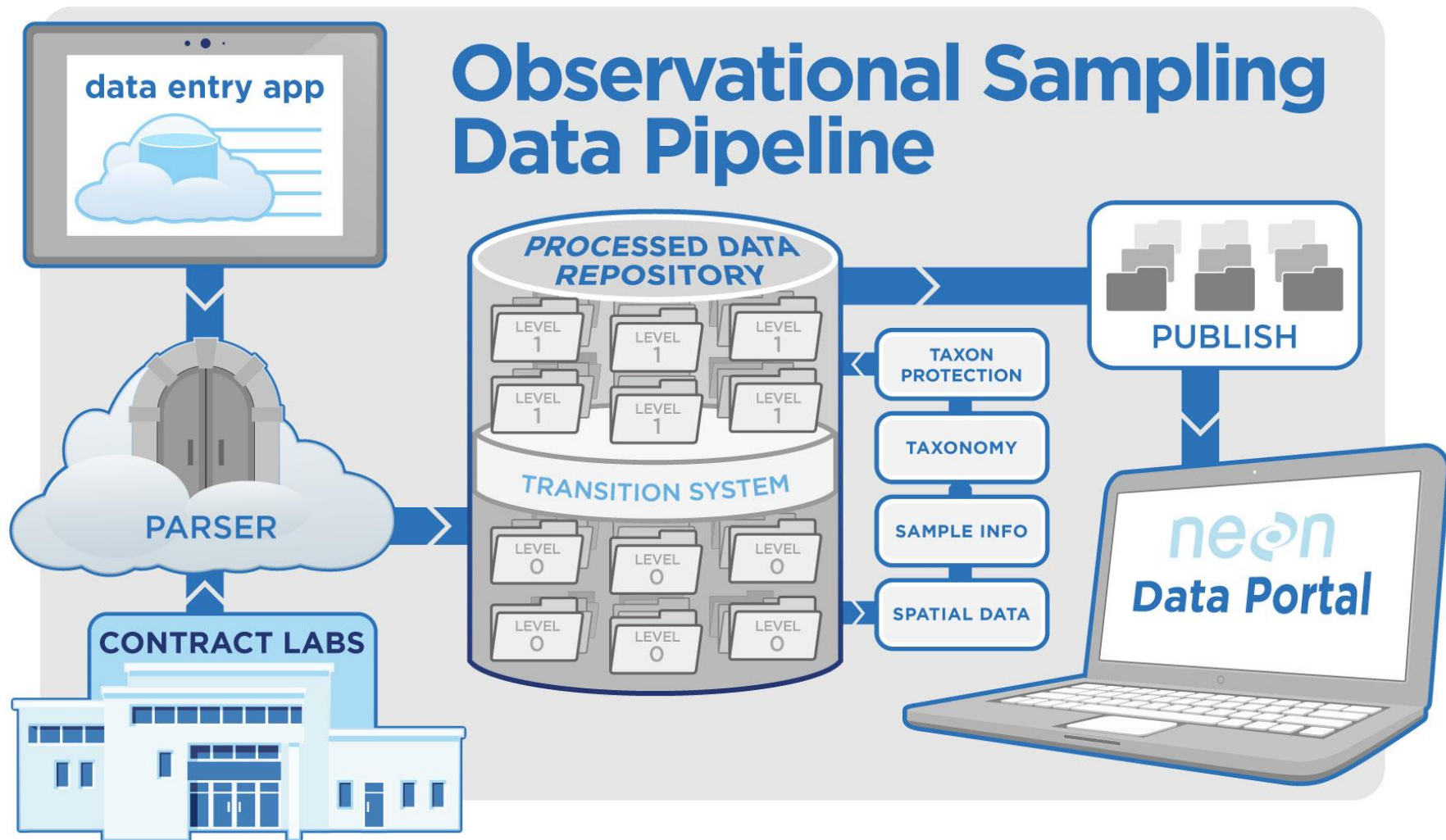
# Sample archive



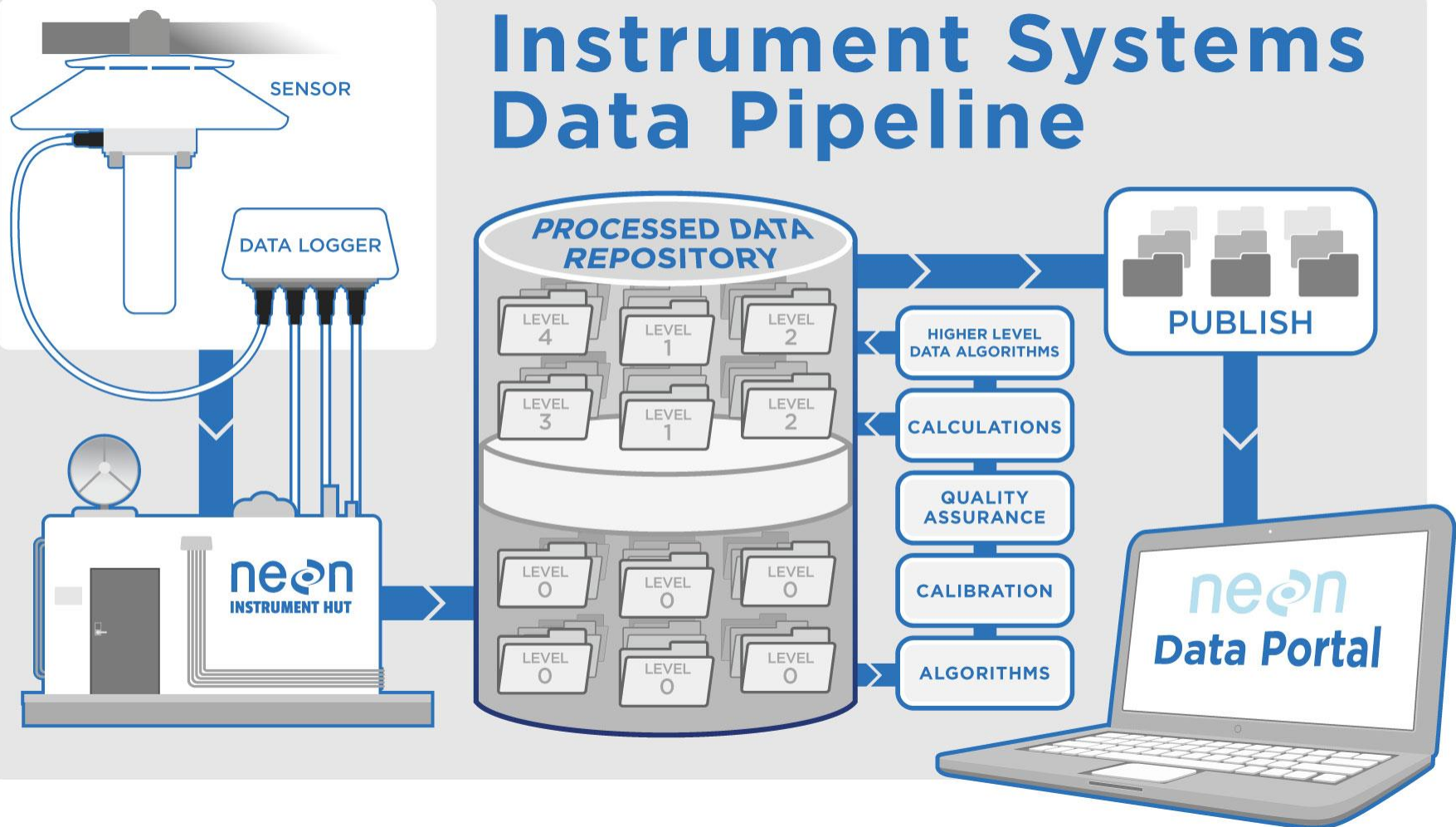
- Small mammals\*
- Fish\*
- Ground beetles\* & bycatch
- Mosquitos\*
- Ticks\*
- Zooplankton
- Benthic macroinvertebrates\*
- Vascular plants, algae, bryophytes and lichens
- Soil microbes\*
- Soil
- Dust
- Wet deposition

\*including genomic extracts

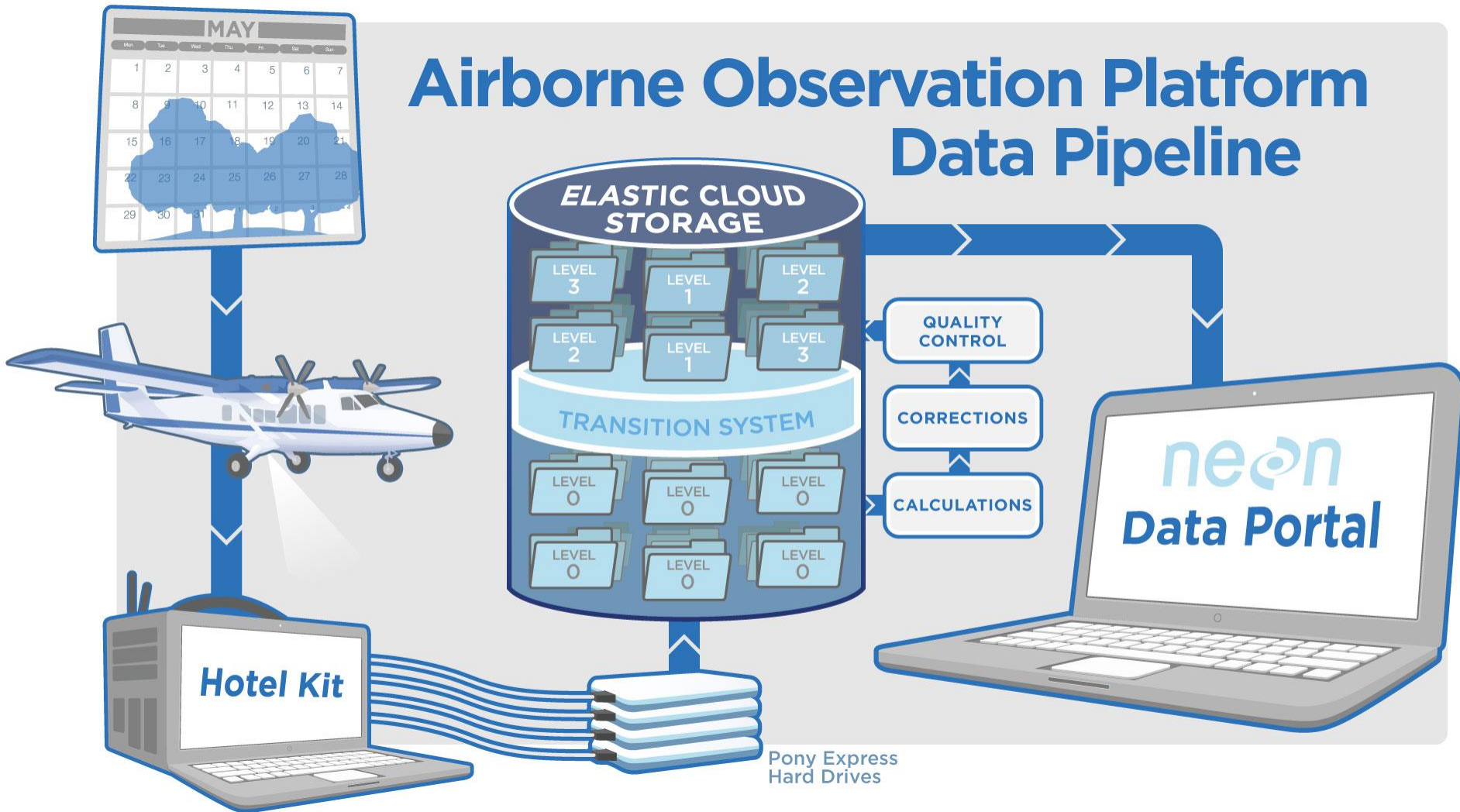




# Instrument Systems Data Pipeline

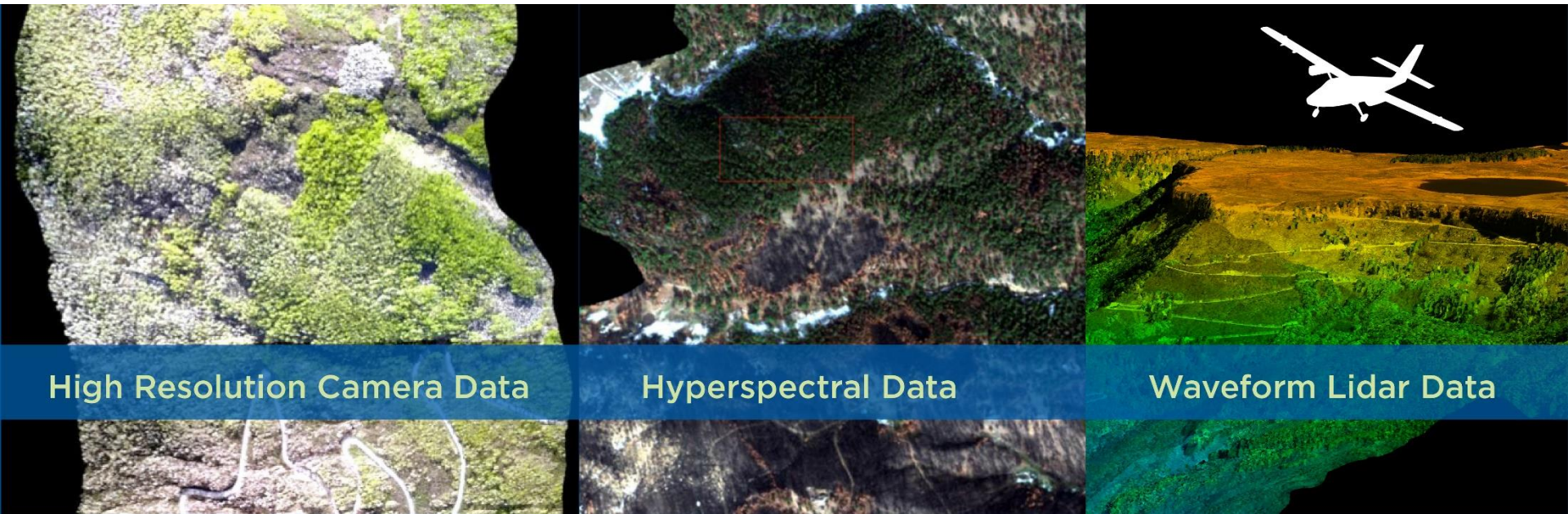


# Airborne Observation Platform Data Pipeline



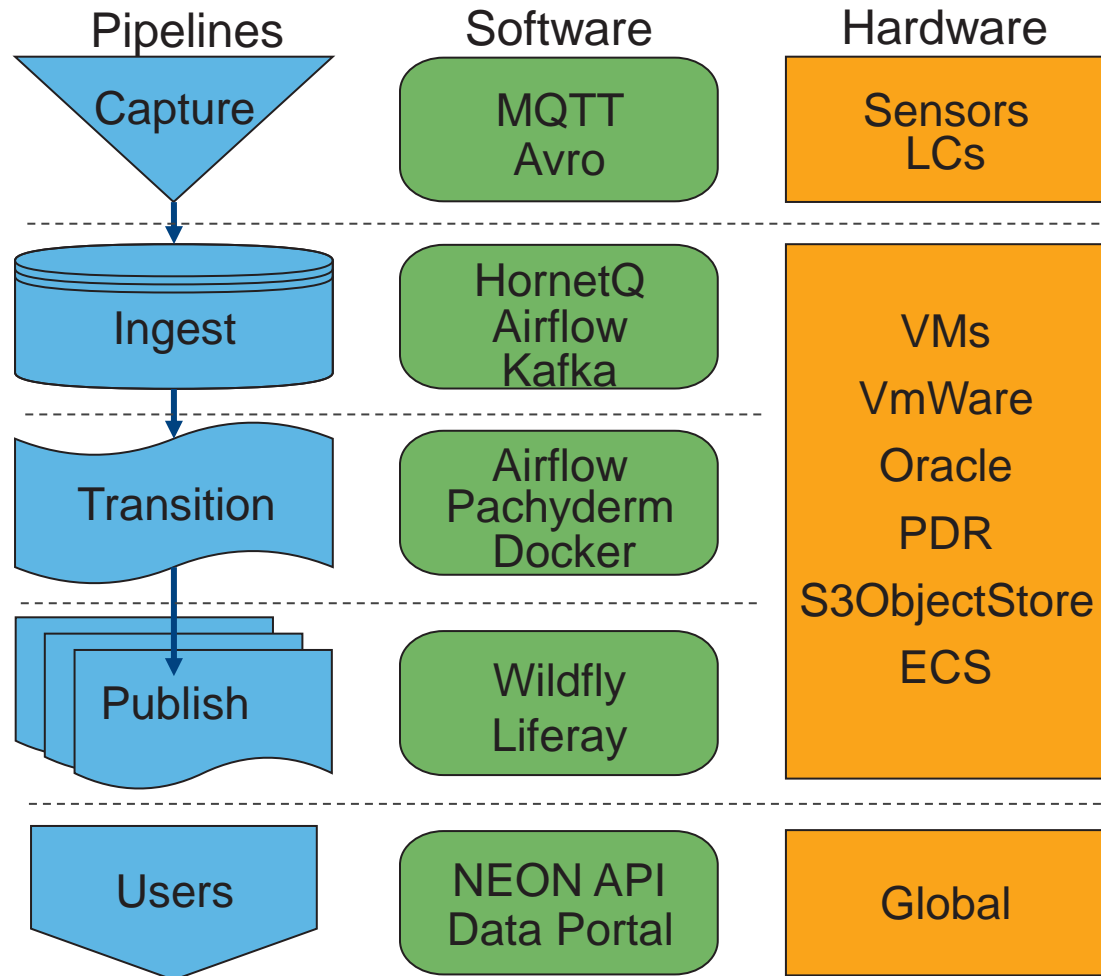


# Airborne Observation Platform

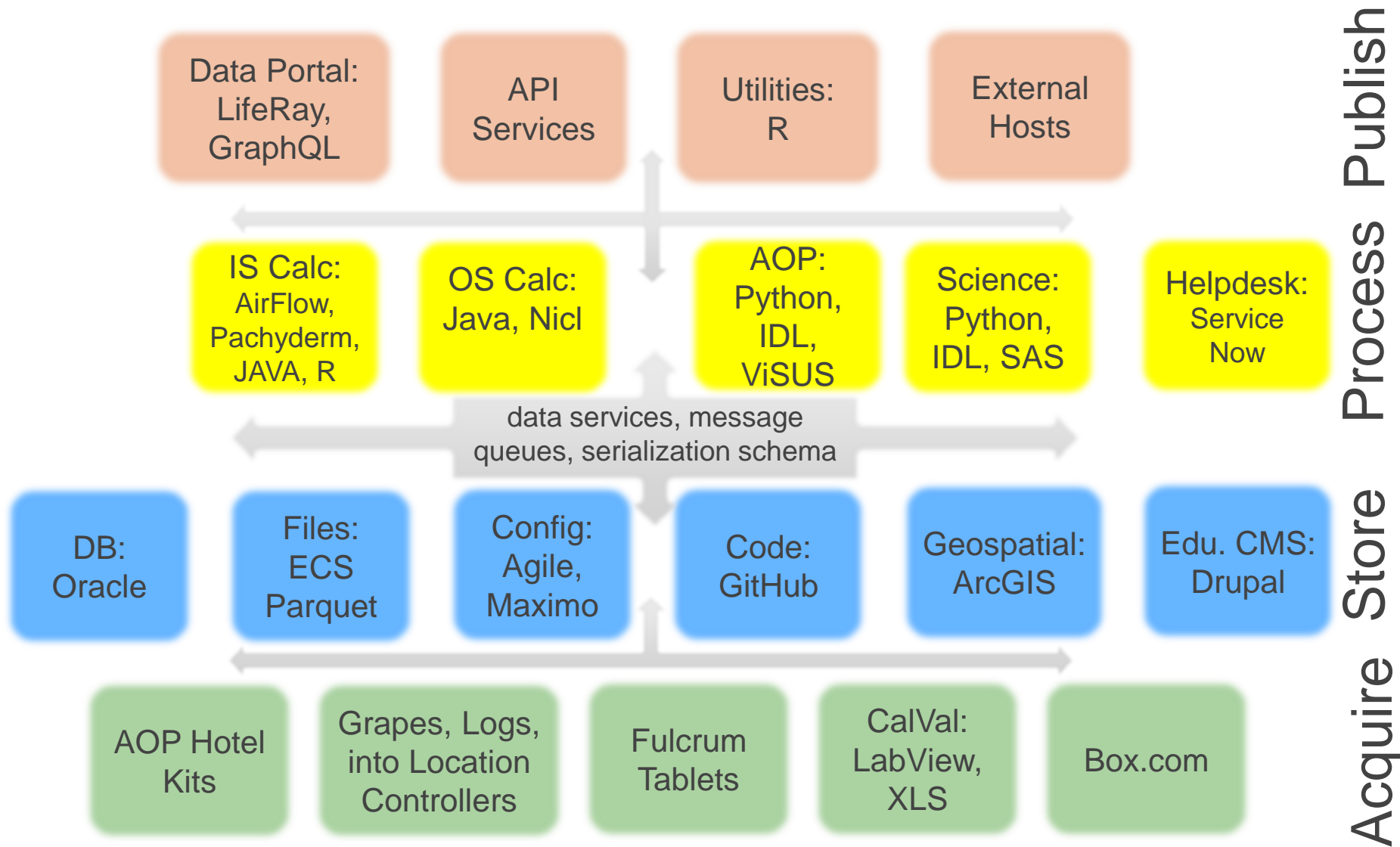


***Surveys scheduled for each site's peak greenness***

# NEON Cyberinfrastructure

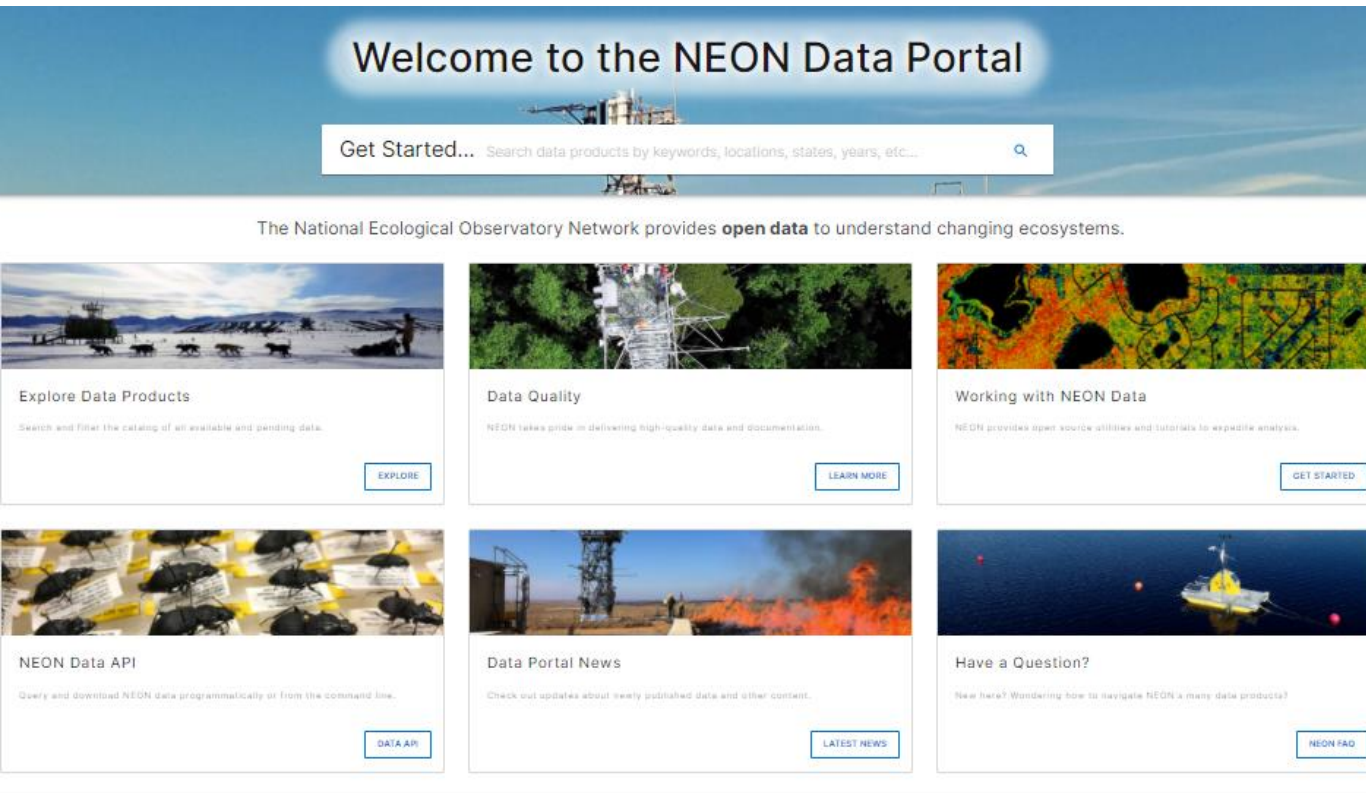


# NEON CI Software Architecture - Elements





# Data portal - data.neonscience.org



## Explore Data Products By Site



- View Product Catalog
- Data provenance & quality management
- Read protocols
- Interact geo or tabular
- Download data
- API primer
- User utilities code
- Links to external hosts
- Post request or issue
- Register, or not

# Browsing what's available when, where

## Data Status

- ☐ Available (159)
- ☐ Coming Soon (12)

## Visualizations

- ☐ Time Series Viewer (34)
- ☐ AOP Data Viewer (2)

## Science Team

- ☐ Airborne Observation Platform (AOP) (29)
- ☐ Aquatic Instrument System (AIS) (22)
- ☐ Aquatic Observation System (AOS) (37)
- ☐ Terrestrial Instrument System (TIS) (52)
- ☐ Terrestrial Observation System (TOS) (31)

## States

- ☐ Alabama (150)
- ☐ Alaska (151)
- ☐ Arizona (134)
- ☐ California (137)
- ☐ Colorado (143)

[+ VIEW ALL \(25\)](#)

## Sites

- ☐ ABBY (91)  
Abby Road, WA
- ☐ ARIK (77)  
Arikaree River, CO

### [Chemical properties of surface water](#)

DP1.20093.001

Grab samples of surface water chemistry including general chemistry, anions, cations, and nutrients.

DOWNLOAD DATA 

PRODUCT DETAILS 

#### Available Dates

2010-12 through 2020-09

#### Data Themes



Key:  Available  No data

View By:

[SUMMARY](#) [SITE](#) [STATE](#) [DOMAIN](#)



### [Root biomass and chemistry, Megapit](#)

DP1.10066.001

Standing stock of fine and coarse root biomass plus root carbon (C) and nitrogen (N) concentrations and stable isotopes from soil Megapits. Samples were collected in 10cm increments for the first 1m depth... [More >](#)

DOWNLOAD DATA 

PRODUCT DETAILS 

#### Available Dates

2012-06 through 2018-07

#### Data Themes



Key:  Available  No data

View By:

[SUMMARY](#) [SITE](#) [STATE](#) [DOMAIN](#)



### [Small mammal sequences DNA barcode](#)

DP1.10076.001

CO1 DNA sequences from select small mammals

DOWNLOAD DATA 



PRODUCT DETAILS 

#### Available Dates

2012-06 through 2019-11

#### Data Themes



Key:  Available  No data

View By:

[SUMMARY](#) [SITE](#) [STATE](#) [DOMAIN](#)



# Browsing what's available when, where

## Data Status

- ☐ Available (159)
- ☐ Coming Soon (12)

## Visualizations

- ☐ Time Series Viewer (34)
- ☐ AOP Data Viewer (2)

## Science Team

- ☐ Airborne Observation Platform (AOP) (29)
- ☐ Aquatic Instrument System (AIS) (22)
- ☐ Aquatic Observation System (AOS) (37)
- ☐ Terrestrial Instrument System (TIS) (52)
- ☐ Terrestrial Observation System (TOS) (31)

## States

- ☐ Alabama (150)
- ☐ Alaska (151)
- ☐ Arizona (134)
- ☐ California (137)
- ☐ Colorado (143)

[VIEW ALL \(20\)](#)

## Sites

- ☐ ABBY (91)
- ☐ ARIK (77)

### Chemical properties of surface water

DPI1.20093.001

Grab samples of surface water chemistry including general chemistry, anions, cations, and nutrients.

[DOWNLOAD DATA](#)

[PRODUCT DETAILS](#)

#### Available Dates

2010-12 through 2020-09

#### Data Themes



Key: ☒ Available ☐ No data

View By: [SUMMARY](#) [SITE](#) [STATE](#) [DOMAIN](#)



### Root biomass and chemistry, Megapit

DPI1.10066.001

Standing stock of fine and coarse root biomass plus root carbon (C) and nitrogen (N) concentrations and stable isotopes from soil Megapits. Samples were collected in 10cm increments for the first 1m depth... [More >](#)

[DOWNLOAD DATA](#)

[PRODUCT DETAILS](#)

#### Available Dates

2012-06 through 2018-07

#### Data Themes



Key: ☒ Available ☐ No data

View By: [SUMMARY](#) [SITE](#) [STATE](#) [DOMAIN](#)



### Small mammal sequences DNA barcode

DPI1.10076.001

CO1 DNA sequences from select small mammals

[DOWNLOAD DATA](#)

[PRODUCT DETAILS](#)

#### Available Dates

2012-06 through 2019-11

#### Data Themes



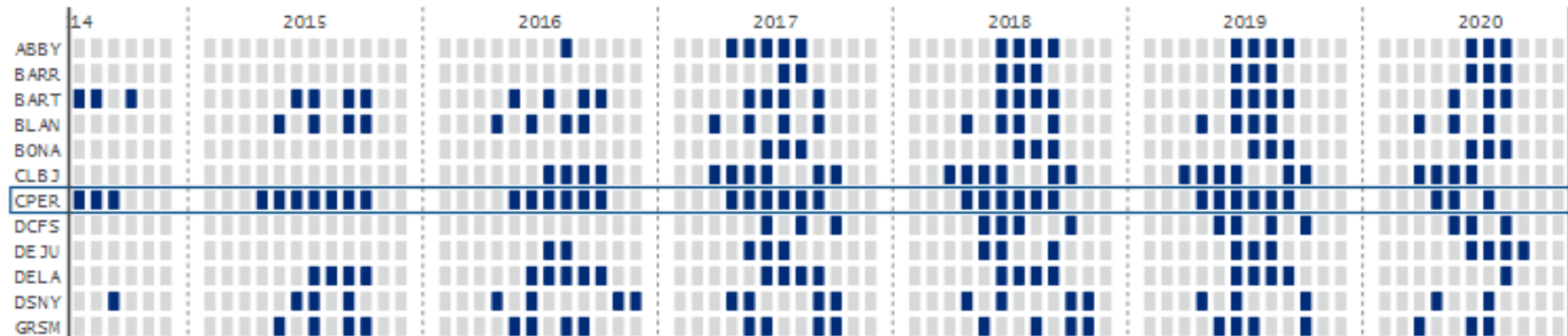
Key: ☒ Available ☐ No data

View By: [SUMMARY](#) [SITE](#) [STATE](#) [DOMAIN](#)



Key: ☒ Available ☐ No data

View By: [SUMMARY](#) [SITE](#) [STATE](#) [DOMAIN](#)





# Browsing trends

## 2D wind speed and direction

Site: ABBY (Abby Road)

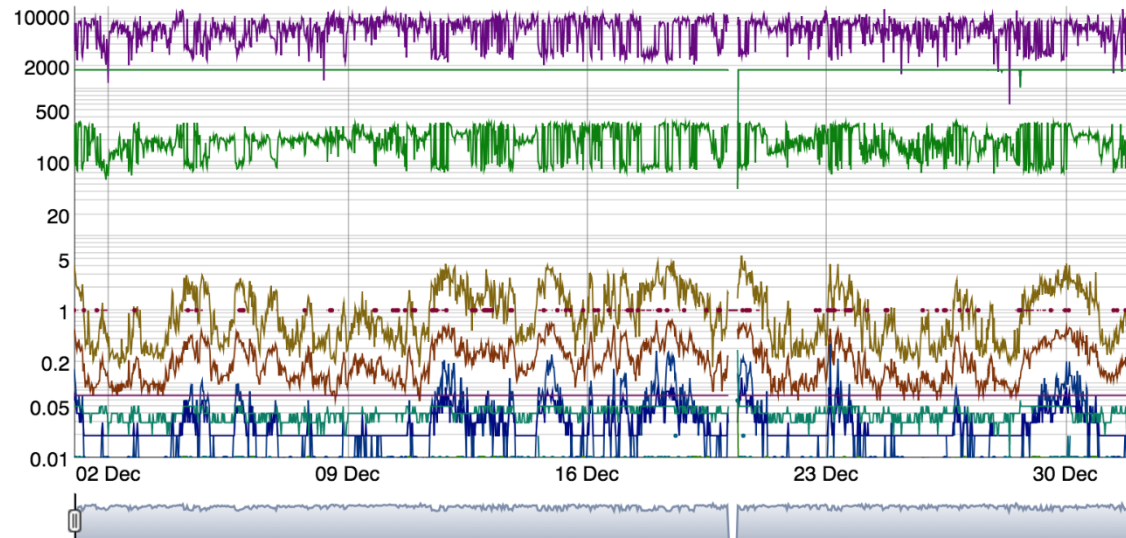
Month: 2018-12

Positions: [x](#) (horizontal: 000, vertical: 010)

Variables: Select Variables...

- ☒ Log Scale  
☐ Quality Flags

— windSpeedMean  
— windSpeedMinimum  
— windSpeedMaximum  
— windSpeedVariance  
— windSpeedNumPts  
— windSpeedExpUncert  
— windSpeedStdErMean  
— windSpeedFinalQF  
— windDirMean  
— windDirVariance  
— windDirNumPts  
— windDirExpUncert  
— windDirStdErMean  
— windDirFinalQF



SUMMARY

SITES & POSITIONS

DATE RANGE

VARIABLES

x/y AXES

y Axes

Scale

Toggle between linear and logarithmic scales on all y axes

LINEAR

LOGARITHMIC

y1 Range

Set min and max range for y1 axis (metersPerSecond)

CENTERED

FROM ZERO

CUSTOM

Max  
0.699

Min  
-0.059

$\sigma = 0.079$

x Axis (Time)

Time Step

Set a smaller time step to see NEON data aggregated with finer granularity

AUTO

30MIN

2MIN

Roll Period

Set a rolling window to smooth out noisy data



none

1.9 days

3.8 days

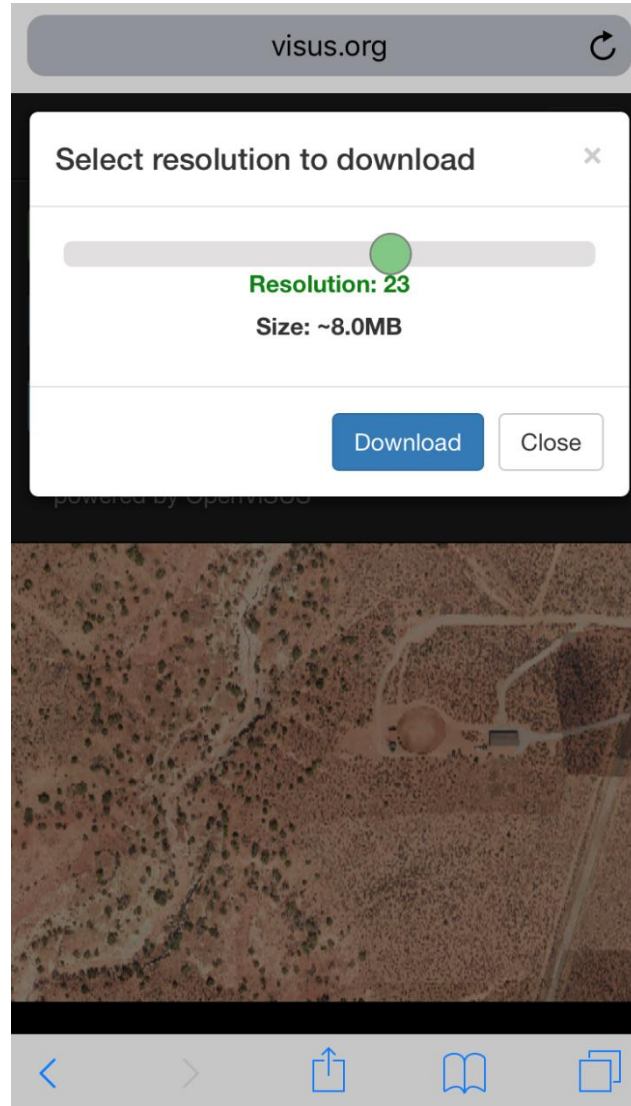
5.6 days

7.5 da



neon  
Operated by Battelle

# Visualizing high-volume AOP imagery



- Univ Utah, Pascucci lab
- ViSUS platform
- Petabyte scale
- Preprocessed mosaics
- Interactive
- Scalable downloads
- Shareable links
- GeoTIFF & LAZ
- Hard drives on demand

# API Endpoints

Endpoint	Attributes	Query by
products	Product code Name Description Design description Available months Change logs...	Product code
sites	Site code Lat/Lon...	Site code
locations	Lat/Lon/Z/offset... Hierarchy Periods	Name Type Hierarchy
data	Product code Site code Year-month Filename, URL	Product code Site code Year-month Package type
taxonomy	ID Names gbif classifications	taxonTypeCode Kingdom, phylum... ScientificName
samples	Supported classes	Sample tag

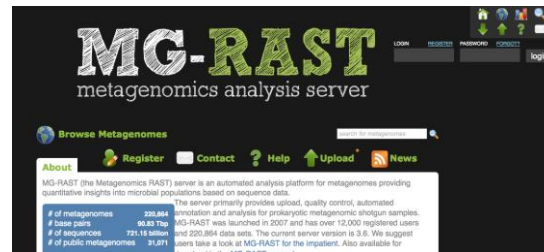
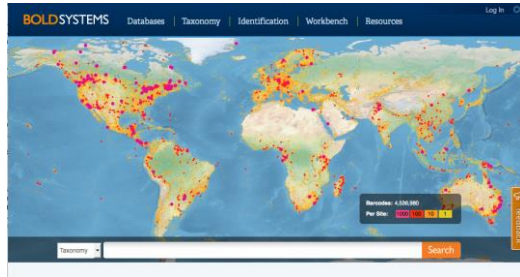


# API Open Utilities (Tiers 1-3)

Endpoint	Attributes
stackByTable	joins the monthly files by data table
zipsByProduct	Stores downloaded data to enable joins
loadByProduct	Creates R environment of zips and stacks
getPackage	Increments monthly downloads
byFileAOP	Preserves original AOP file structure
readTableNEON	Builds R arrays
transformFileToGeoCSV	Crates file with GeoCSV headers from raw CSVs
...approximately 20	

# External Partners Hosting

## Barcode of Life (BOLD) MG-RAST



## Sequence Read Archive (SRA)



### Getting Started

[How to Submit](#)

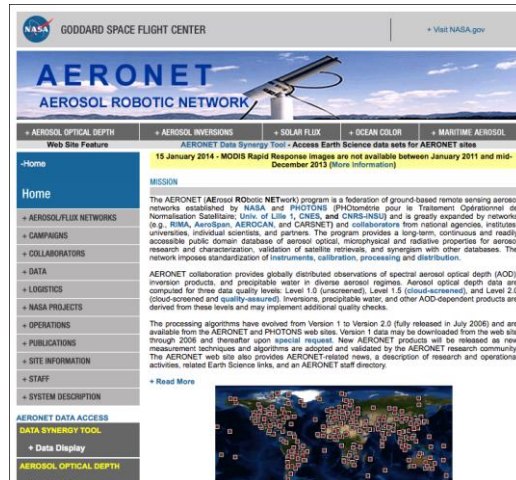
[Login to SRA](#)

### Tools and Software

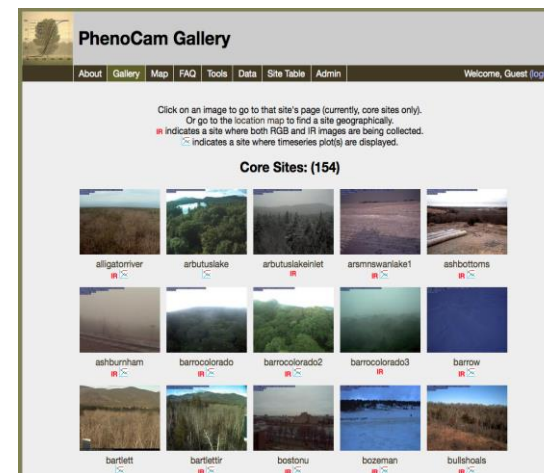
[Download SRA Toolkit](#)

[SRA Toolkit Documentation](#)

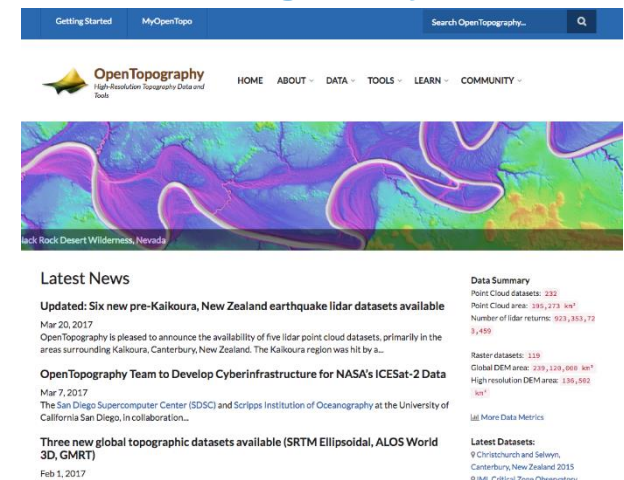
## AERONET



## PhenoCam Network



## OpenTopography







neon  
Operated by Battelle

## Contacts

NSF: Roland Roberts, Montona Futrell-Griggs; Anna Lee Misiano

NEON: Paula MaBee Observatory Director, Chris McKay PM,  
Kate Thibault Science Team, Christine Laney User/Data Services,  
Steve Jacobs Cyberinfrastructure

720-746-4844 | [neonscience@BattelleEcology.org](mailto:neonscience@BattelleEcology.org) | [NEONscience.org](http://NEONscience.org)