BDEC AND SBG

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Biodiversity and conservation's signature mission

Where are we now?

Mission Status

- Two projects, one mission: TIR + VNIR (with ASI)+ VSWIR.
- Both sensor teams are moving ahead on technical design and engineering.
- Challenges have occurred mainly due to the high volumes of data from smallish platforms.
- Interesting technical solutions are being explored for cost and schedule on VSWIR.
- *What is the SBG team and friends doing for the BDEC community?*

Campaigns are opportunities for multi-scaled science: BYOS (Smaller 'agile' campaigns)

Western Diversity Time Series: *Foundational Development*

SHIFT
SBG High Frequency Timeseries

SHIFT: *Algorithms on phenological time scales*

BIOSCAPE
Biodiversity Survey of the Cape

BIOSCAPE: *Biodiversity Science and Applications*

AVUELO
Airborne Validation Unified Experiment **Land to Ocean**

AVUELO *Tropical plant and phytoplankton trait algorithms*

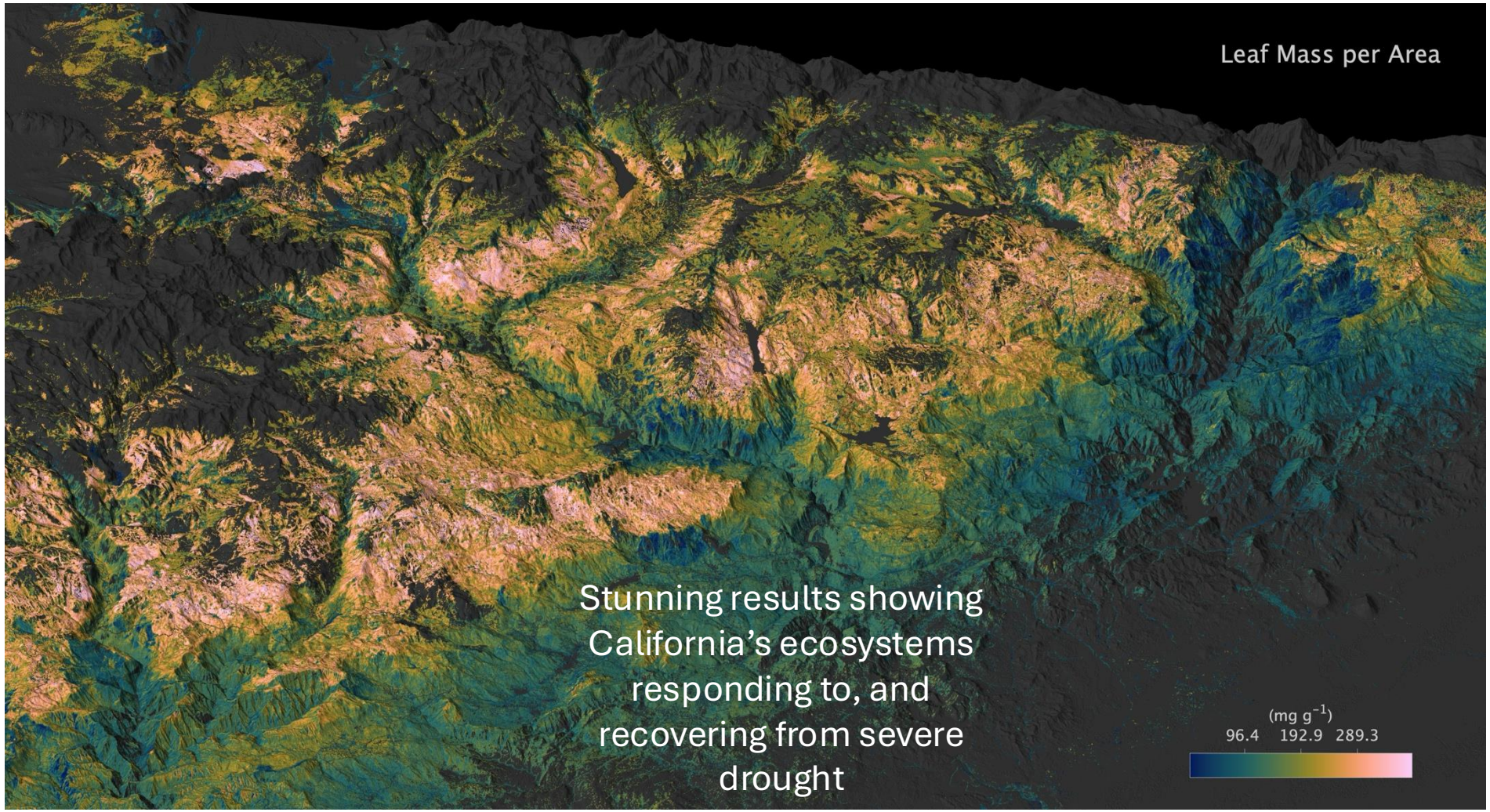
PLANTS DATA BASE WILL LINK IN SITU, LAB, SPECTRAL AND REMOTE DATA

- PLEASE SEE DANA CHADWICK OR YOSELINE ANGEL FOR DETAILS!

- PLANTS IS AN SQL (RELATIONAL) DATA BASE FOR ALGORITHM DEVELOPMENT, CALIBRATION AND VALIDATION, AND RESEARCH.

- PLANTS WILL BE PART OF A LARGER DATA RESOURCE INCLUDING THERMAL INFORMATION (EG MINERAL SIGNATURES)

Western Diversity Time Series



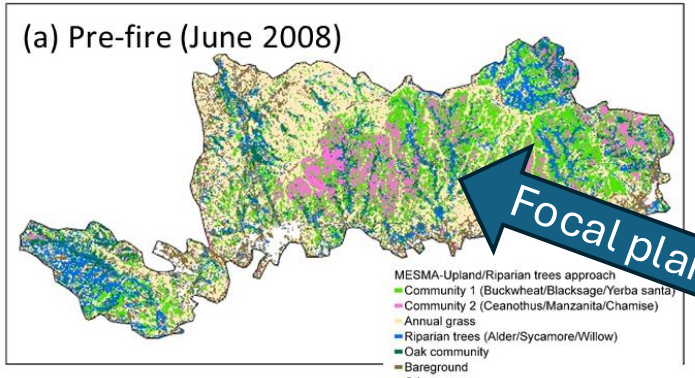
RECOVERY FROM DISTURBANCE AND POLLINATOR HABITAT CHANGE:
Bycatch from the WDTS

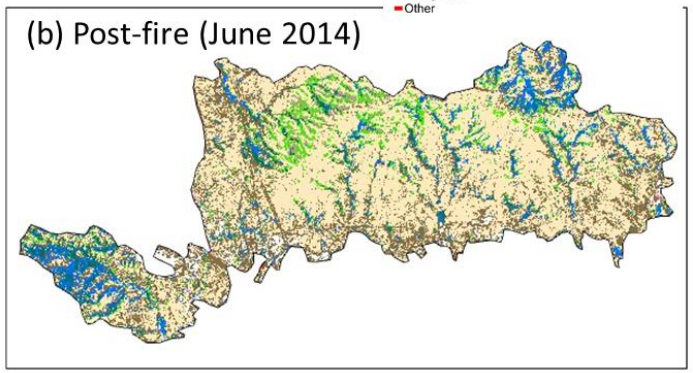
This project used VSWIR, TIR, Lidar and UAVSAR

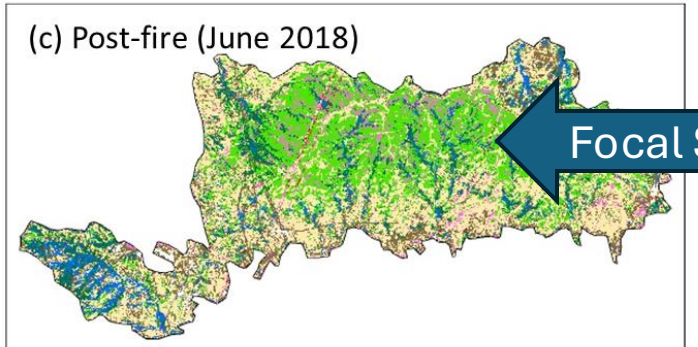
Drought

Rains Return

Native cooler than invaded



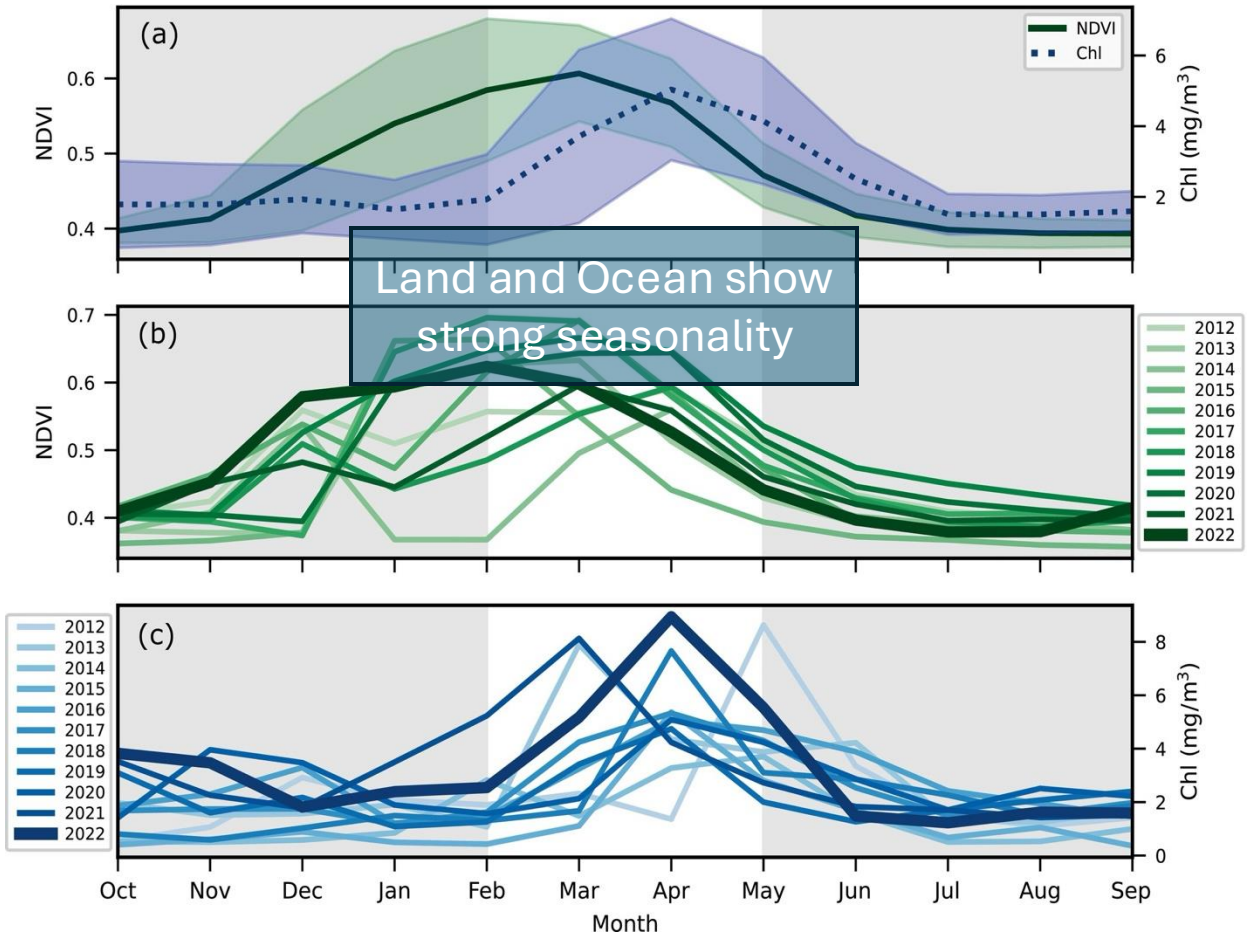




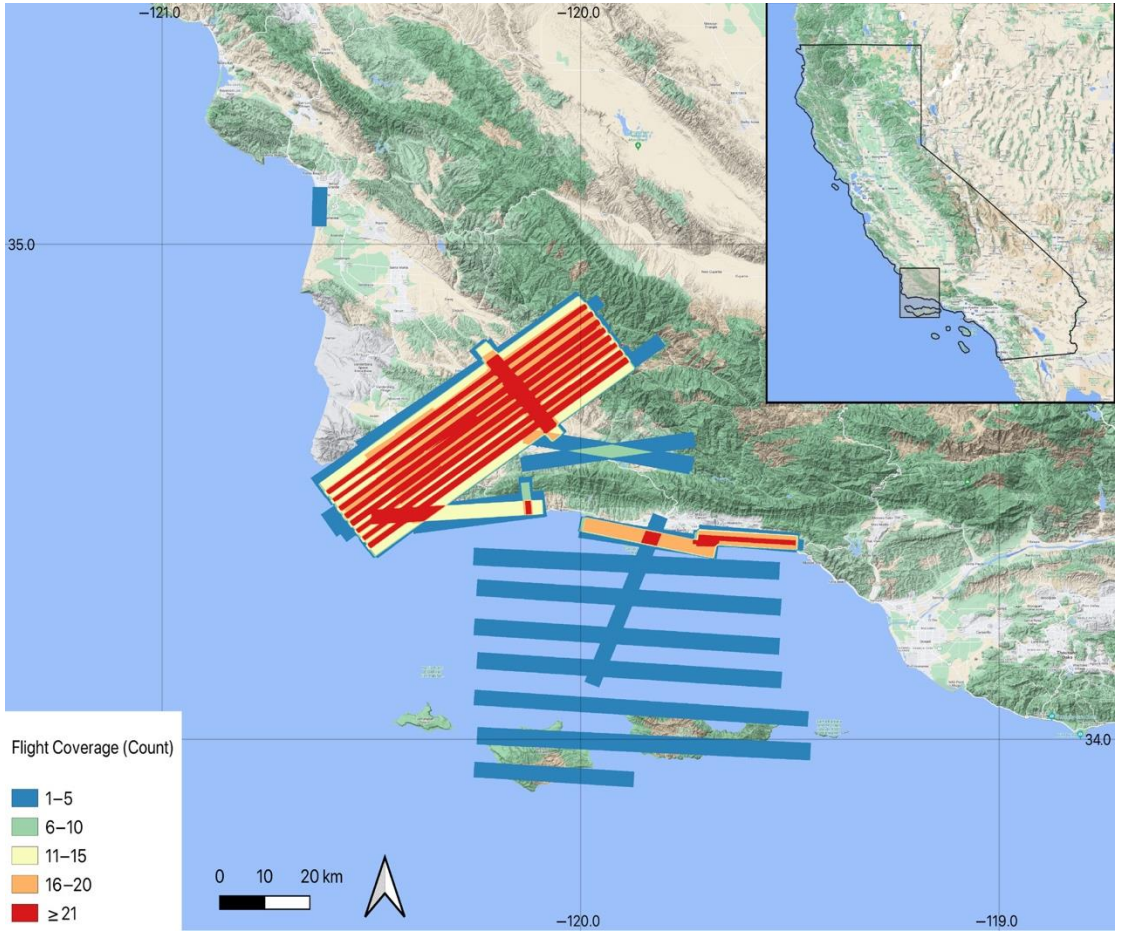
Focal plant Species Pre-Fire

Focal Species Recovery

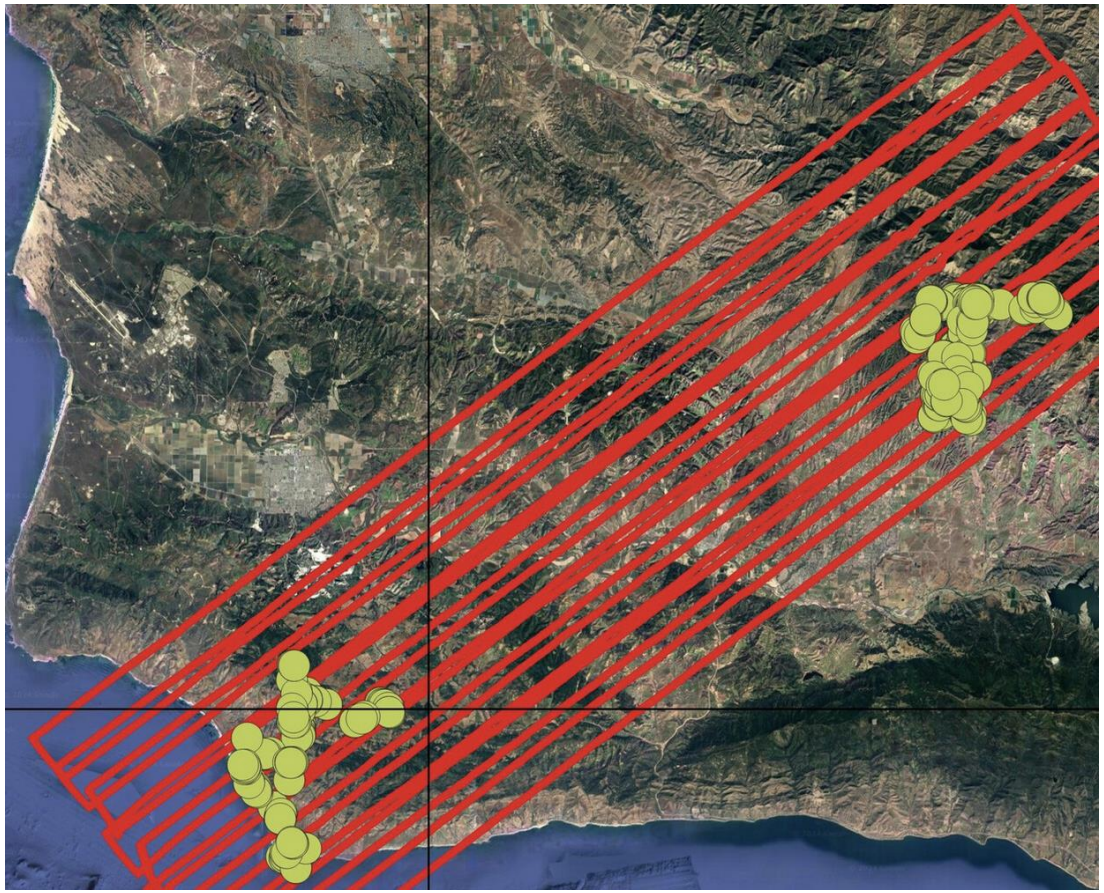
Land and Ocean Seasonality
SBG has requirements tied to seasonal timescales

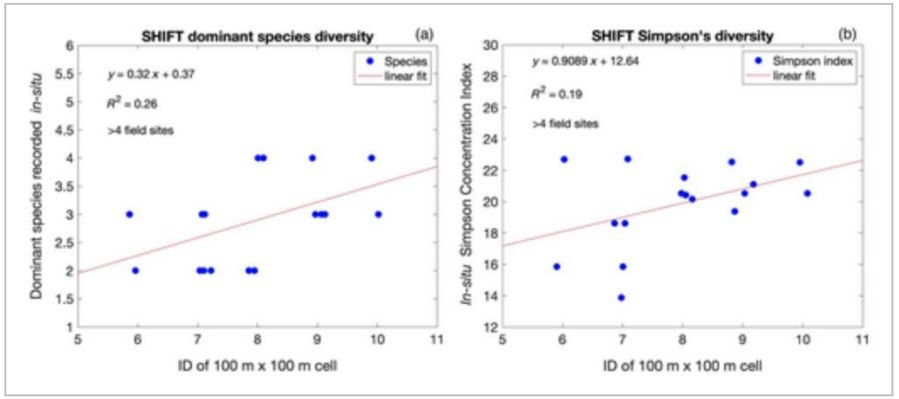


Land and Ocean show strong seasonality



Intrinsic dimensionality as a metric for plant diversity





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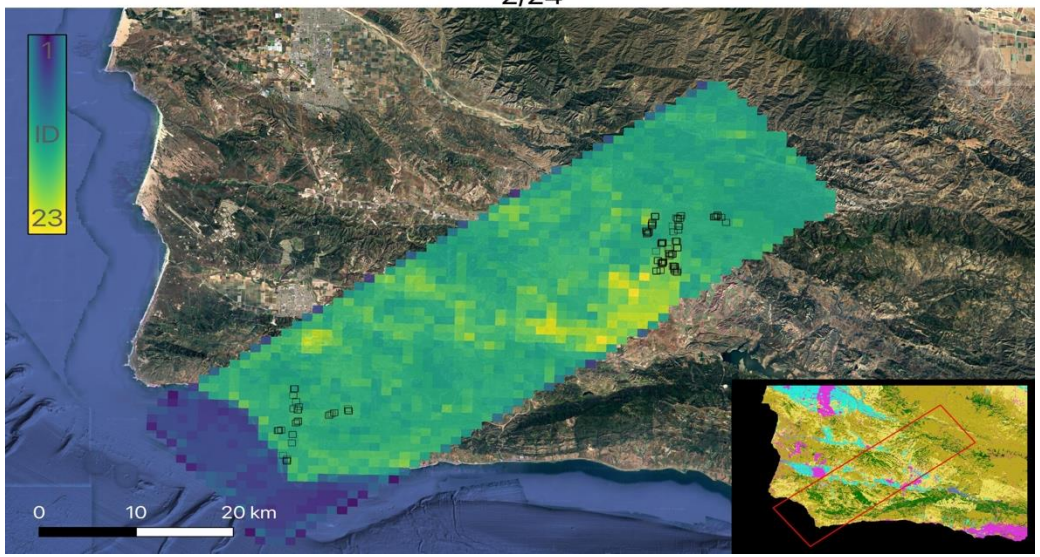
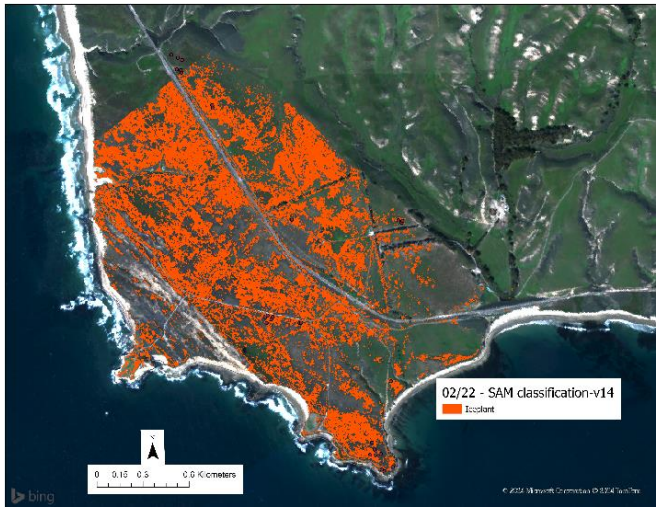
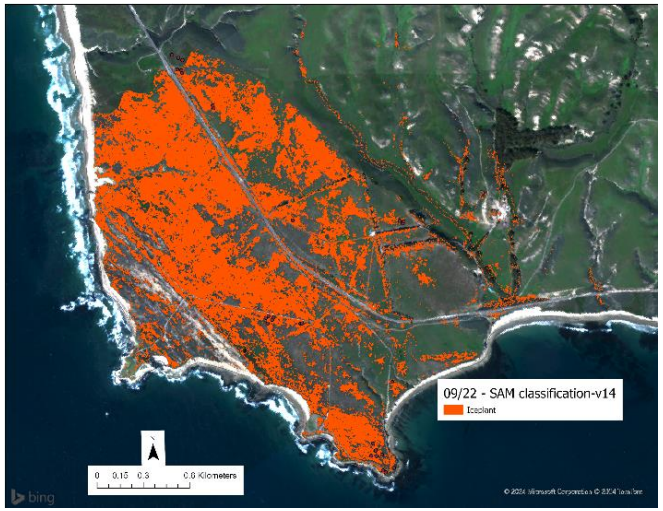


Cawse-Nicholson et al, 2025

SHIFT Ecological Conservation: Multi-temporal data to map Invasives
Bycatch from SHIFT

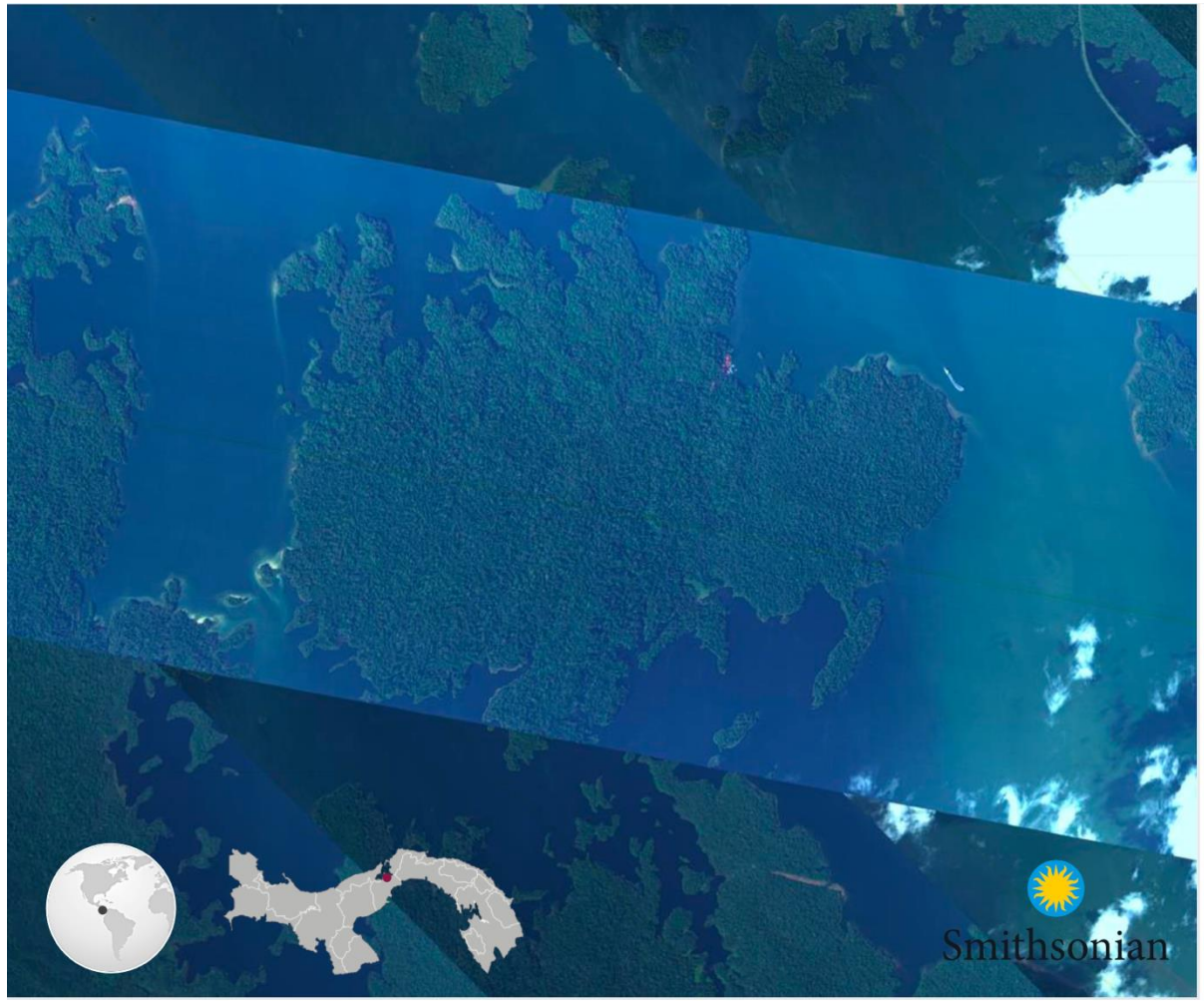


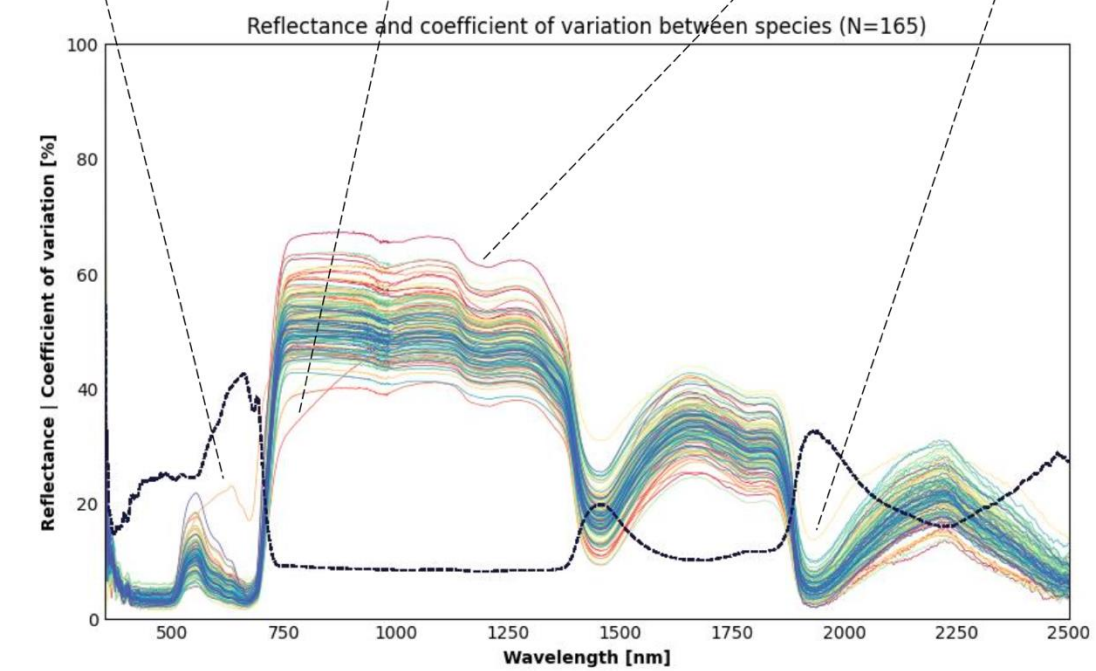
Iceplant: improved mapping through seasonal coverage



AVUELO

Airborne Validation Unified Experiment **Land to Ocean**





AVULEO *in situ* Measurements: A Sampler

Growth-Related-Traits	Defense	Other
Chlorophyll (Chl)	Lignin and cellulose	^{15}N
Nitrogen content (N)	Phenolics	Taxonomic identify
Phosphorus content	Glycosides	Barcode
Genome size	Chl/N ratio	Precise location
Water content	Water content	Flower color
Leaf thickness	Leaf thickness	Stomatal density

LPDAAC requested for these data.

SBG PRODUCTS

LEVEL 1

VNIR (VIREO)

- Radiance at Sensor

TIR ONLY

- Radiance at Sensor[1]
- Brightness temperature[2]

VSWIR ONLY

- Radiance at Sensor[7]

JOINT

LEVEL 2

VNIR (VIREO)

- Reflectance
- Vegetation indices

TIR ONLY

- Emissivity
- Land surface temperature[2]
- Water surface temperature[2]
- Cloud top temperature[2]
- Cloud Mask[9]

VSWIR ONLY

- Surface Reflectance[8]
- Cloud Mask[9]
- Surface BRDF for VSWIR[10]

JOINT

- Spatially and temporally integrated VSWIR surface reflectance and TIR land surface temperature and emissivity

LEVEL 3

TIR ONLY

- Elevated temperature features[2]
- Surface mineralogy - sm[3]
- Wildfire risk
- Vegetation growing days
- Coastal dynamics

VSWIR ONLY

- Fractional Cover[11]
- Snow and Ice fractional cover[11]
- Snow spectral and broadband albedo[11]
- Snow grain size[12]
- Minerals Identification[9]
- Mineral Spectral Abundance[11]
- Top of Canopy Leaf water content[6]
- Equivalent water thickness[13]
- Top of Canopy nitrogen[11]
- Top of Canopy Leaf mass per area[6]
- Aquatic Chlorophyll a[14]
- Phytoplankton Absorption Coefficients[15]
- Benthic Fractional Cover[11]
- Plant foliar characteristics
- Leaf water content
- Snow properties
- Aquatic biogeochemistry
- Benthic cover[3]
- Chromophoric Dissolved Organic Matter
- Aquatic Suspended Particulate Matter
- Aquatic Classification
- Water biogeophysics
- CH_4 Enhancement
- CO2 Enhancement
- Top of Canopy Chlorophyl a + b
- Top of Canopy Phenolics
- Top of Canopy Lignin
- Canopy biophysical properties
- Cyanobacteria Concentration
- Volcanic gases and aerosols

JOINT

- Spatially and temporally integrated VSWIR surface reflectance and TIR LST and emissivity
- Surface Mineral types, clays, and silicates

LEVEL 4

TIR ONLY

- Water Use Efficiency[4]
- Evaporative Stress Index
- Evapotranspiration[5]
- Volcanic activity

VSWIR ONLY

- CH_4 point sources
- CO_2 point sources

JOINT

- Snowpack conditions, temperature and change, surface water availability, snow melt
- Surface energy balance, severe weather
- Large scale Volcanic hazards (aviation, climate)
- Agricultural inputs, precision agriculture
- Forecasting Volcanic hazards
- Food security
- Forest and cropland stress
- Fire risk, prescribed fire
- Ecosystem physiology: Plant function, GPP, forest and crop condition
- Water quality
- Fire behavior
- Temperature, combustion efficiency, and CH_4 emissions from flaring operations

KEY

Funding

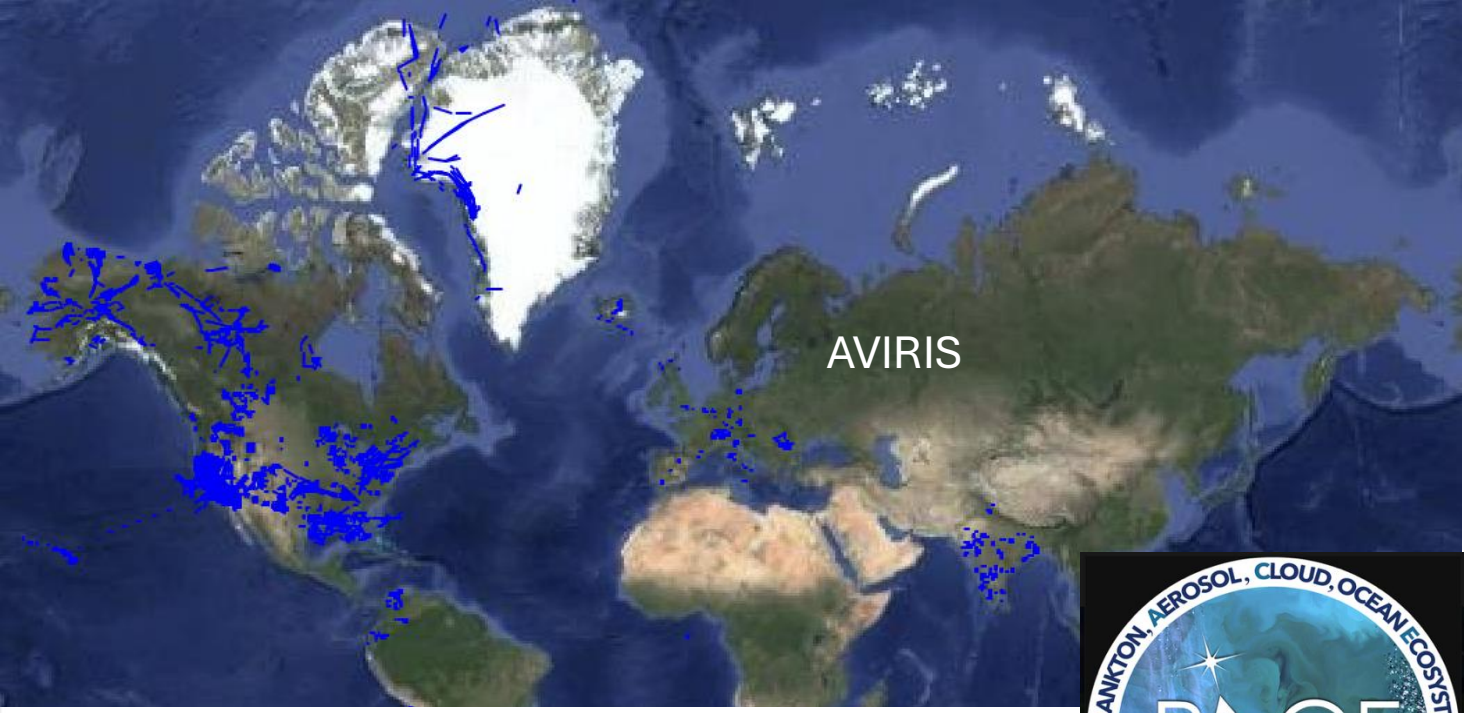
- Paid by ASI
- Paid by TIR
- Paid by VSWIR
- Paid by SBG Competed team
- Funding Undertermined

Units

1: W/sr/m2/um
2: Kelvin
3: %
4: GPP/ET
5: mm/day
6: g/m2
7: Spectral radiance
8: Hemispherical Directional Reflectance Factors
9: Categorical classification map
10: Parametric function of incidence and exitance angles
11: Unitless fractions
12: Micrometers
13: cm
14: ug L-1
15: m-1

Coverage

Global
Global vegetation
Land
Snow covered regions
Lakes, rivers and oceans
Deserts
Forested areas
Lake and dams coverage
Vegetated areas drying
Volcanoes
Mid-latitude agricultural areas



EVAPOTRANSPIRATION, WILDFIRE, GLOBAL PLANT FUNCTIONAL DIVERSITY, COMMUNITY MAPPING, BIODIVERSITY INDICES …

COMING SOON OR AT A DAAC NEAR YOU!

SGB WILL CONTINUE THIS RECORD FOR TIR/VNIR AND VSWIR AS WALL-TO-WALL TIME SERIES