ARTIFICIAL ENVIRONMENTAL INTELLIGENCE WITH HIGH FLYING, FAR WALKING AND DEEP LEARNING

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January 2018

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AM LD

Machine learning

From Wikipedia, the free encyclopedia

Applications [edit]

Applications for machine learning include:

- Automated theorem proving[38][39]
- Adaptive websites[*citation needed*]
- Affective computing
- Bioinformatics
- Brain–machine interfaces
- Cheminformatics
- Classifying DNA sequences
- Computational anatomy
- Computer Networks
- Computer vision, including object recognition
- Detecting credit-card fraud
- General game playing[40]
- Information retrieval
- Internet fraud detection[27]
- Linguistics
- Marketing
- Machine learning control
- Machine perception
- Medical diagnosis
- Economics
- Insurance
- Natural language processing
- Natural language understanding[41]
- Optimization and metaheuristic
- Online advertising
- Recommender systems
- Robot locomotion
- Search engines
- Sentiment analysis (or opinion mining)
- Sequence mining
- Software engineering
- Speech and handwriting recognition
- Financial market analysis
- Structural health monitoring
- Syntactic pattern recognition
- Time series forecasting
- User behavior analytics
- Translation[42]

Natural environmental systems are extremely complex

- Highly multidimensional
- Multiscale
- Multimodal

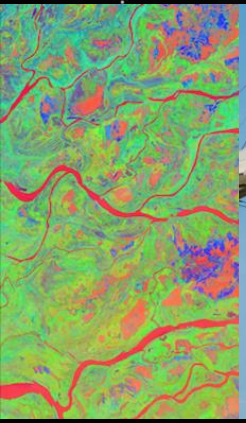
Data is irregular, fragmented and noisy

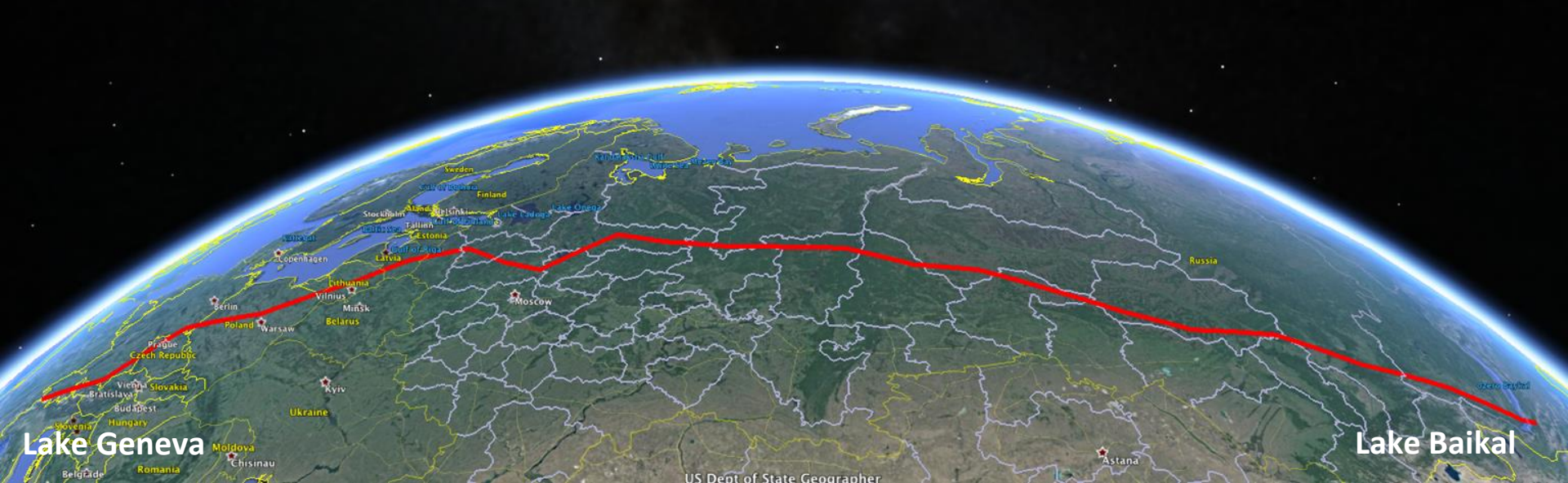
Data collection and management are labor intensive and don't scale well

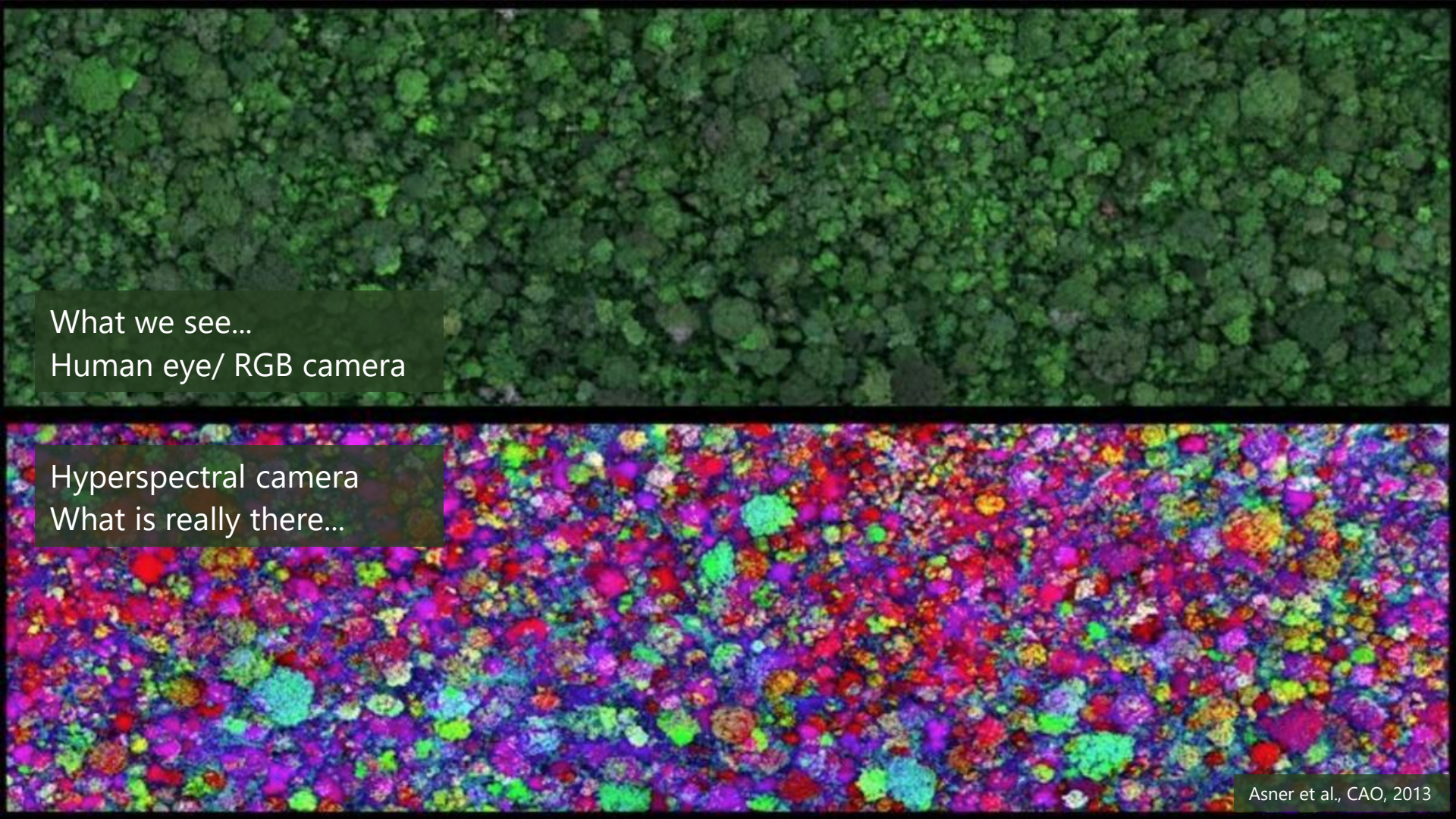

РОСМОРРЕЧФЛОТ
ВС-03-55
МУССОН


HB-IOSJ

Transeurasian expedition Leman-Baikal 2013-2015






What we see...
Human eye/ RGB camera
Hyperspectral camera
What is really there...
Asner et al., CAO, 2013

$5 TN INDUSTRY, $500 BN in PROFITS, $115 BN OPPORTUNITY

EFFICIENCY

- FUEL
- FERTILISERS
- CHEMICALS
- WATER
- MANUAL LABOR

SUSTAINABILITY

- YIELD
- QUALITY
- BUSINESS DECISIONS
- IMPACT ACROSS 10 SDGs

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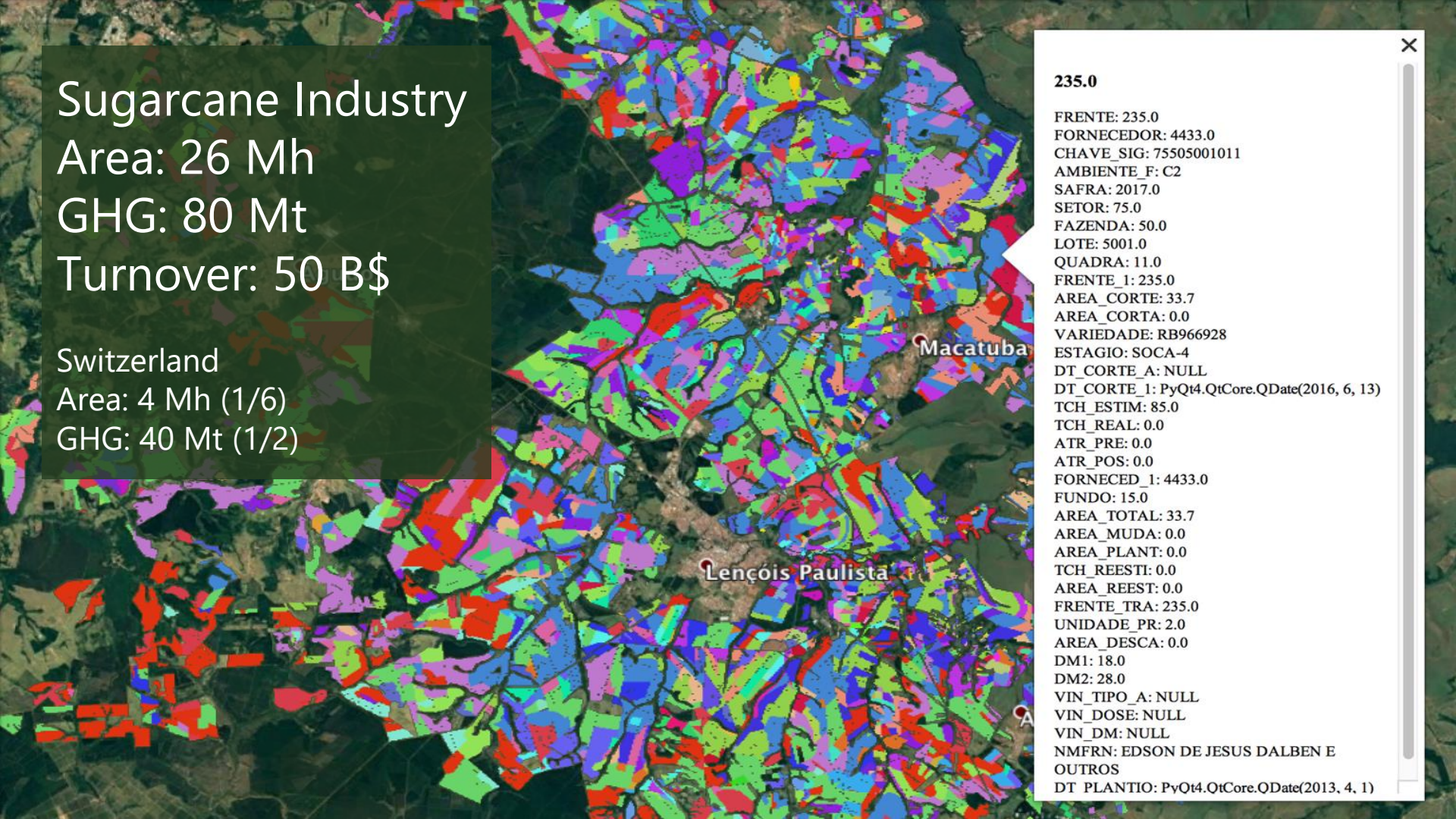
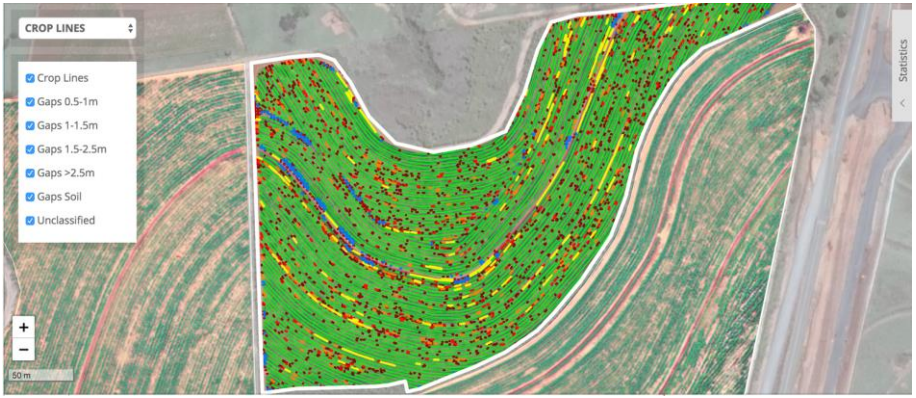
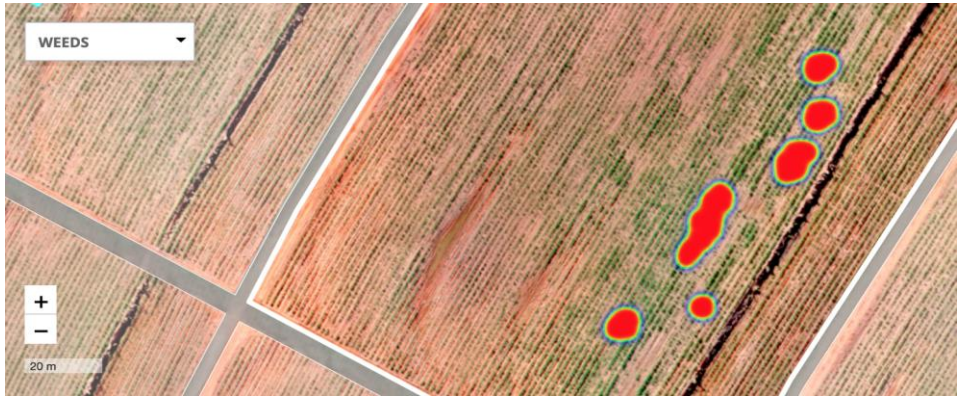

Sugarcane Industry
Area: 26 Mh
GHG: 80 Mt
Turnover: 50 B$
Switzerland
Area: 4 Mh (1/6)
GHG: 40 Mt (1/2)
Macatuba
Lençóis Paulista
235.0
FRENTE: 235.0
FORNECEDOR: 4433.0
CHAVE_SIG: 75505001011
AMBIENTE_F: C2
SAFRA: 2017.0
SETOR: 75.0
FAZENDA: 50.0
LOTE: 5001.0
QUADRA: 11.0
FRENTE_1: 235.0
AREA_CORTE: 33.7
AREA_CORTA: 0.0
VARIEDADE: RB966928
ESTAGIO: SOCA-4
DT_CORTE_A: NULL
DT_CORTE_1: PyQt4.QtCore.QDate(2016, 6, 13)
TCH_ESTIM: 85.0
TCH_REAL: 0.0
ATR_PRE: 0.0
ATR_POS: 0.0
FORNECED_1: 4433.0
FUNDO: 15.0
AREA_TOTAL: 33.7
AREA_MUDA: 0.0
AREA_PLANT: 0.0
TCH_REESTI: 0.0
AREA_REEST: 0.0
FRENTE_TRA: 235.0
UNIDADE_PR: 2.0
AREA_DESCA: 0.0
DM1: 18.0
DM2: 28.0
VIN_TIPO_A: NULL
VIN_DOSE: NULL
VIN_DM: NULL
NMFRN: EDSON DE JESUS DALBEN E OUTROS
DT_PLANTIO: PyQt4.QtCore.QDate(2013, 4, 1)

SUGARCANE, BRAZIL

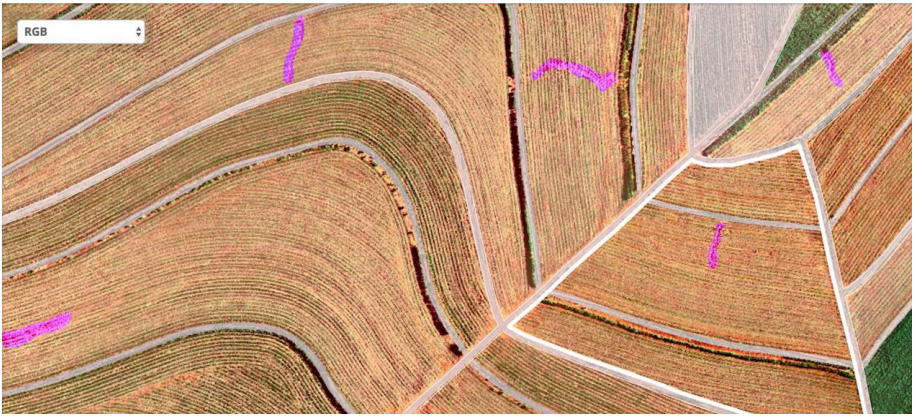
Planting failures analysis



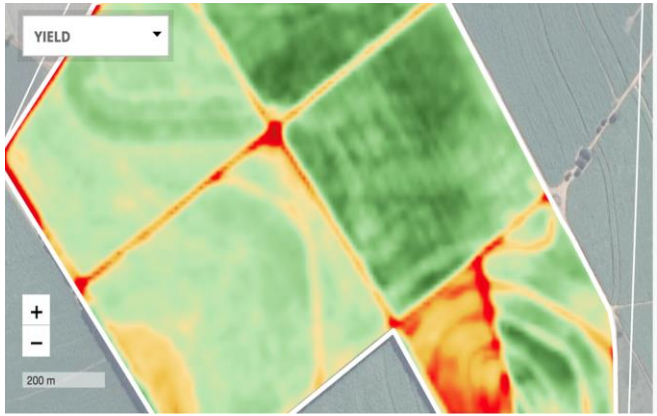
Weed detection and classification



Detection of soil erosion



Yield prediction

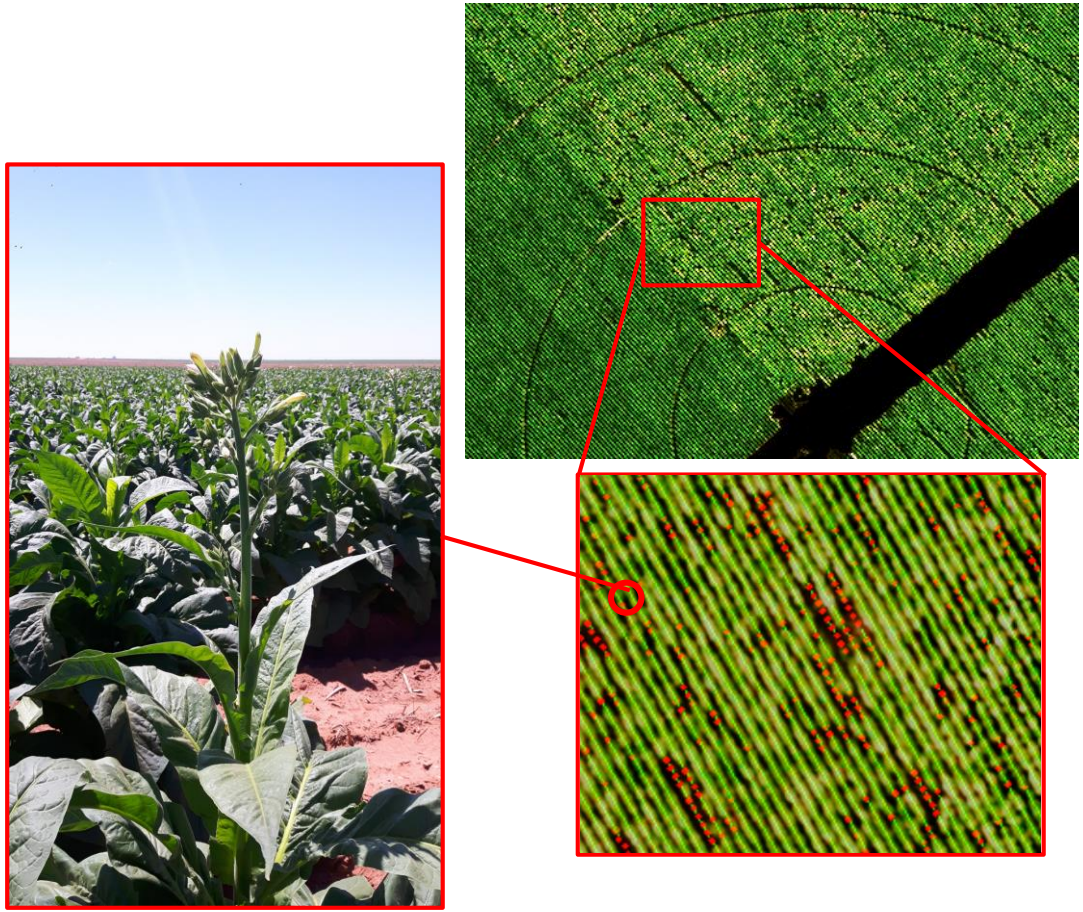


Domain	Ururai (641.6 ha)
Farm	Paraiso IV (153.0 ha)
Parcel	1073 (153.0 ha)
Crop	sugarcane cut on 2017-08-30
Variety	CTC 9001

Field Yield Statistics

soil	1.6%
> 70 t/ha	7.1%
> 80 t/ha	11.8%
> 90 t/ha	22.4%
> 100 t/ha	38.8%

TOBACCO, BRAZIL



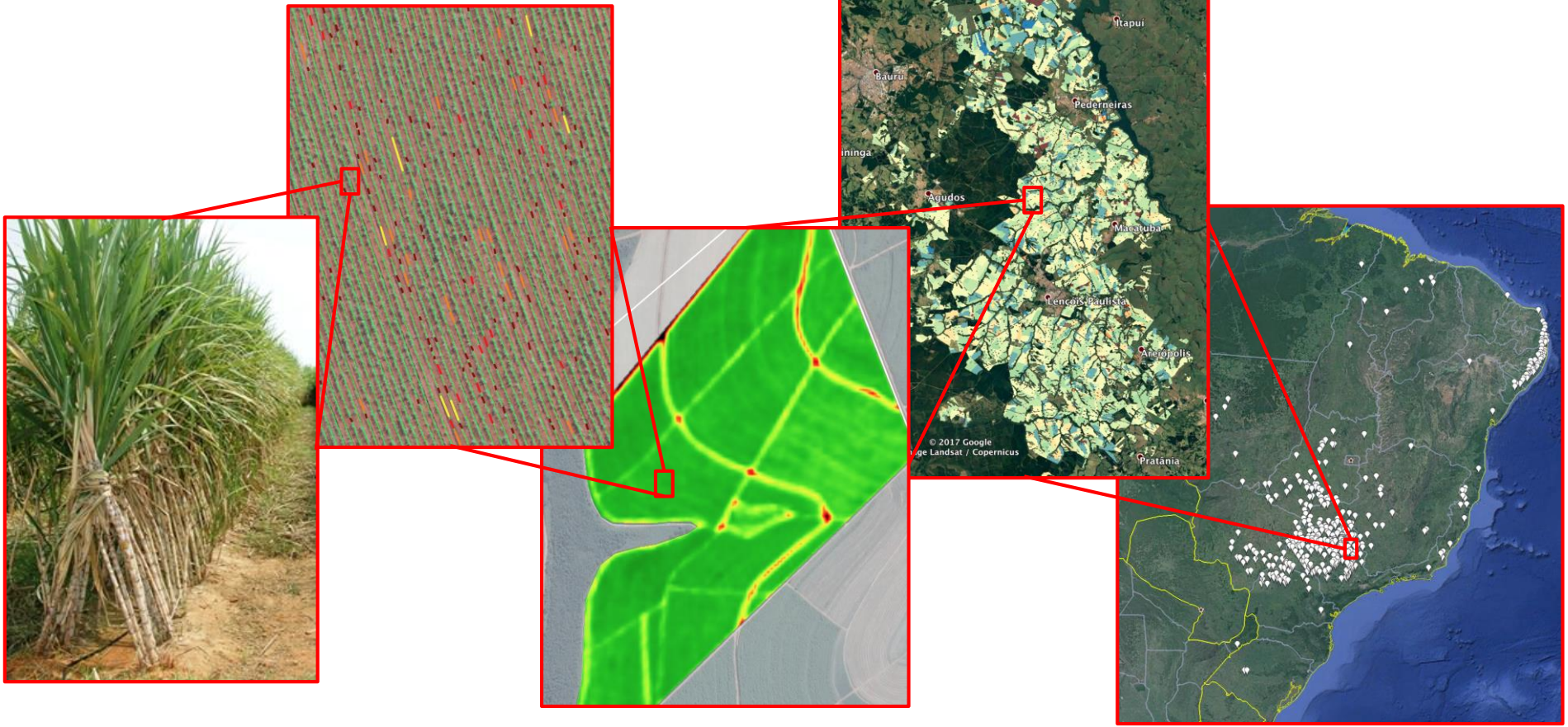
Plant level analytics:

- Tobacco virus
- Weeds
- Plant maturity
- Flowering
- Sucker removal
- Soil compaction

Large-scale analytics:

- Yield prediction
- Quality assessment
- Soil health management
- Supply chain management and sustainability

From one plant to billions...



ARTIFICIAL ENVIRONMENTAL INTELLIGENCE

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satellite observations

airborne hyperspectral imaging

weather stations

multi-scale sensor fusion

AEI engine

monitoring, heuristics and manual tagging

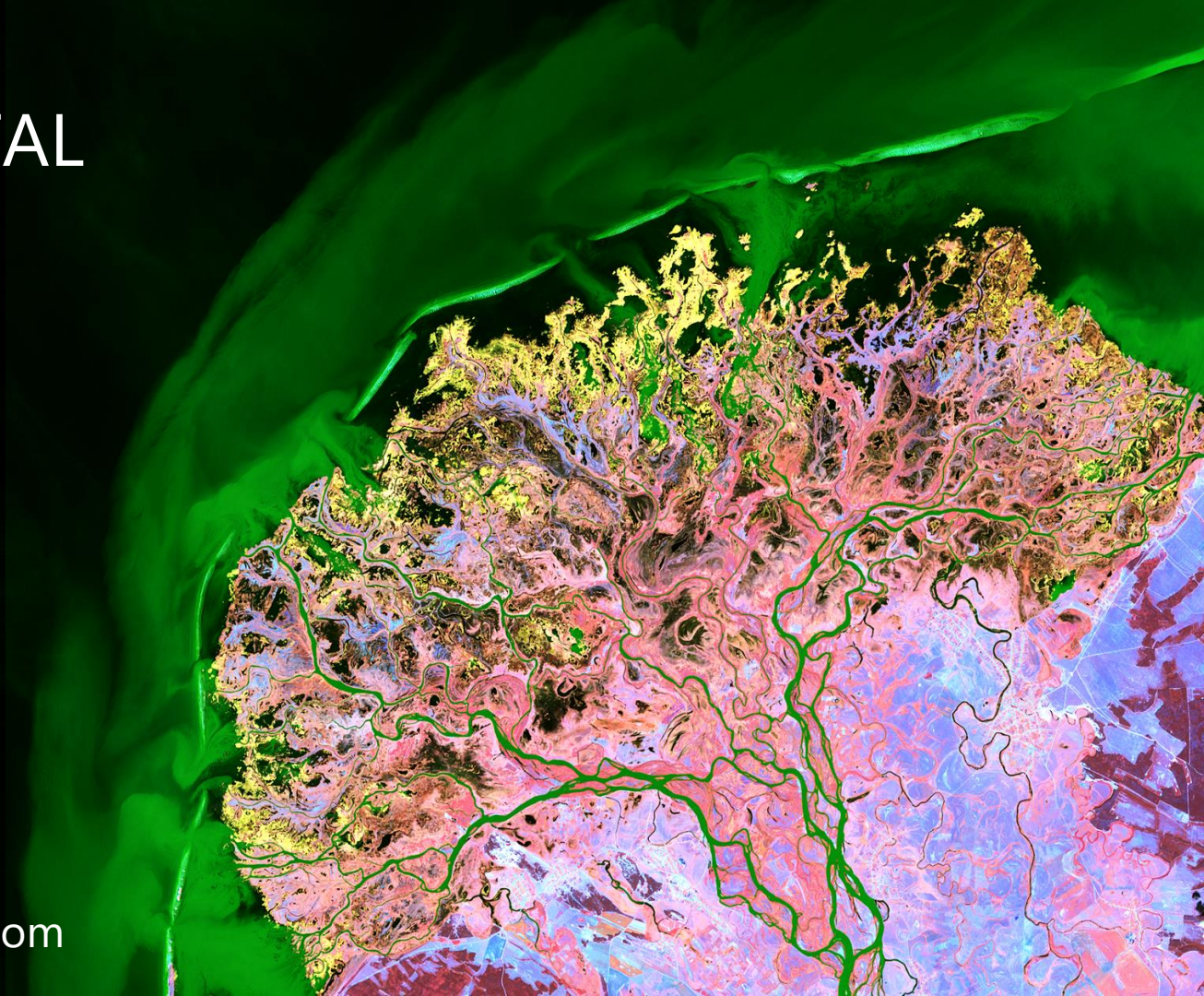
field robotics

agricultural machinery

decision support and automation

ENVIRONMENTAL INTELLIGENCE

- COMPELLING
- CHALLENGING
- PROFOUND



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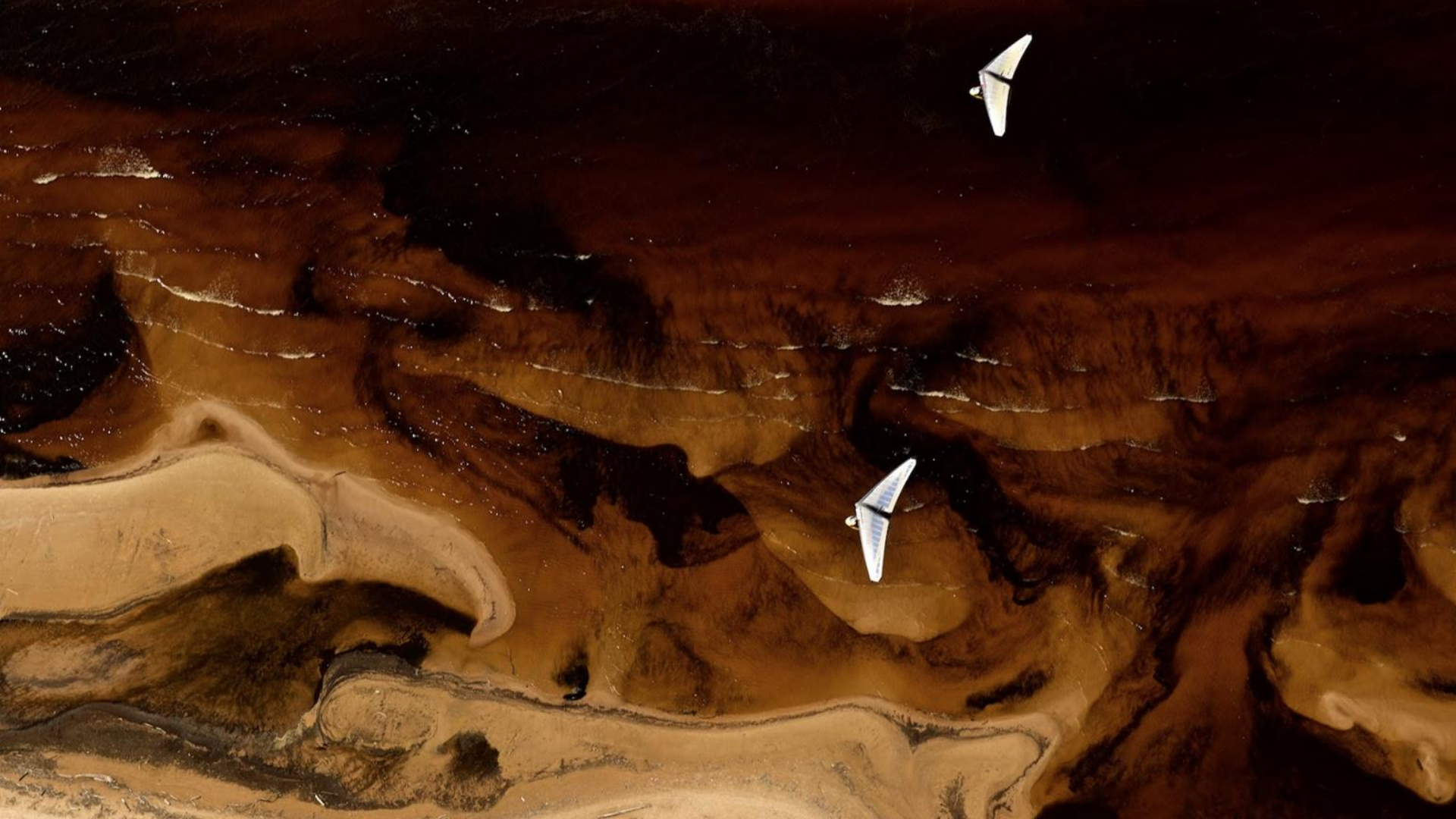
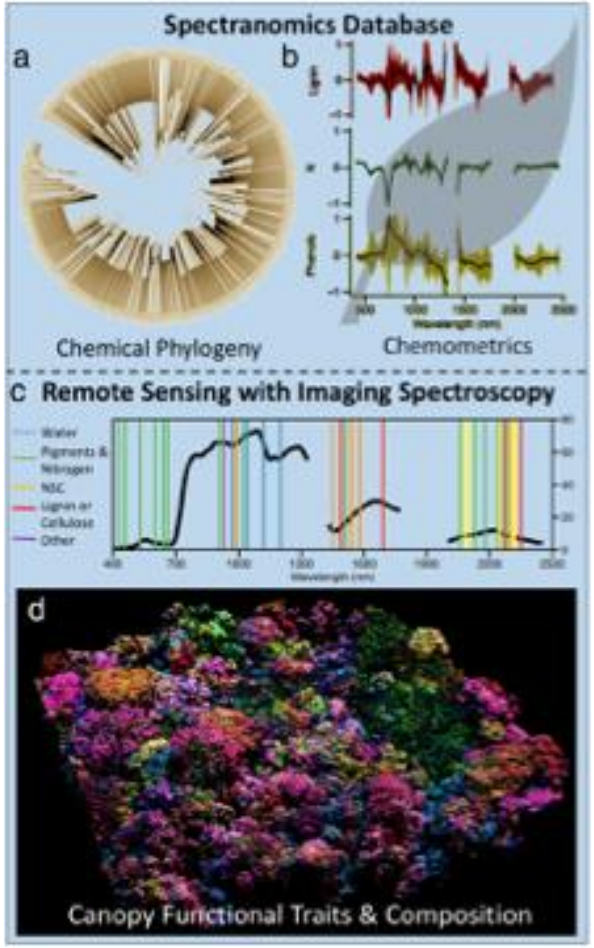
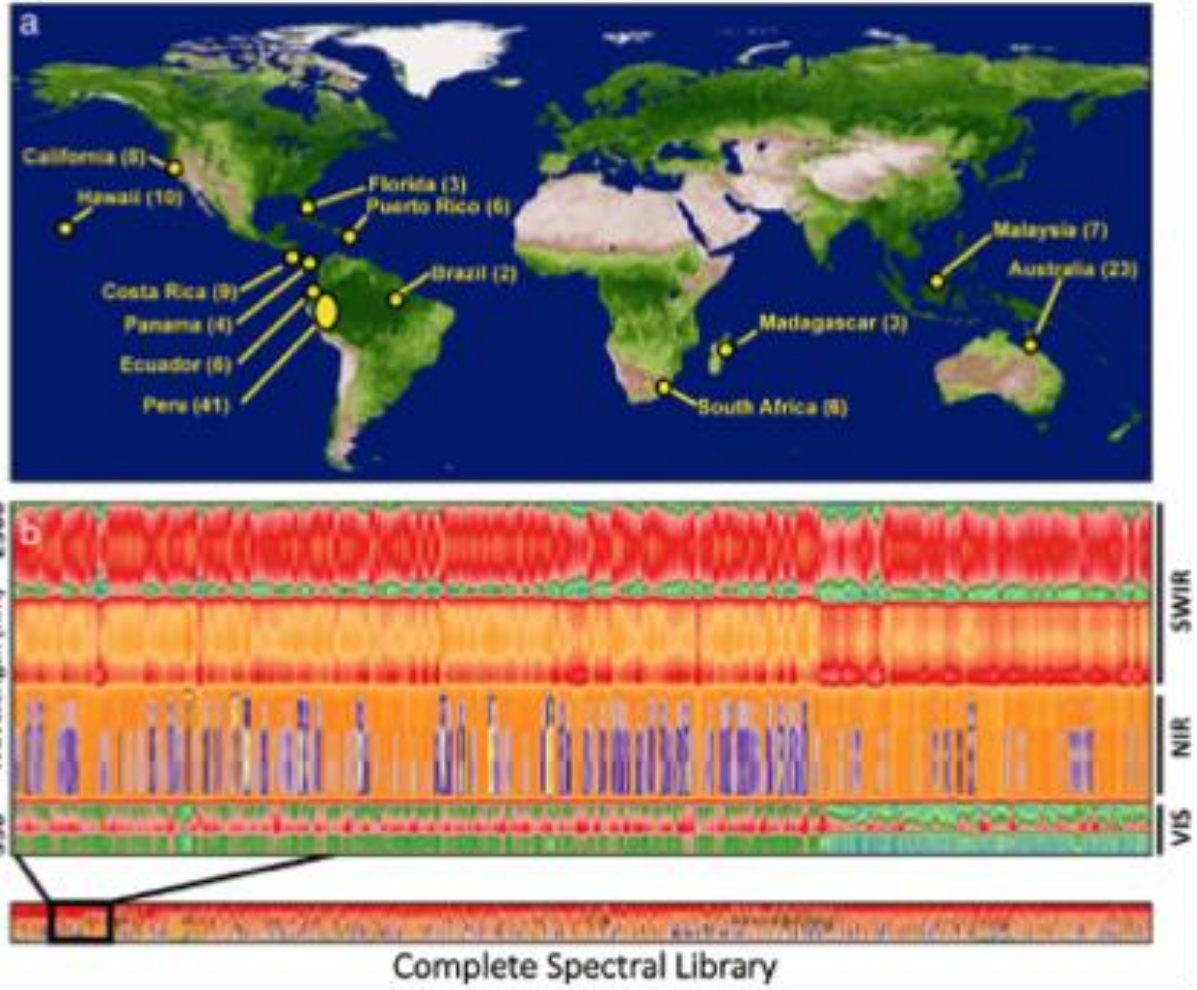
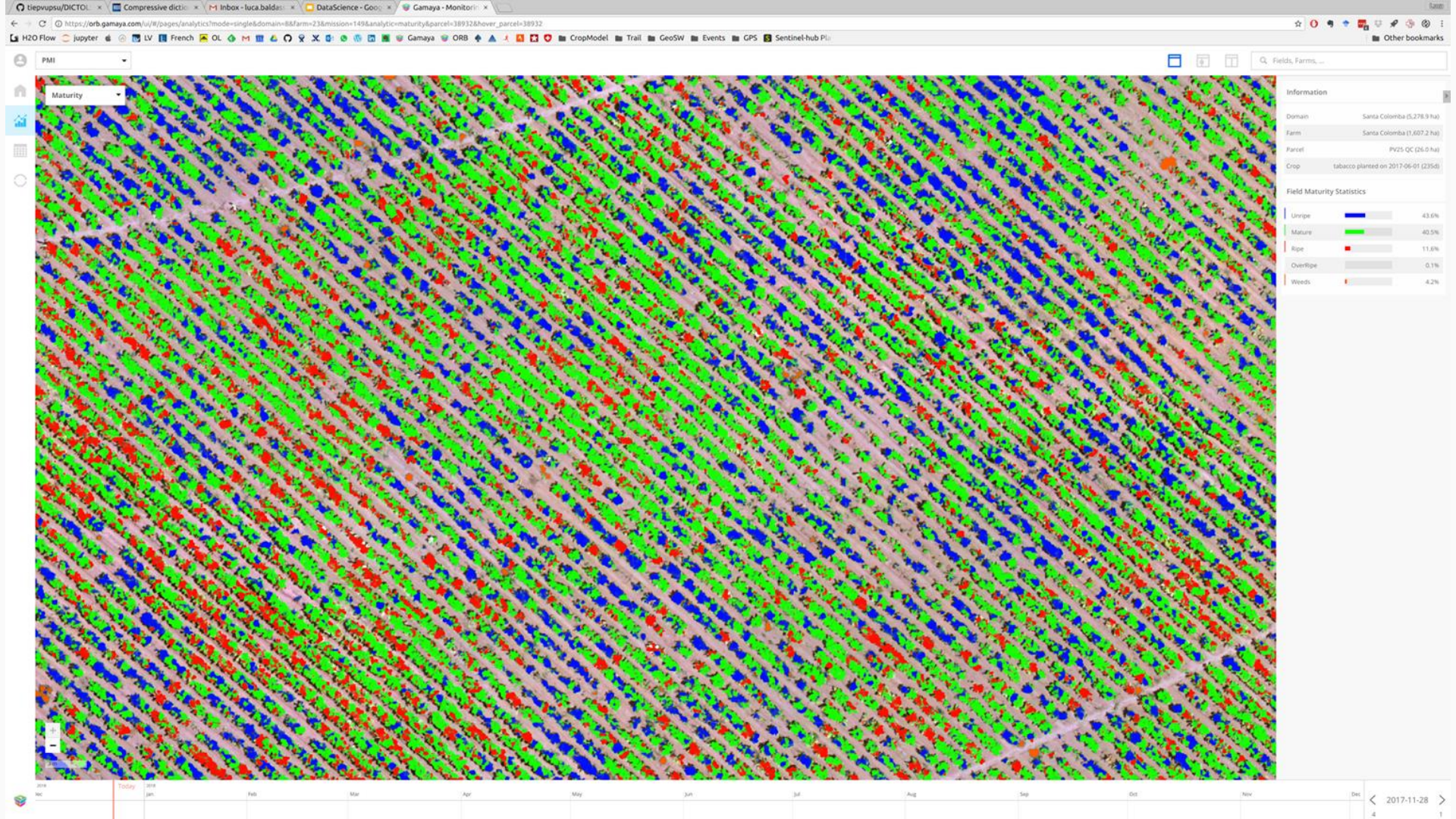



Spectranomics Database
a
b
Chemical Phylogeny
Chemometrics
c Remote Sensing with Imaging Spectroscopy
Water
Pigments & Nitrogen
NSC
Lignin or Cellulose
Other
d
Canopy Functional Traits & Composition


a
California (8)
Hawaii (10)
Florida (3)
Puerto Rico (6)
Costa Rica (9)
Panama (4)
Ecuador (6)
Peru (41)
Brazil (2)
Malaysia (7)
Australia (23)
Madagascar (3)
South Africa (8)
b
2500
Wavelength (nm)
350
SWIR
NIR
VIS
Complete Spectral Library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Compressive dictio
Inbox - luca.baldas
DataScience - Goog
Gamaya - Monitorin
https://orb.gamaya.com/ui/#/pages/analytics?mode=single&domain=8&farm=23&mission=149&analytic=maturity&parcel=38932&hover_parcel=38932
H2O Flow
jupyter
LV
French
OL
Gamaya
ORB
CropModel
Trail
GeoSW
Events
GPS
Sentinel-hub Pla
Other bookmarks
PMI
Fields, Farms, ...
Maturity
Information
Domain
Santa Colomba (5,278.9 ha)
Farm
Santa Colomba (1,607.2 ha)
Parcel
PV25 QC (26.0 ha)
Crop
tabacco planted on 2017-06-01 (235d)
Field Maturity Statistics
Unripe
43.6%
Mature
40.5%
Ripe
11.6%
OverRipe
0.1%
Weeds
4.2%
Today
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2017-11-28