The added value of Planet Fusion for existing EO products

Results from a Joint Technical Project

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Global Connection

Outline

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  - Technology
  - EO Products
  - Applications
- **Joint Tech Project**
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  - Methodology
  - Results
  - Use Cases
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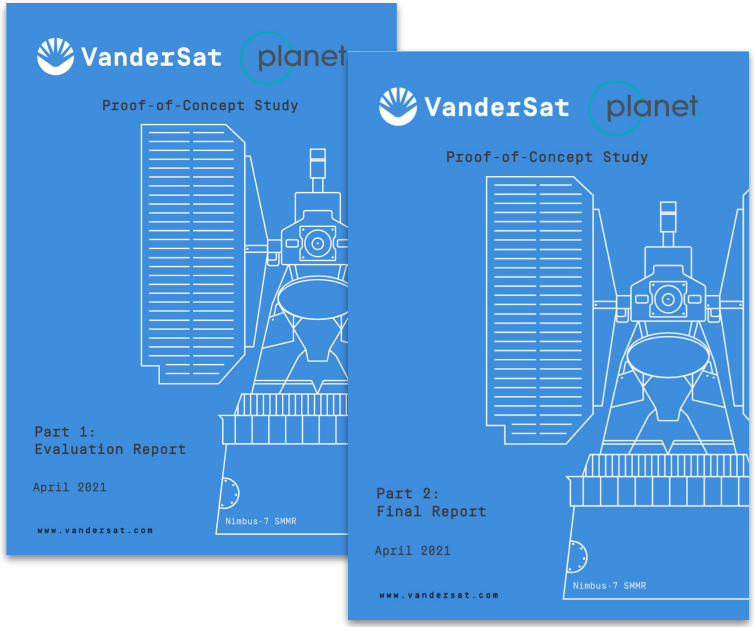

Background VanderSat

Company

a provider of global satellite-observed data, products and services over land

- EO data lab + Service
- HQ in Haarlem, NL
- ~35 fte
- Strong scientific roots
- Experts in Microwave RS
- Customer focus
  - Agriculture
  - Insurance and Banking
  - Water and Climate

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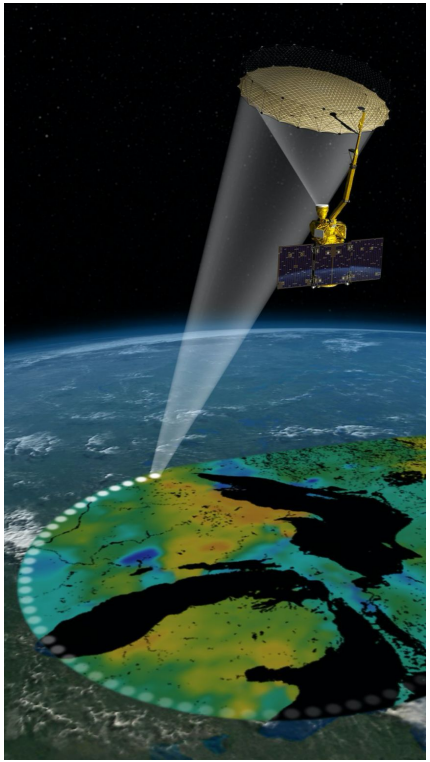
Technology

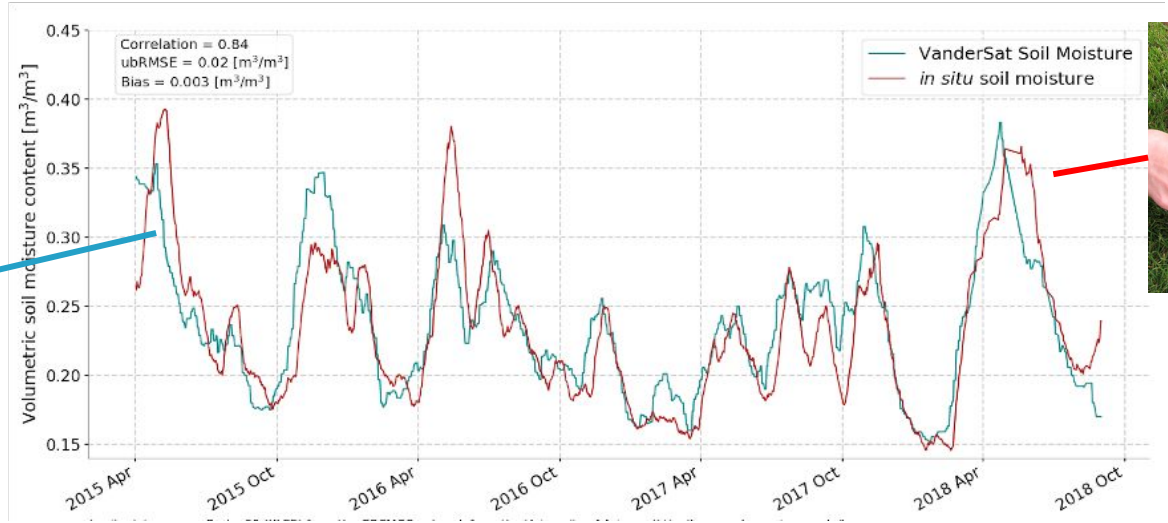
- Earth is emitting EM energy in the microwave domain
- Energy is measured with satellite radiometers
- Amount of energy emitted from the land surface is mainly a function of
  - Soil Moisture
  - Soil / Vegetation Temperature
  - Vegetation Water Content
- Vandersat developed scientific algorithms to extract this information from microwave satellite data



NASA-SMAP

Background VanderSat

Technology



Soil Moisture Validation, site in Kenya (0.2825,36.8669)

In situ ground-sensor from COSMOS network, probe 50 (KLEE)
http://cosmos.hwr.arizona.edu/Probes/StationDat/055/index.php

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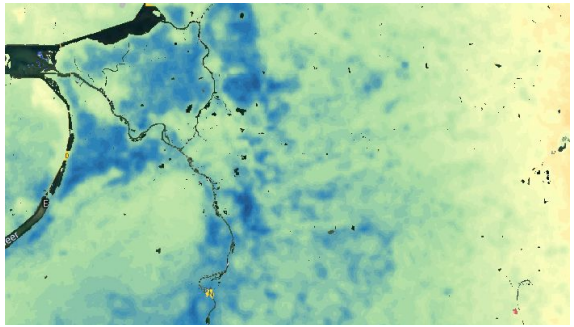
Background VanderSat

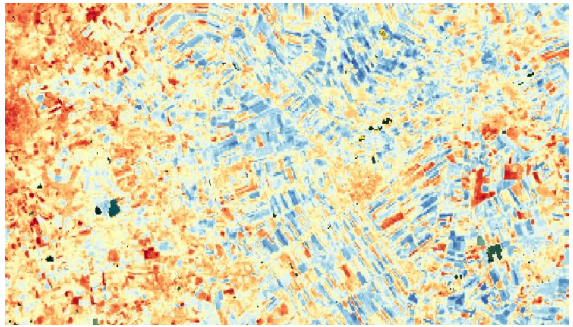
Products

Soil Moisture



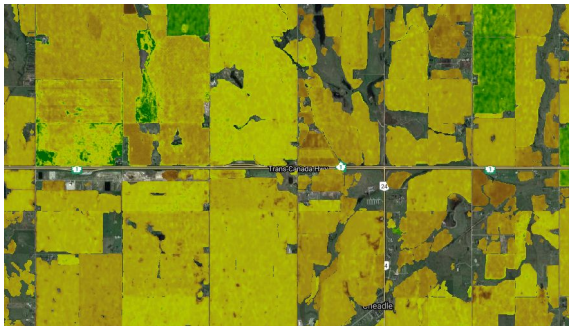
- 100 m (9km and 25km*)
- Near Real Time
- 20+year archive
- Daily
- Global
- Accuracy ~0.04 m3/m3

Soil Temperature



- 100 m
- Near Real Time (2021)
- 20+year archive
- Daily
- Global
- Accuracy ~2.5 K

Biomass (proxy)



- 10 m
- Near Real Time
- 4+year archive
- Daily
- Global (2022)
- Index [0-1]

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*NB the 9 and 25 km soil moisture are our global public available dataset (available @ the different data portals).

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Background VanderSat

Applications

- **Insurance & Banking**
  - Drought Insurance
  - Credit Scoring
- **Agriculture**
  - Agri Practices
  - Commodity trading
- **Water and Climate**
  - Water Management
  - Climate Data Records
  - Interventions

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Joint Tech Project

Goals

March-April 2021: 8 Week Joint Tech Project VanderSat-Planet

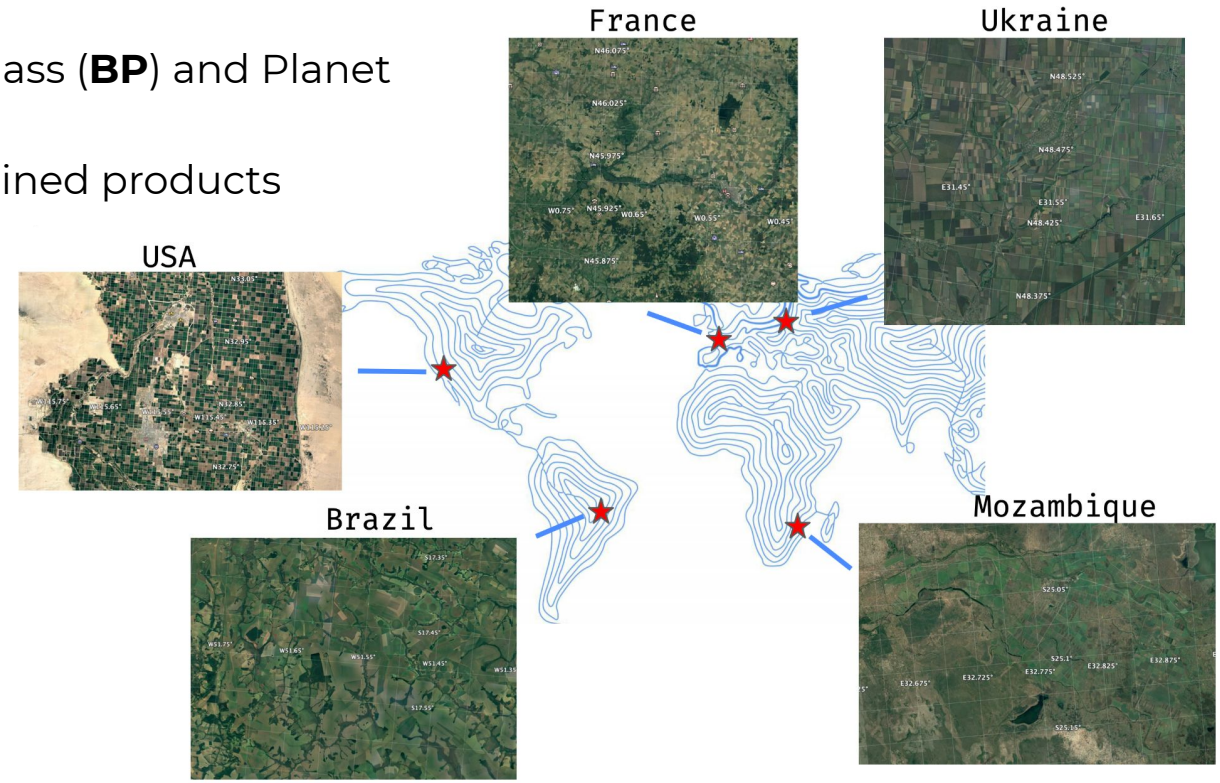
To explore the potential added value of joint services:

- Can the VanderSat biomass product and the Planet Monitoring Fusion NDVI complement each other and what improvements can we expect?
- When Planet (Fusion) and VanderSat technologies are combined, what are the main benefits?

Joint Tech Project

Methodology

- Selection of 5 Regions
- Evaluate VanderSat Biomass (**BP**) and Planet Fusion NDVI (**PF-NDVI**)
- Create and analyse combined products



Data used (2018-2020)

- Planet Fusion NDVI
- VanderSat Products
  - BP, SM, LST
- Ancillary Agri info

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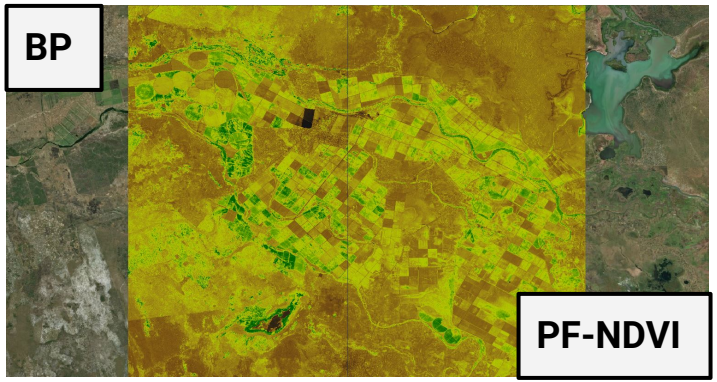
Joint Tech Project

Methodology

Daily Planet Monitoring Fusion surface reflectance data of 5 ROIs are used

- Based on CESTEM method (Houborg and McCabe, 2018)
- NDVI values were calculated (**PF-NDVI**)
- Quality Flags were used to obtain the highest quality values



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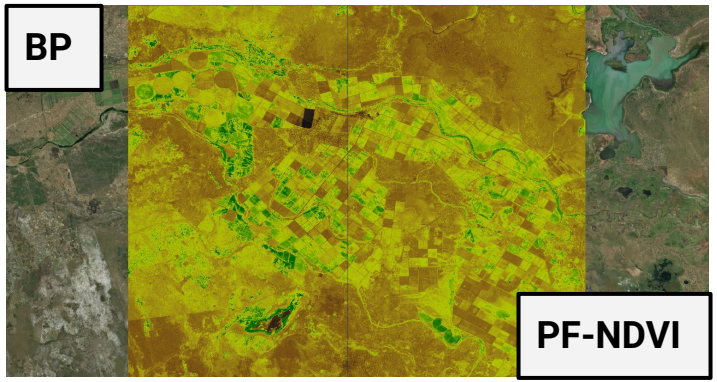
Methodology

VanderSat Biomass (**BP**) is based on spatiotemporal fusion of satellite signals from

- Optical Sentinel-2 NDVI
  - Field Segmentation+in field variation
- Active Radar backscatter from Sentinel 1 (both VH and VV)

For the new Biomass (**BP+**) the Sentinel-2 NDVI is replaced with Planet Fusion NDVI



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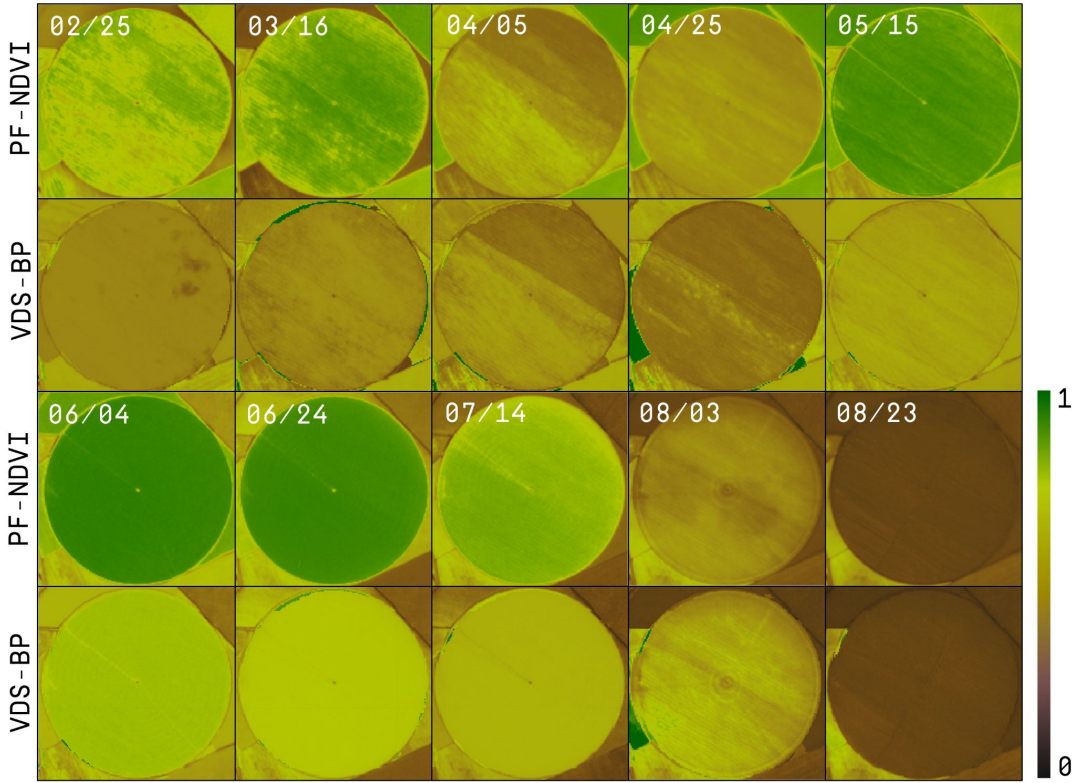
Results



An Agricultural Pivot in Brazil

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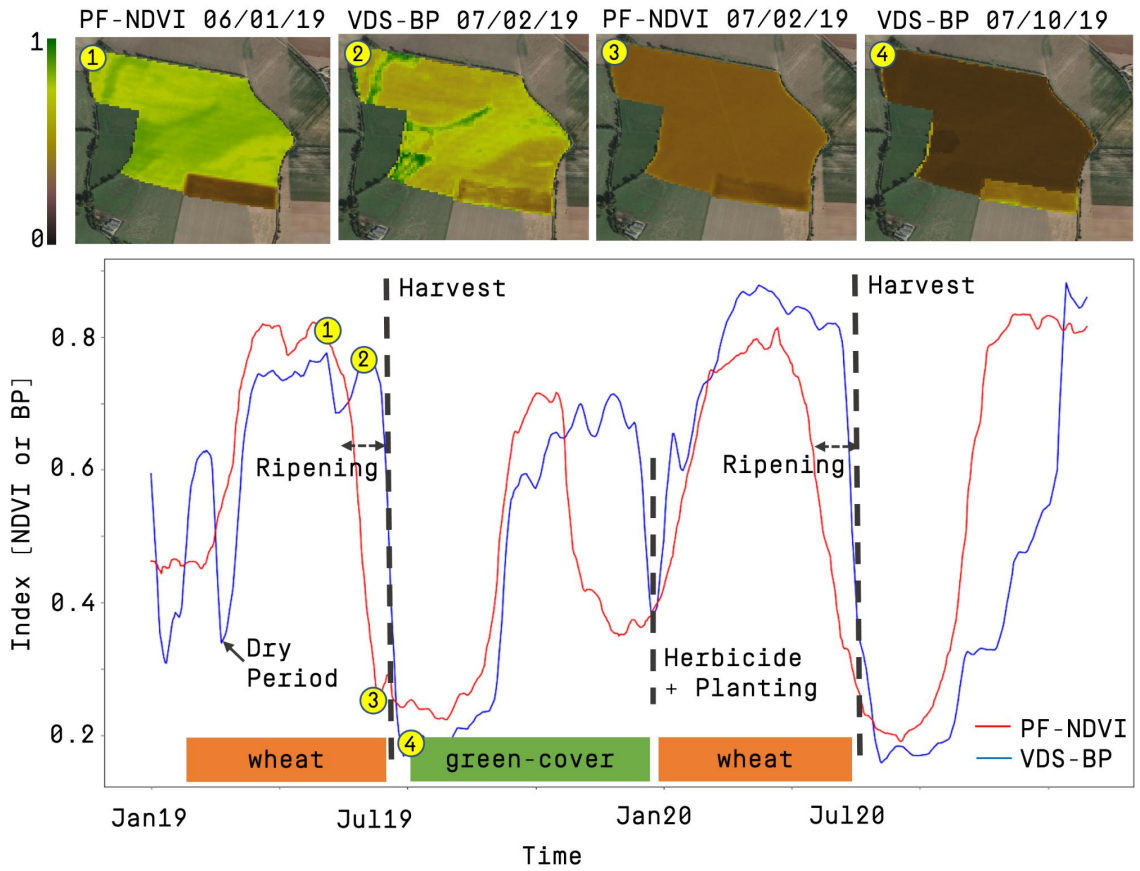
Results



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Results

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Results

When Sentinel-2 NDVI is replaced with PF-NDVI as input of the segmentation:

- Ability to capture small fields/objects
- Straighter lines (less mixed pixels)
- Less artefacts

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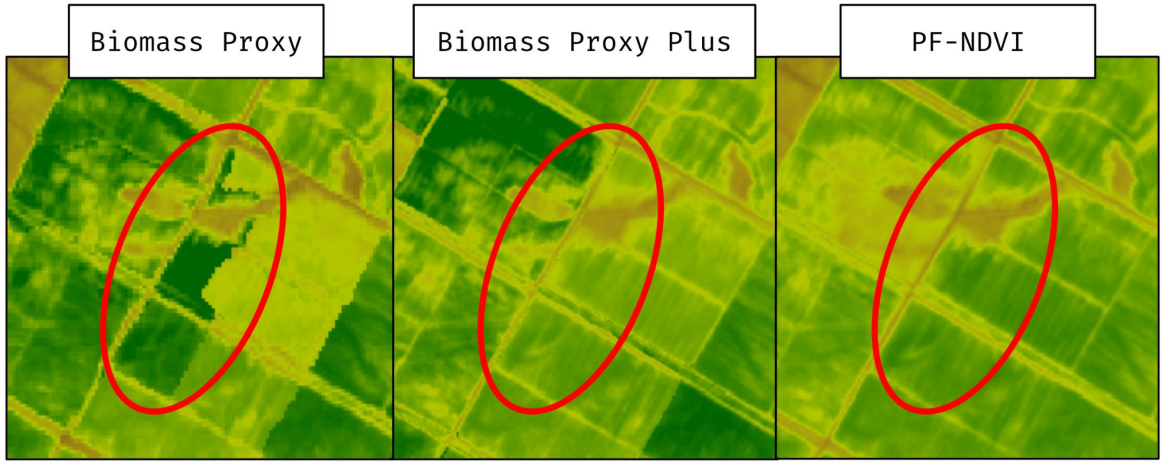
Results

- BP+ give a better spatial representation
- You go from 10 m to 3 m resolution.
- The replacement of S2 input to Planet Data for the BP+ does not affect the temporal behavior of the signal.



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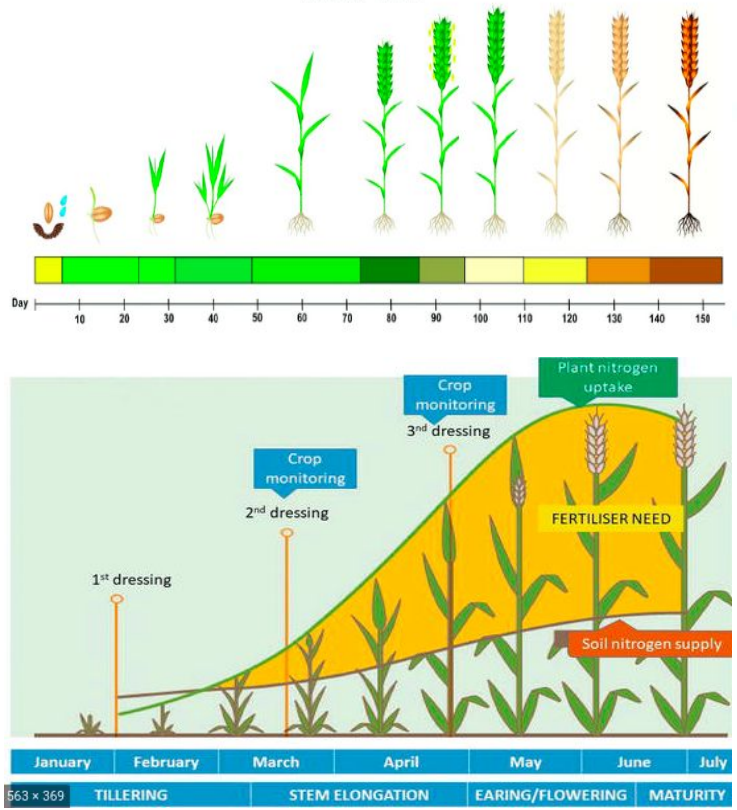
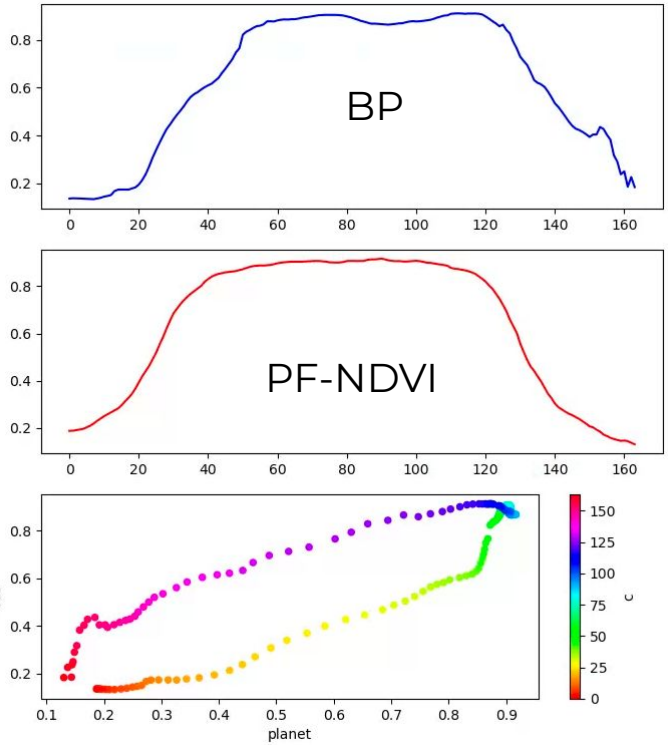
Use Cases



Linking “circle of life” to phenology for Durum Wheat (average of 9 fields)



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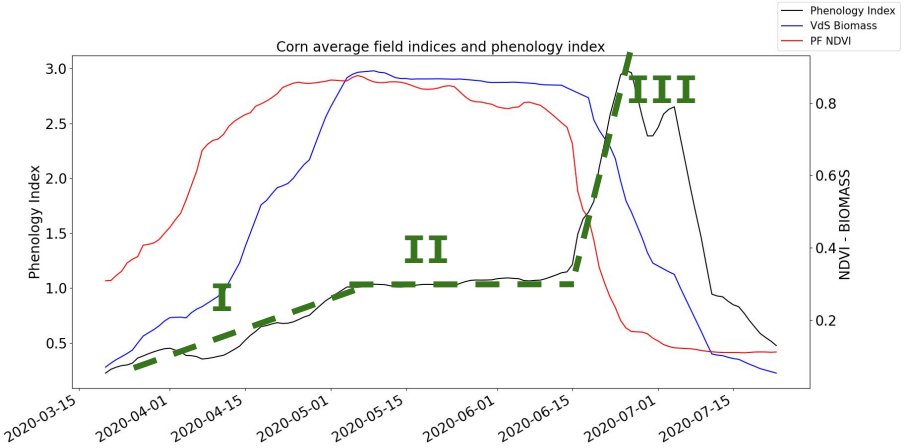
Use Cases

The combination of BP with NDVI can determine phenology stages

Why is this important?

It is directly linked to agricultural practices (e.g. nitrogen management)

NB. This can already be done with the existing VanderSat BP and Planet NDVI



I = Tillering, II = Flowering, III = Maturation

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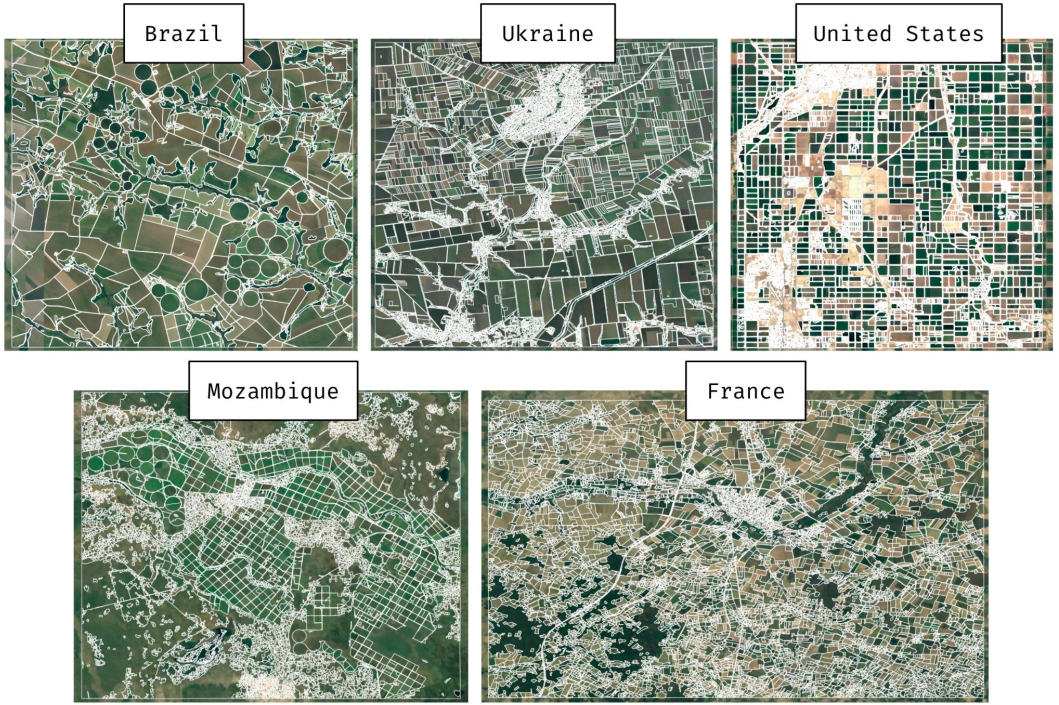
Use Cases

- Field segmentation using our delineation approach with Planet data is more realistic.
- Affects the spatial quality of the Biomass product, and...



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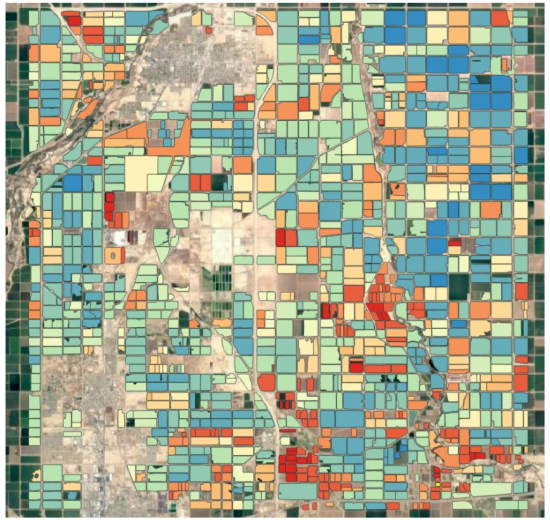
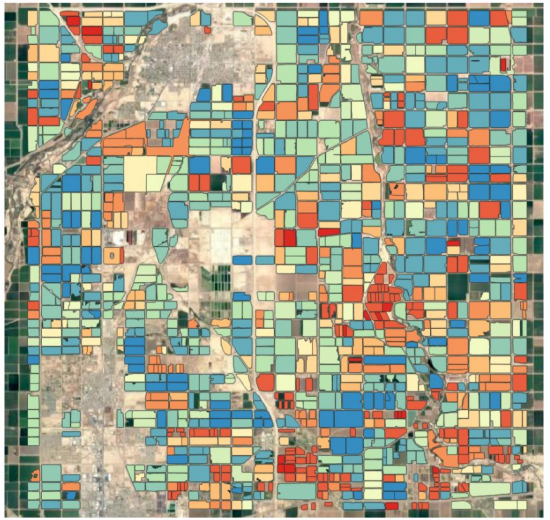
Use Cases

Improves our object oriented downscaling approach on our core products (land surface temperature and soil moisture) towards field level information

Landsat 8 TIR based LST (11am)



VDS based LST (1.30am)



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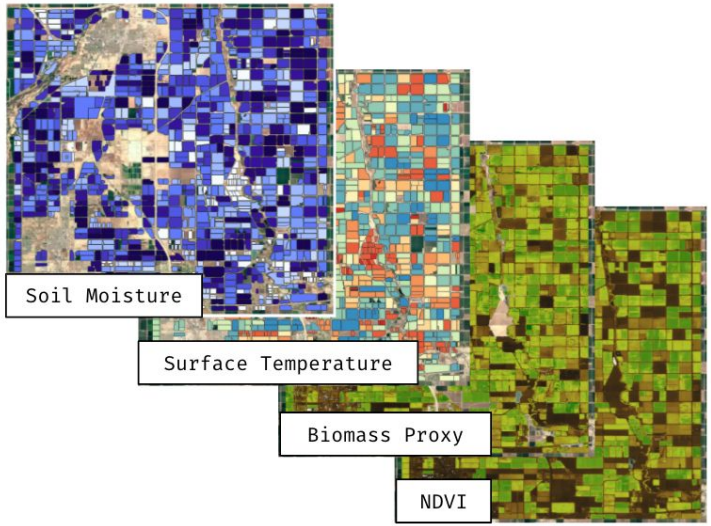
Use Cases

Delivery of these multilayer building blocks opens numerous opportunities related to:

- Water Accounting/Irrigation
- Nitrogen Management
- Carbon Sequestration
- Field Scouting
- Yield Forecasting
- Parametric Insurance
- Credit Scoring
- Etc.



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Overall Conclusions

- VanderSat Biomass (**BP**) and Planet NDVI (**PF-NDVI**) give different insights
- Both have a strong connection to Ag
- **BP** and **PF-NDVI** can be complementary
  - Yield Prediction
  - Determination of Phenology Stages
- With **PF-NDVI** the **BP** can be improved
  - Better spatial representation of biomass
- With Planet data we can develop multilayer building blocks
- Multilayer building blocks could form the basis for numerous applications

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