Application Specific Constellations – The case for Agriculture

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nSight-1
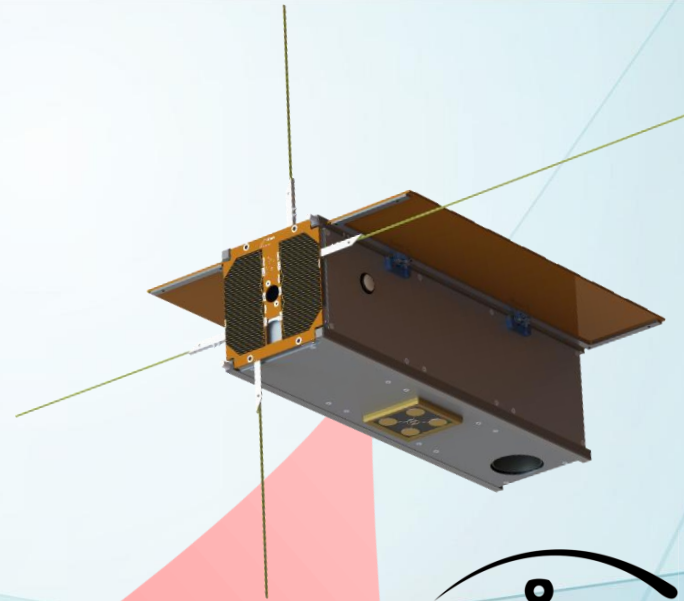
nSight- 2

- JPG 503.7KB (4:4:4) (Within two overpasses)
- RAW 2200 KB (Within 5 days)

Applications NDVI

| Technical Requirement Specifications	Spatial	Spectral	Temporal	
A. ARM 1 requirement	3-5m	multi-spectral	Once per two days(land use), monthly (agriculture)	
B. ARM 2 requirement	20m-30m, swath 600km	multi-spectral	Daily (or twice per day if possible)	
C. ARM 3 requirement	0.5m -0.75m	Pan, RGB	Once per annum all areas of interest	
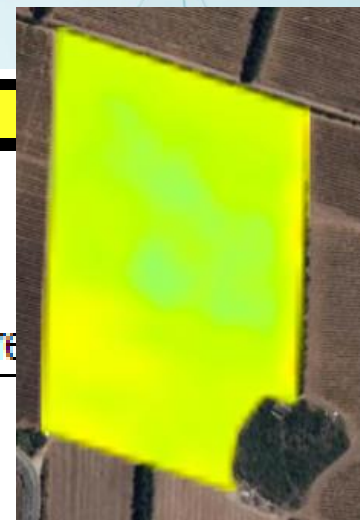
10m GSD - MS
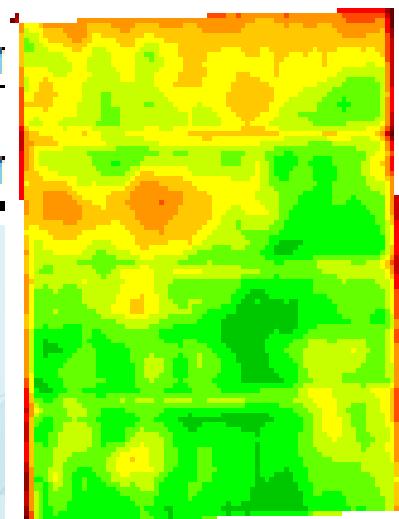
3m-5m GSD - MS

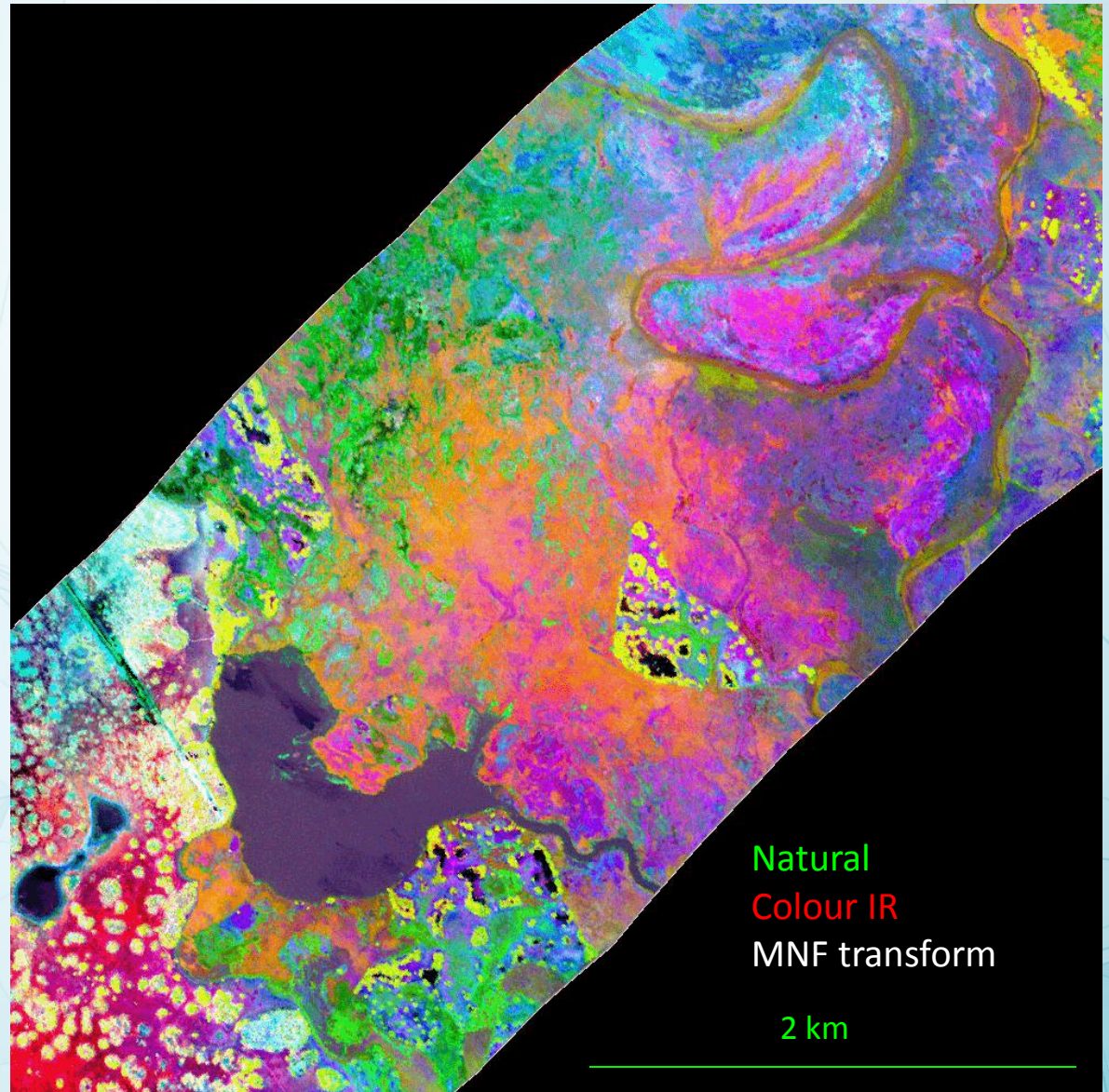4 hectar area
See what you can see
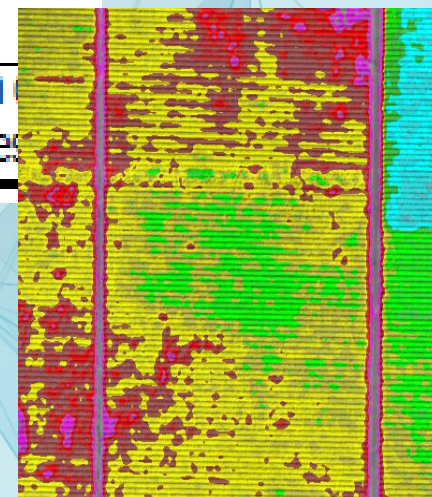
1m GSD

Example:

RGB
vs.
Colour-IR
vs.
Hyperspectral
(false colour)

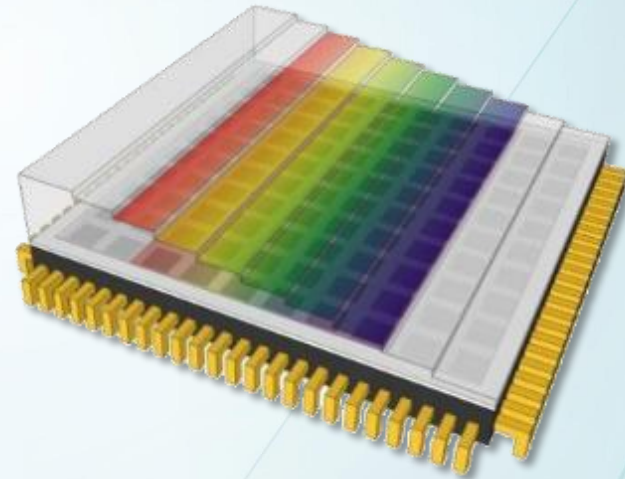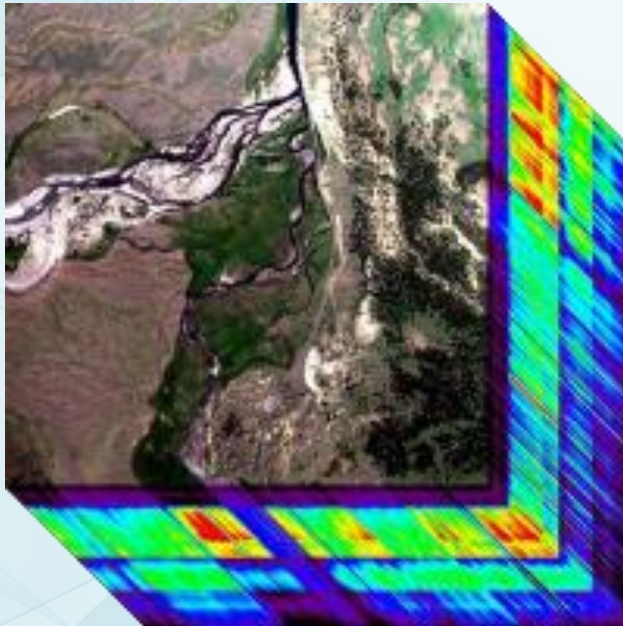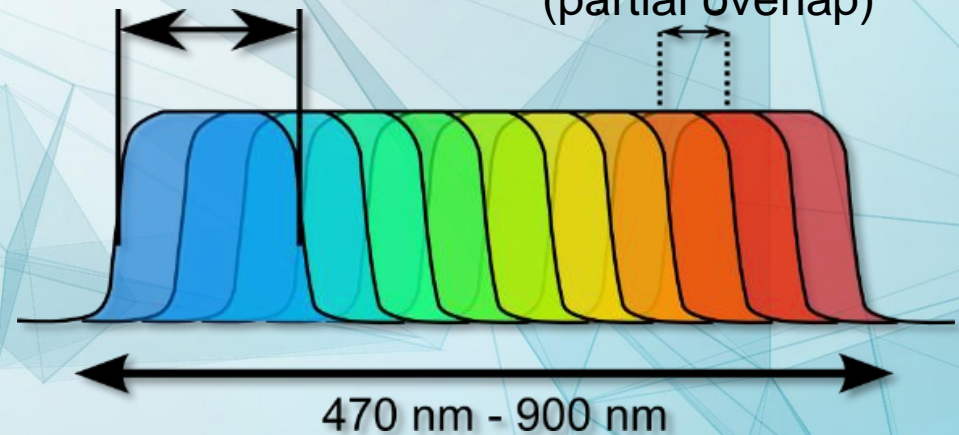Natural
Colour IR
MNF transform

2 km

Hyperspectral bands
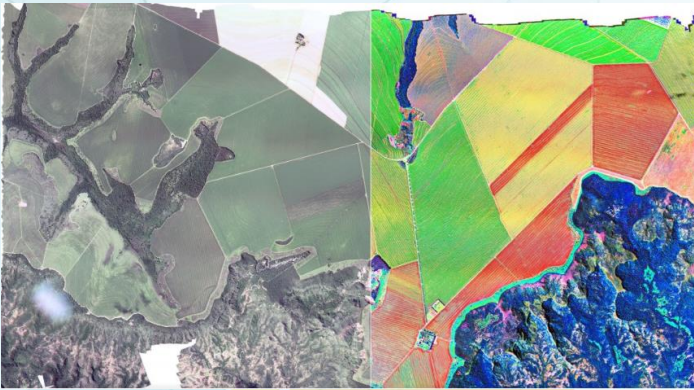
- VIS-NIR

- Up to 148 bands

Narrow spectral bands

Very narrow spacing (partial overlap)

470 nm - 900 nm

Why Hyperspectral ?

Better decisions better results

Hyperspectral bands focused on agricultural application needs

Not just WHERE But What
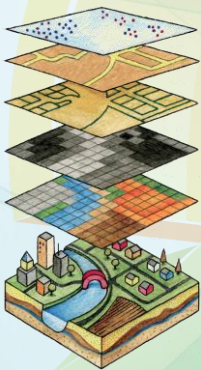
Multiple layers and Access, Support New discoveries Better answers
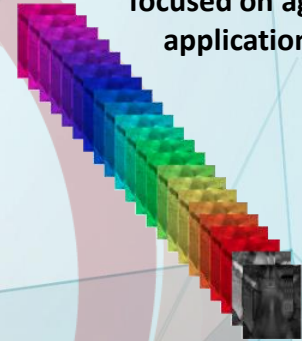
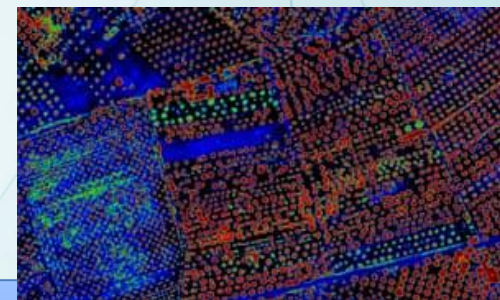**Crop specific agricultural solutions**
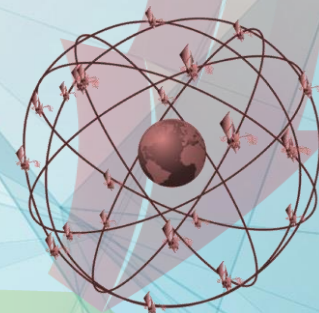
Daily Revisit Constellation

Some Agriculture Benefits

Hyperspectral imaging is widely used iin vegetation, climate changes, and desert studies

Hyperspectral data allows identification of processes based on its spectral footprint each pixel

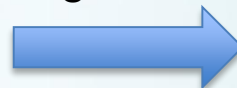| Information needs for optimal production	RGB & Multispectral	Hyperspectral
- DETECTION DISEASES AND PESTS	no	yes
- DETECTION OF WEEDS	Limited unclassified	yes
- DETECTION OF PK DEFICIENCY	no	yes
- DETECTION OF NITROGEN	limited	yes
- YIELD PREDICTION	limited	yes
- DETECTION OF CROP MATURITY	no	yes
- GENERAL CROP HEALTH (NDVI)	yes	yes

- Miniturisation
- Standardisation
- Larger volume manufacturing

- Storage unlimited
- Processing unlimited
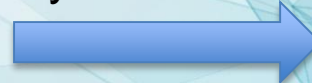- Other Impacts:
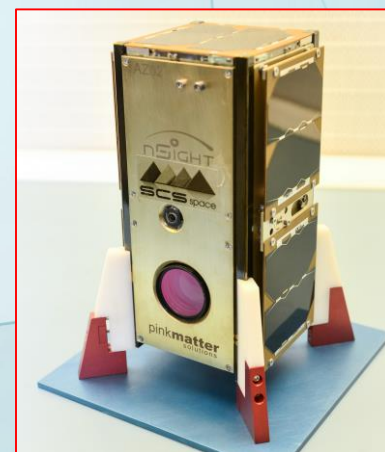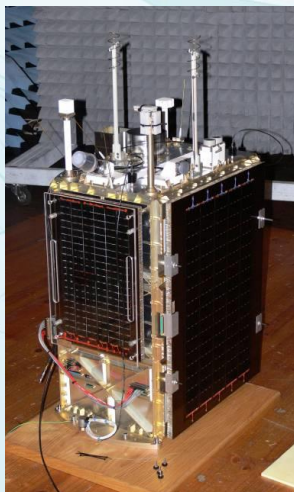 – New Business Models

Sunsat

64 kg – 12m GSD

nSight 1
4.5 kg – 30m GSD

Launch Delay
3.5 years

Sumbandilasat

Launch Delay
3 years

>Twelve Launch Opportunities in Next 12 months
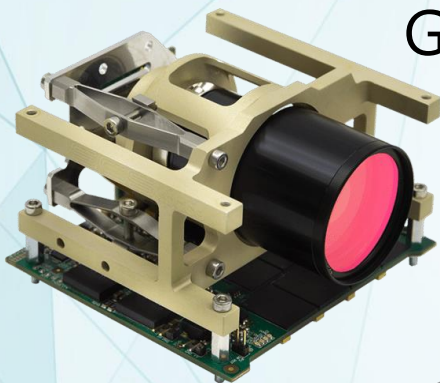
Gecko
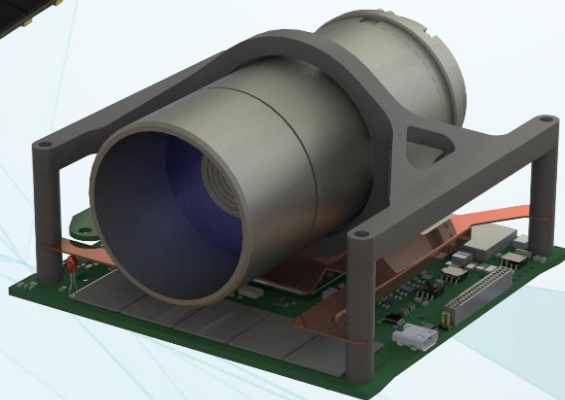
nSight-1
Payload

Mantis

nSight-2
Payload

Chameleon

nSight-3
Payload

	Gecko
PAN GSD	n/a
HS GSD	40 m
Swath	80 km
Mass	0.5 kg

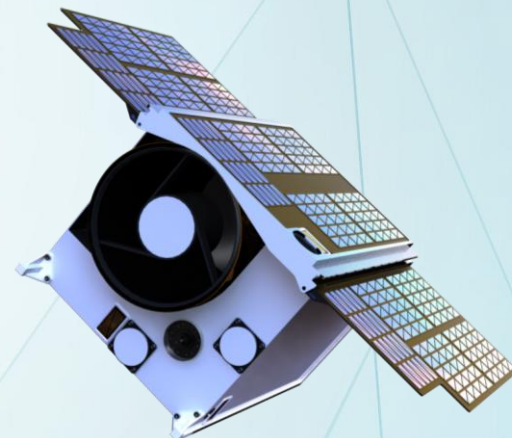|	Mantis-HS
PAN GSD	16 m
HS GSD	32 m
Swath	33 km
Mass	0.5 kg

	Chameleon
PAN GSD	6 m
HS GSD	29 m
Swath	20 km
Mass	1.6 kg

Parameters	SCS3U
Form Factor	3U
Satellite Mass	6 kg
Payload Mass	0.5 kg
Orbit Average Power (OAP)	8 W
Data TX	25 Mbps
Propulsion MP (mono-prop) CG (cold gas)	No

HyperFarm Constellation

Nano-Satellites

SCS 6U	
Ground Sampling Distance	10 m
Swath Width	40 km
Spectral Bands	Blue, Green, Red, NIR Red Edge1, Red Edge 2, NIR2, Xantophil
Payload Data Downlink	50 Mbps (X-band)
Design Lifetime	5 Year
Orbit	500km Sun-synchronous
Mass	12 kg

| Phoenix	
Ground Sampling Distance	2 m /10m
Swath Width	20 km
Spectral Bands	PAN, Blue, Green, Red, NIR Red Edge1, Red Edge 2, NIR2, Xantophil
Payload Data Downlink	50 Mbps (X-band)
Design Lifetime	5 Year
Orbit	500km Sun-synchronous
Mass	20 kg

Constellation Required

- Satellite travels at 7km per sec
- 100 minutes around the world
- World rotates 2400 km at equator
- Satellite has one 5-10min observation window over mid latitude country per day
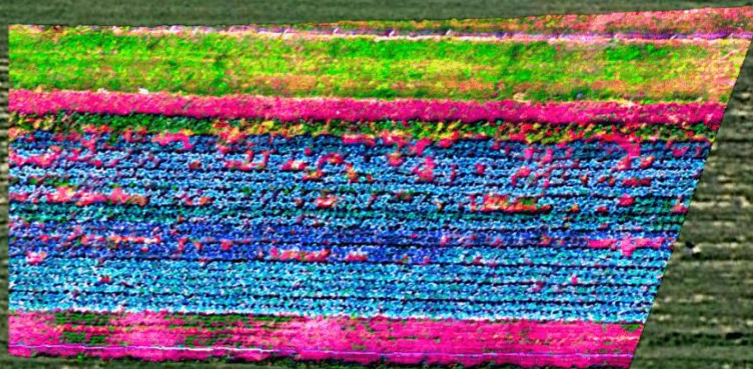- Need constellation of satellites to provide more regular coverage
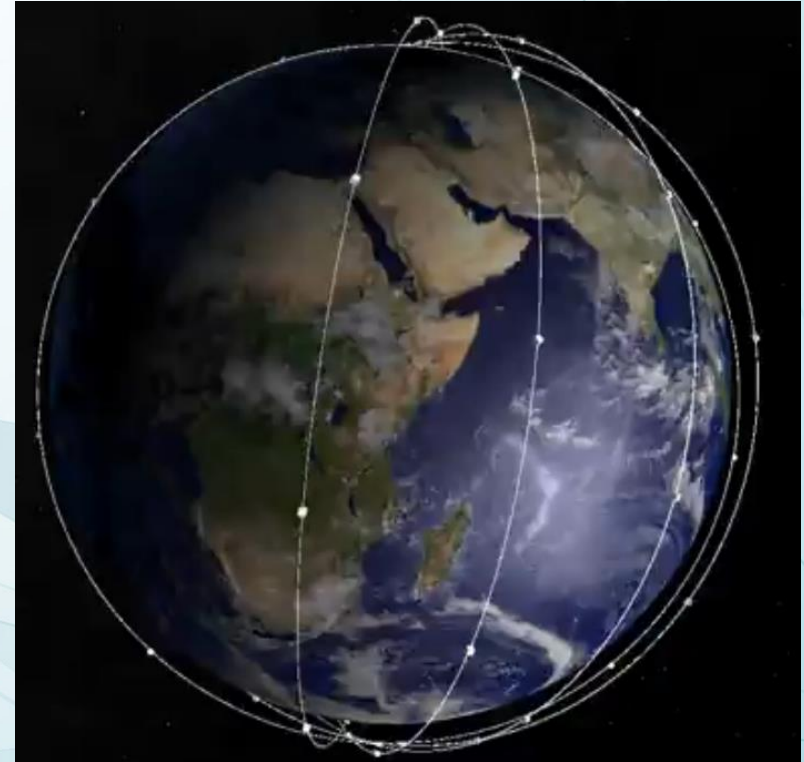
Thank You

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Precision agriculture requires more than multispectral imagery
Hyperspectral imaging is going to be the most advanced and accurate
technology for remote sensing applications