Data Guide

Let's discover **Wyvern's Data Product Guide**!

If you have any questions, please reach out to sales@wyvern.space.

🚀 Data Product Guide

Wyvern's data product guides have details on Wyvern's hyperspectral data products. They contain information about products specifications, formats, and constellation performance.

The current product guide supports version 2.1 of our data product. To view previous versions, you can select versions in the top-right corner of the page.

Archive Library

The Archive Library provides access to on-the-shelf hyperspectral imagery from previous Dragonette satellite collections.

Key Details

- Contains all HSI data products:
  - Previously collected by Wyvern
  - Ordered via constellation tasking (without Permanent Image Exclusivity)
- Products are available **after a 30-day holdback period** (from acquisition datetime)
  - i.e. All imagery in the Archive Library is at least 30 days old
- Scene-based delivery and pricing

How to Order

1. Search for available scenes in Wyvern's archive
2. Fill out the archive order form and email to orders@wyvern.space
3. Wyvern will process your order and deliver the data product via secure download link

Cloud Cover Policy

- No set cloud cover policy
- Each product includes a thumbnail and preview for review before purchase
- Once an Archive Library imagery product is purchased there are no returns allowed with refund or credit since cloud cover can be assessed by clients before purchasing any given archive imagery data product

Assured Capacity

Wyvern's highest-priority offering for clients needing guaranteed, dedicated imaging capacity with exclusive access.

Key Features

Feature	Assured Capacity
Tasking Priority	Highest
Minimum Order Size	Full image scenes to cover AOI (400 sqkm)
Maximum AOI Size	n/a
Collection Window	Varies by AOI location
Product Framing	Scene-Based
Cloud Cover Policy	None (all images delivered)
Definite Collection Schedule	Yes
Order Cancellation	Not allowed (contractual)
Archive Holdback	Perpetual (exclusive access)
Permanent Image Exclusivity	Included

Feature	Assured Capacity
Collect-to-Delivery Latency	Average 48 hours (L2A delivery can be 1 day later than L1B)
Data Licensing	Internal Use/Public Release
Spectral Range	Standard/Extended VNIR

How to Order

1. Share AOIs and TOIs with Wyvern
2. Wyvern conducts feasibility analysis
3. Execute contractual agreement to reserve capacity

Data Collection & Delivery

- Guaranteed acquisition of new hyperspectral imagery for your AOI and TOI
- First-come, first-served basis; cannot be preempted by other orders
- Scene-based delivery and pricing (based on full image scenes covering AOI)
- Permanent Image Exclusivity: perpetual archive withhold for all new data
- Highest level of customer service support
- All collected imagery delivered, regardless of cloud cover

Cloud Cover Policy

- All collected imagery is delivered, regardless of cloud cover (up to 100%)
- Designed for persistent monitoring and predictable scheduling

Order Cancellation

- Not allowed by default (see contractual agreement)
- Wyvern dedicates future imaging capacity for your order

Constellation Tasking

Order new imagery for your area-of-interest (AOI) and time-of-interest (TOI) with two options:

- **Standard Tasking**
- **Premium Tasking**

Key Features

Feature	Standard Tasking	Premium Tasking
Tasking Priority	Low	High
Minimum Order Size	100 km^2	50 km^2
Maximum AOI Size	5,000 km^2	5,000 km^2
Minimum Collection Window	1 Month	1 Week
Product Framing	Area-Based	Area-Based
Cloud Cover Policy	< 20%	< 20%
Definite Collection Schedule	No (can be bumped)	Only if scheduled
Order Cancellation	> 72 hrs before start	> 48 hrs before start
Default Archive Holdback	30 Days	30 Days

Feature	Standard Tasking	Premium Tasking
Permanent Image Exclusivity	Not available	Available (upgrade)
Collect-to-Delivery Latency	~96 hrs	~72 hrs (L2A delivery can be 1 day later than L1B)
Data Licensing	Internal/Public	Internal/Public
Spectral Range	Standard/Extended VNIR	Standard/Extended VNIR

How to Order

Via API

If you have API access, follow the Tasking API Guide to submit your order programmatically.

Via email

1. Complete Wyvern's tasking imagery order form
2. Email PDF to orders@wyvern.space
3. If Wyvern collects an image, you will receive a secure download link when the data product is ready

Tasking Logic

- Orders are queued and scheduled based on priority, weather, and capacity
- No guarantee of collection; best effort only
- AOI must be a single polygon and meet minimum order size (MOS)
- AOI smaller than MOS will be buffered to meet requirements
- Time-of-interest (TOI):

    - Start date: ≥ 3 days after order submission
    - End date: ≤ 1 year after order submission

Data Collection & Delivery

- Area-based pricing ($/km^2, including cloudy pixels)
- Large AOIs may require multiple scenes (~10% overlap, only charged once for overlap)
- Cloud cover policy applies to total AOI (< 20% clouds)
- If not enough cloud-free imagery is collected by end date, only delivered area is invoiced

Cloud Cover Policy

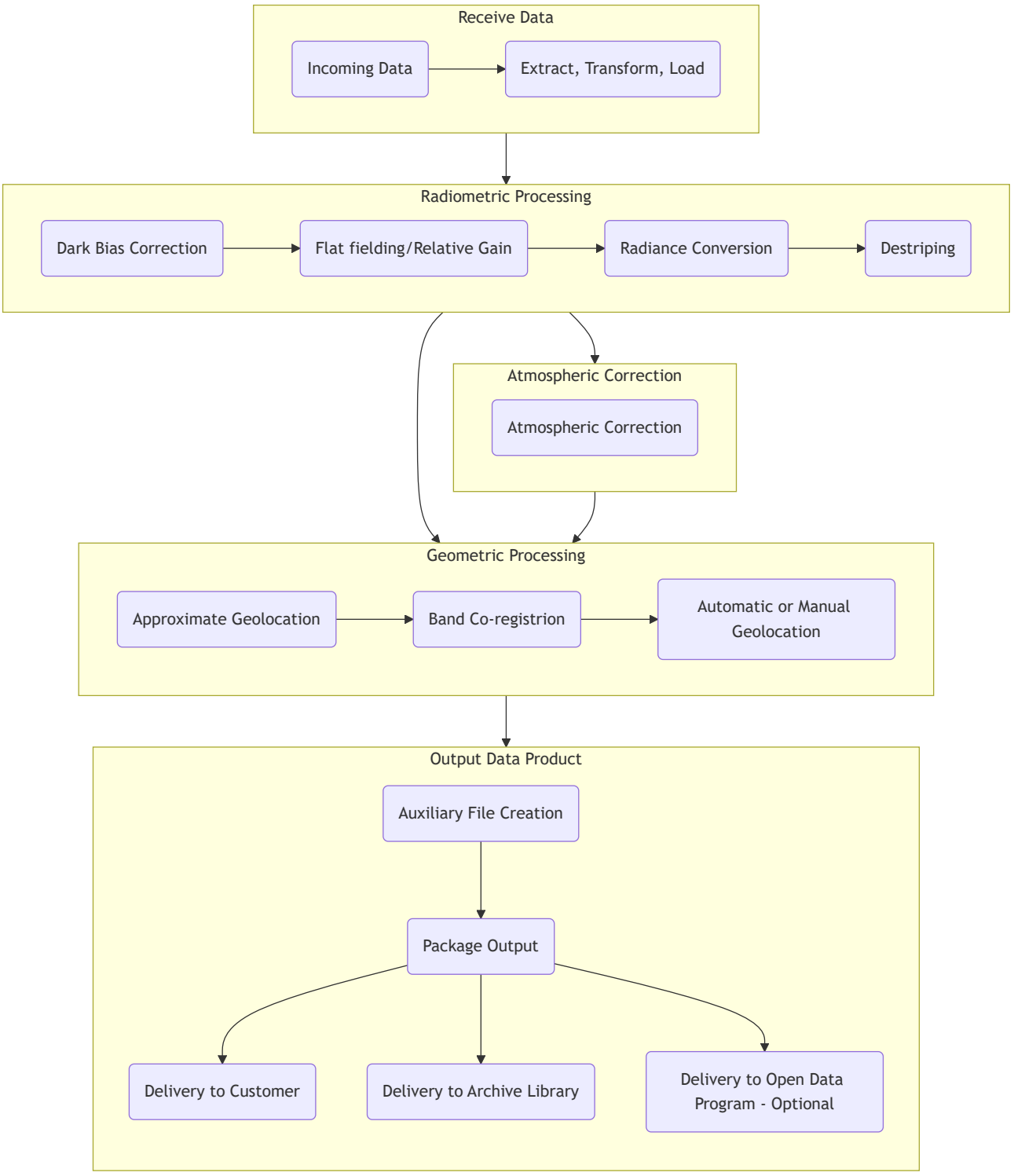
- Images delivered if cloud cover < 20% (by Wyvern QA)
- If > 20% cloud cover:
    - Customers can review thumbnail and accept/purchase if desired

Order Cancellation

- Email cancellation requests to orders@wyvern.space
- Must be received before cutoff:
    - Standard: > 72 hours before acquisition start
    - Premium: > 48 hours before acquisition start
- Late cancellations not honored; collected data will be delivered and invoiced

Data Processing & Generation Workflow

To deliver hyperspectral imagery data products in a consistent, scalable, reliable, and timely manner Wyvern has built a cloud-based data processing pipeline that converts raw sensor data and platform ephemeris metadata into usable output imagery data products that are delivered to end-users. The data processing pipeline includes spectral band co-registration at a < 25% subpixel level to ensure the best possible spectral purity in each pixel thereby enabling robust spectral analysis of the HSI data products.



Wyvern's cloud-based data processing and imagery product generation pipeline

Furthermore, the data processing pipeline for Wyvern's hyperspectral imagery data products requires that a significant portion of any given image includes unobstructed land with heterogeneous features in order to perform the georeferencing step that enables the standard geolocation accuracy specification. Consequently, the designated geolocation accuracy specification CE90 performance is only provided for imaging collections over unobstructed land that generate imagery data products with < 20% cloud cover. For any

imagery data products collected over open water or with higher levels of cloud cover Wyvern does not offer a designated geolocation accuracy specification. Instead, each HSI data product over open water, homogeneous features or high cloud cover will have a geolocation characteristic that is limited to the inherent pointing accuracy of the Dragonette satellites which varies by imaging collection in the approximate range of several kilometres.

Quality Assurance

Wyvern has built an advanced proprietary image quality assurance (QA) system to confirm that imagery data products align with the documented standard product specifications and the offering's cloud cover policy. If the quality assurance system determines that a new tasking imagery data product does not meet the standard performance specifications or cloud cover policy and there is available imaging capacity the Wyvern constellation tasking system will automatically re-schedule a new imaging collection attempt within the tasking order's time-of-interest (TOI) acquisition date range. This automatic QA standard performance specifications misalignment retasking applies to both Standard Tasking and Premium Tasking offerings where available imaging capacity for re-schedule is offering-dependent. New tasking attempts will continue until an imagery data product is acquired that aligns with standard product specifications or the constellation tasking order's acquisition date range expires. Furthermore, for Premium Tasking orders with automatic cloudy collection retasking if an imagery data product does not align with the cloud cover policy the Wyvern constellation tasking system will automatically re-schedule a new tasking request to attempt another imaging collection within the order's acquisition date range based on available Premium Tasking capacity and upcoming weather forecast (automatic cloudy collection retasking is not available for Standard Tasking which is a single shot offering).

Wyvern's quality assurance (QA) system includes an advanced proprietary cloud detection algorithm based on a machine learning (ML) model that identifies pixels within the imagery data product where the ground is significantly obscured by clouds. Wyvern defines a cloudy pixel as one where either a cumuliform cloud completely obscures the ground surface or part of a stratiform or cirrus cloud obscures at least a minimum of > 25% of the total reflected sunlight in that pixel. If a pixel has light haze or other atmospheric aerosols but at least ≥ 75% of the data signal is sunlight reflected from the surface of the Earth then that pixel is considered suitable for analysis and is not considered cloudy. Wyvern delivers a usable data mask raster file with every imagery data product including a cloud mask band that reflects the binary result of the cloud detection algorithm assessment. Once cloudy pixels have been identified the total percentage of cloudy pixels within the constellation tasking order's area-of-interest (AOI) is measured in relation to the offering's cloud cover

policy to determine if the imagery data product has passed QA checkout to be delivered with subsequent billing invoice based on the area of imagery data pixels within the AOI.

Security and Confidentiality

Wyvern provides access to high-quality Earth observation imagery data products in a highly secure and confidential manner that aligns with the requirements of extremely sensitive missions. Wyvern has implemented industry-standard security measures while maintaining strict privacy protocols that ensure our client's identity, information and data is strictly confidential. Consequently, Wyvern has taken the necessary measures to ensure that the systems, infrastructure, facilities, people, and information are protected to the highest industry standards.

Wyvern has implemented rigorous operational security controls for all cloud-based infrastructure, online platform, enterprise computing systems, ground segment, space communications network, personnel, and facilities. Wyvern's order management, data processing, product generation and online delivery systems are built in Amazon Web Services (AWS) cloud infrastructure in alignment with standard cybersecurity measures and architectural design with end-to-end encryption per U.S. NIST AES-256 standards with cryptographic keys maintained in U.S. FIPS 140-3 (Revision 1) compliant storage. All of Wyvern's cloud-based infrastructure follows the AWS Best Practices for Security, Identity, & Compliance with very strong cybersecurity at all levels based on the AWS Well-Architected Framework. This security posture provides the confidence that Wyvern is performing the due diligence required to protect information and data at every moment of creation, transport, and rest. Finally, Wyvern's operational security controls also include a robust incident response plan for detection, analysis, containment, eradication, and recovery.

Wyvern has a rigorous stance on maintaining strict privacy practices with full client confidentiality. Consequently, Wyvern never shares client identity information with any of our operational service providers or space & ground segment mission partners. This strict confidentiality posture includes rigorous controls on our client's personal and organizational identity associated with all imagery data product orders across all of Wyvern's offerings. All client end-user and organizational identification is obfuscated into anonymous randomly generated universally unique identifiers (UUIDs) before satellite tasking order imaging collection instructions are sent to our operational space & ground segment mission partners. All interactions within Wyvern's systems are performed using the anonymized

UUIDs for both organization and end-user so that no connection can be made back to client's personal identity. Finally, all personal and organizational identifying information is stored in a separated isolated system with full encryption in alignment with standard security protocols.

Image Metadata

All imagery data products are delivered with the hyperspectral imagery data stored in a Cloud-Optimized GeoTIFF (COG) format raster file with LZW compression. Standard GeoTIFF tags for both radiometric and geometric parameters are included.

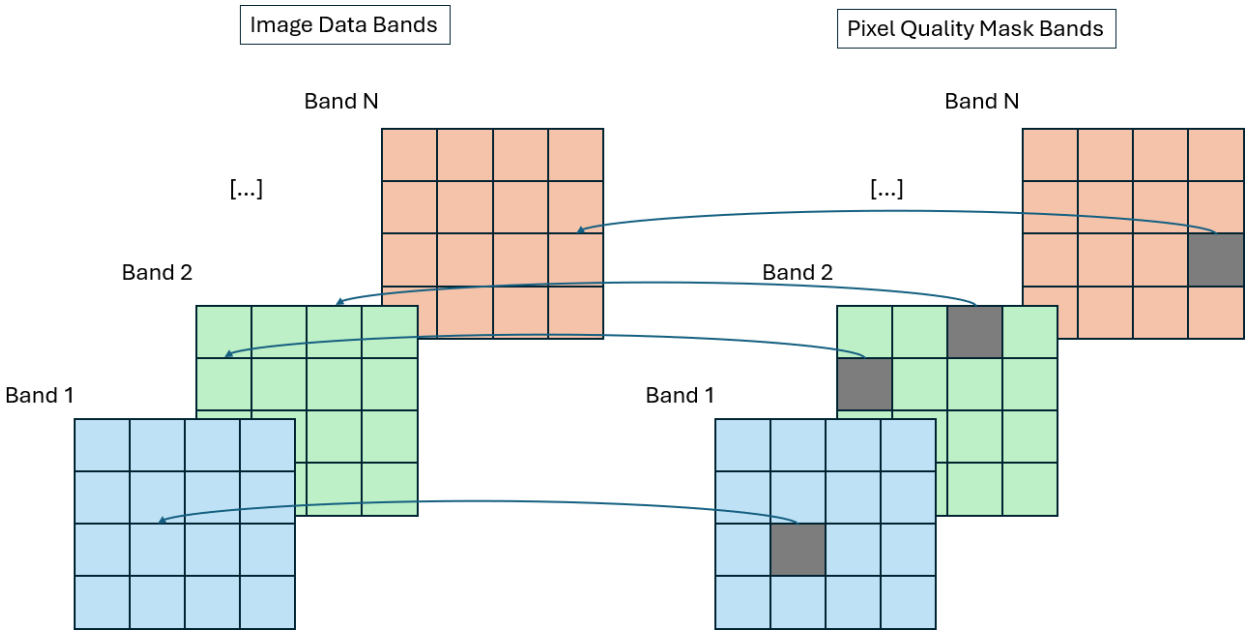
Field Name	Type	Description
Description	ASCII Text	The name of the band
FWHM	ASCII Text	The Full Width at Half Maximum of the band
GDAL_METADATA	ASCII Text	An XML list describing information for each band
GDAL_NODATA	ASCII Text	Contains an ASCII text encoded NoData background pixel value
GeoKeyDirectoryTag	SHORT	Describes the model coordinate system
ModelPixelScaleTag	DOUBLE	The size of raster pixel spacing
Wavelength	ASCII Text	The wavelength of the band
Wavelength_Units	ASCII Text	The units of the band's wavelength

Pixel Quality Mask

Products are delivered with a pixel quality mask raster file generated by Wyvern's QA system in Cloud-Optimized GeoTIFF (COG) format raster file with LZW compression that has unsigned 8-bit byte (uint8) data type. The pixel quality mask raster has the same number of bands as the image data GeoTIFF (i.e. 23-bands for Dragonette-001 and 31-bands for other Dragonette satellites).

Each band of the pixel quality mask raster indicates whether the corresponding pixel in the image data raster has a known pixel quality condition. The value of the pixel indicates which quality condition is present.

Pixel Value	Description
0	No documented pixel quality condition
1	The pixel is interpolated
255	NoData



Relationship between bands and pixels in the pixel quality mask raster and the image data raster

Product Delivery

All imagery data products are delivered as a single ZIP file bundle that contains all imagery data and metadata files packaged together for each individual HSI data product. The name of the ZIP archive file is Wyvern's globally unique identifier (GUID) and processing level for the tasking order imaging collection attempt that generated the resulting imagery data product. The ZIP archive file for any given HSI data product contains the following files:

- Folder named by GUID and processing level containing all of the imagery data product files
  - Format: `<guid>_<processing_level>`
    - e.g. `108f5a68-e949-4de7-929c-2d7ef960eba0_l2a`
  - STAC Catalog File (This file is a STAC catalog file for a catalog with a single item. The path to that item's STAC JSON file can be located in the list of links.)
- Subfolder named by File Naming Convention containing the following files:
  - Hyperspectral Imagery Data Raster TIFF File
  - STAC Metadata Text JSON File
  - Usable Data Mask Raster TIFF File (includes a cloud mask band)
  - Pixel Quality Mask Raster TIFF File
  - Preview Image PNG File (full resolution RGB colour representation)
  - Thumbnail Image PNG File (8x downsampled of the Preview Image)

Naming Convention

The data & metadata files delivered for any given imagery data product have a consistent naming convention that aligns with the following file naming pattern:

`wyvern_<platform_name>_<capture_date_time>_<collection_id>_<processing_level>_<auxiliary_file_type>.<file_extension>`

where:

- `<platform_name>` is one of the satellites in the Dragonette constellation
- `<capture_date_time>` is acquisition time in UTC format [YYYY][MM][DD]T[hh][mm][ss]
- `<collection_id>` is the first 8 characters of the globally unique identifier
- `<processing_level>` is the processing level of the data product. Possible values are:
  - l1b: Radiometrically calibrated and geometrically corrected data to top-of-atmosphere radiance units
  - l2a: Surface reflectance data that has been atmospherically corrected
- `<auxiliary_file_type>` is auxiliary delivery files such as 'preview', 'thumbnail', 'data_mask'
- `<file_extension>` is common format file extensions (e.g., '.tiff', '.json', '.png')

Example

`wyvern_dragonette-003_20240716T104031_12345678_l2a_data_mask.tiff`

STAC Metadata

All imagery data products are delivered with acquisition time, radiometric, geometric, and other various metadata properties delivered in a JavaScript Object Notation (JSON) format ASCII text file that aligns with the SpatioTemporal Asset Catalog (STAC) open geospatial standard. For more background information please visit the STAC specification website.

Catalog File Contents

The catalog file is a STAC catalog file for a catalog with a single item. The path to that item's STAC JSON file can be located in the list of links. The item has a 'rel' value of 'item' and can be used to locate the items STAC metadata description.

General Information

The following describes general information fields.

Field Name	Type	Description
type	string	Describes the type of item
stac_version	string	STAC version
id	string	STAC unique identifier
created	string	Creation datetime of this file as ISO 8601 formatted datetime, in UTC (YYYY-MM- DDTHH:MM:SSZ)
updated	string	Last update datetime of this file as ISO 8601 formatted datetime, in UTC (YYYY-MM- DDTHH:MM:SSZ)
stac_extensions	[string]	List of STAC extensions included in this file

Sensor Information

The following describes the type of sensor used to capture the images.

Field Name	Type	Description
sensor_mode	string	Operation mode of the sensor
sensor_type	string	Type of the sensor
product_type	string	Output product

License & Provider

The following describes the license and provider information.

Field Name	Type	Description
license	string	The type of license. Full license provided in links
providers	[Provider Object]	Information describing Wyvern as data provider
links	[Link Object]	List of resource link objects and related URLs
License Link Object		
rel	string	Relationship between the current document and the linked document
href	string	The actual link in the format of an URL
title	string	Human-readable title

Field Name	Type	Description
Providers Object		
name	string	Name of the organization
roles	[string]	Roles of the provider
url	string	Homepage of the provider

Satellite Information

The following describes the satellite and constellation that captured the imagery.

Field Name	Type	Description
constellation	string	The name of the constellation
platform	string	The name of the satellite
instruments	[string]	Name of instrument used
sat:platform_international_designator	string	The International Designator

Capture Timestamps

The following describes the timestamps of the image capture.

Field Name	Type	Description
datetime	string	The mid-way time of the capture as ISO 8601 formatted datetime, in UTC (YYYY-MM- DDTHH:MM:SSSSSSZ)

Field Name	Type	Description
start_datetime	string	The start time of the capture as ISO 8601 formatted datetime, in UTC (YYYY-MM- DDTHH:MM:SSSSSSZ)
end_datetime	string	The end time of the capture as ISO 8601 formatted datetime, in UTC (YYYY-MM- DDTHH:MM:SSSSSSZ)

Processing Information

The following describes information about the processing chain.

Field Name	Type	Description
processing:level	string	The processing level of the delivered data product
processing:facility	string	The name of the facility that produced the data
processing:version	string	The version of the primary processing software or processing chain that produced the data

View Geometry Information

The following describes the position of both the satellite and sun during imaging collection.

Field Name	Type	Description
view:off_nadir	number	The angle from the sensor between nadir (straight down) and the scene centre measured in degrees (0° to 20°)

Field Name	Type	Description
view:incidence_angle	number	The incidence angle is the angle between the vertical (normal) to the intercepting surface and the line of sight back to the satellite at the scene centre measured in degrees (0° to 20°)
view:azimuth	number	Viewing azimuth angle. The angle measured from the sub-satellite point (point on the ground below the platform) between the scene centre and true north. Measured clockwise from north in degrees (0° to 360°)
view:sun_azimuth	number	Sun azimuth angle. From the scene centre point on the ground, this is the angle between truth north and the sun. Measured clockwise in degrees (0° to 360°)
view:sun_elevation	number	Sun elevation angle. The angle from the tangent of the scene centre point to the sun. Measured from the horizon in degrees (15° to 90°)

Projection and Geospatial Data

The following describes how to interpret any geospatial data in this file or in the associated Cloud-Optimized GeoTIFF file.

Field Name	Type	Description
gsd	number	Ground sample distance measured in metres (m)
geometry	GeoJSON Geometry Object of type Polygon	The footprint of the item

Field Name	Type	Description
bbox	[number]	Image bounding box in product Coordinate Reference System [xmin, ymin, xmax, ymax]
proj:epsg	number	EPSG code
proj:shape	[integer]	Number of pixels in Y and X directions for the default grid

Electro-Optical Information

The following describes data that represents a snapshot of the Earth for assets.

Field Name	Type	Description
eo:cloud_cover	number	Estimate of cloud cover, in %
eo:bands	[Band Object]	An array of available bands where each object is a Band Object
Band Object		
name	string	The name of the band, as "Band_<centre wavelength in nanometres>nm"
common_name	string	The name commonly used to refer to the band
centre_wavelength	number	Centre wavelength of the band in micrometres (µm)
full_width_half_max	number	The full width at half-maximum (FWHM) for this band in micrometres (µm)
solar_illumination	number	The solar illumination for each band which represents the ESUN solar irradiance generated

Field Name	Type	Description
		using Thuillier 2003 dataset as measured at half the maximum transmission in units of 'W / (m2 * µm)'

Raster Information

The following describes the included raster assets.

Field Name	Type	Description
raster:bands	[Raster Band Object]	An array of available bands where each object is a [Band Object]
Raster Band Object		
nodata	number	Pixel values used to identify pixels that are nodata in the band
sampling	string	Indicates whether a pixel value should be assumed to represent a sampling over the region of the pixel or a point sample at the centre of the pixel
data_type	string	The data type of the pixels in the band
unit	string	Unit denomination of the pixel value
scale	number	Multiplicator factor of the pixel value to transform into the value. Used for hyperspectral files only.
offset	number	Number to be added to the pixel value (after scaling) to transform into the value. Used for hyperspectral files only.

Field Name	Type	Description
classification:classes	[Classification Class Object]	An array of available classes where each object is a [Class Object]
Class Object		
value	integer	Value of the class
name	string	Short name of the class for machine readability
title	string	Human-readable name for use in, e.g. a map legend
description	string	Description of the class
nodata	boolean	If set to true classifies a value as a no-data value. Only present in the nodata class object

Wyvern-Specific Information

The following describes the information specific to Wyvern data.

Field Name	Type	Description
wyvern:radiometric_resolution	number	The radiometric resolution of the image, specified in bits

Asset File Information

The following describes the asset file information.

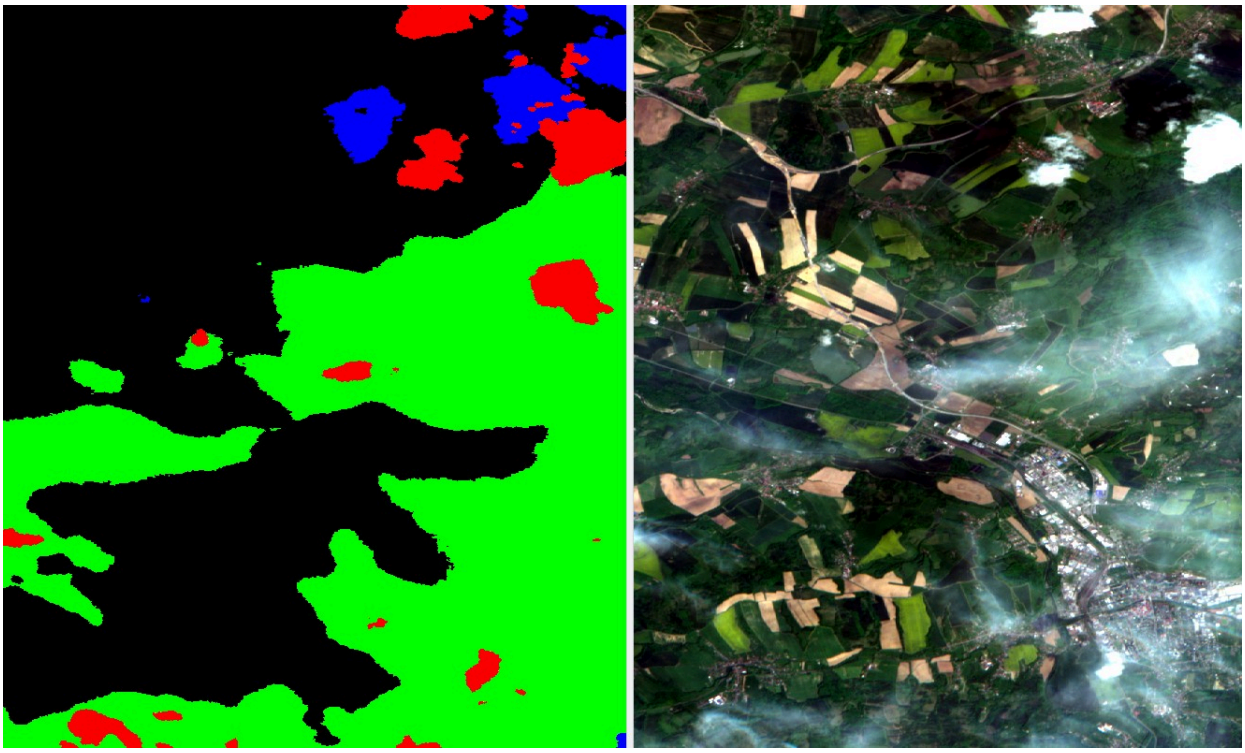
Field Name	Type	Description
href	string	URI to the asset object
type	string	Media type of the asset
title	string	The asset title
description	string	A description of the asset
file:checksum	string	File checksum
file:size	integer	The file size, specified in bytes
roles	[string]	The semantic roles of the asset

Usable Data Mask

Products are delivered with a usable data mask raster file generated by Wyvern's QA system in Cloud-Optimized GeoTIFF (COG) format with LZW compression and unsigned 8-bit byte (uint8) data type. The usable data mask raster has four bands:

- **Band 1: Clear Mask**
  - 1 = Pixel is clear (only if clear in all other useable data mask bands)
  - 0 = Pixel is not clear (cloud, cloud-shadow, or haze)
- **Band 2: Cloud Mask**
  - 1 = Pixel is cloudy
  - 0 = Pixel is not cloudy
- **Band 3: Haze Mask**
  - 1 = Pixel is hazy
  - 0 = Pixel is not hazy
- **Band 4: Cloud-Shadow Mask**
  - 1 = Pixel is cloud-shadowed
  - 0 = Pixel is not cloud-shadowed

All mask bands are binary (1 = present, 0 = not present) with 255 as NoData. The clear mask (Band 1) is only 1 if the pixel is clear in all other bands.



Usable data mask (left) showing cloud (red), haze (green), and cloud-shadow (blue). Natural color RGB (right)

Metadata Example


```
"Data Mask": {
  "href": "./wyvern_dragonette-003_20250508T092313_a60915a4_data_mask.ti
  "type": "image/tiff; application=geotiff; profile=cloud-optimized",
  "title": "Data Mask",
  "description": "A mask containing clear/usable data.",
  "eo:bands": [
    {
      "name": "QA_CLEAR_MASK",
      "description": "Boolean clear mask, 1 == Clear pixel"
    },
    {
      "name": "QA_CLOUD_MASK",
      "description": "Boolean cloud mask, 1 == Cloudy pixel"
    },
    {
      "name": "QA_HAZE_MASK",
      "description": "Boolean haze mask, 1 == Hazy pixel"
    },
    {
```

```
          "name": "QA_CLOUD_SHADOW_MASK",
          "description": "Boolean cloud-shadow mask, 1 == Cloud-shadowed pix
        }
      ],
      "raster:bands": [
        {
          "nodata": 255,
          "sampling": "area",
          "data_type": "uint8"
        },
        {
          "nodata": 255,
          "sampling": "area",
          "data_type": "uint8"
        },
        {
          "nodata": 255,
          "sampling": "area",
          "data_type": "uint8"
        },
        {
          "nodata": 255,
          "sampling": "area",
          "data_type": "uint8"
        },
        {
          "nodata": 255,
          "sampling": "area",
          "data_type": "uint8"
        }
      ],
      "file:checksum":
"c0e402407fd67d8bb1d9ff546a95eea917b9af72c16c827f4d3b3a270439a6f075acfa70d4f
      "file:size": 1328021,
      "roles": [
        "data-mask",
        "clear",
        "cloud",
        "haze",
        "cloud-shadow"
      ]
    }
```

Frequently Asked Questions (FAQ)

Welcome to the Wyvern Data Product Guide FAQ! Below you'll find answers to common questions.

Sample Imagery

Can I see sample data?

See our Open Data Program for sample imagery.

Tasking Imagery

What tasking offerings are available?

- **Constellation Tasking:** Standard and Premium tasking for new imagery collection. See Constellation Tasking.
- **Assured Capacity:** Highest-priority, pre-reserved imaging capacity. See Assured Capacity.

How do I place an order?

Order Form

Orders are placed by submitting a tasking order form and area-of-interest (AOI) file to orders@wyvern.space. See Ordering Process.

Tasking API

We have a Tasking API which will allow customers to place, monitor, and download orders. If you're interested in our API contact sales@wyvern.space.

What is the minimum order size?

- **Standard Tasking:** 100 km^2
- **Premium Tasking:** 50 km^2
- **Assured Capacity:** Full image scenes required to cover AOI
- See Constellation Tasking and Assured Capacity.

What is the cloud cover policy?

- **Standard/Premium Tasking:** <20% cloud cover within AOI. See Constellation Tasking.
- **Assured Capacity:** No cloud cover limit; all collected data delivered. See Assured Capacity.

What is the order cancellation policy?

- **Standard Tasking:** Cancel >72 hours before acquisition start.
- **Premium Tasking:** Cancel >48 hours before acquisition start.
- **Assured Capacity:** No cancellations (pre-reserved capacity).
- See Constellation Tasking and Assured Capacity.

Archive Library

How do I order Archive Library data?

1. Search Wyvern's archive for available scenes.
2. Submit a request to orders@wyvern.space with the scenes you wish to order.
3. Receive your data bundle via secure download link.

For more information, see the Archive Library.

Where can I see a map of your archive data?

Search Wyvern's archive for available scenes!

How much data do you have in your archive?

Our first satellite launched in April 2024 and we've been collecting data since!

Data Products & Delivery

What file formats are delivered?

- **Imagery:** Cloud-Optimized GeoTIFF (COG). See Image Data
- **Metadata:** STAC JSON. See STAC Metadata
- **Masks:** Usable Data Mask and Pixel Quality Mask (GeoTIFF). See Usable Data Mask and Pixel Quality Mask
- **Previews:** PNG images

How are products delivered?

Products are delivered as a ZIP bundle with download links sent via email. See Product Delivery.

API users can download their data products from the API.

What is the naming convention for delivered files?

See Naming Convention. See our Open Data Program for sample imagery.

Are there cloud or quality masks?

Cloud and pixel quality masks are delivered with your data. See Usable Data Mask, and Pixel Quality Mask

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Specifications & Quality

What processing levels are available?

- **Level-1B:** Georeferenced and radiometrically corrected to top-of-atmosphere radiance. See Processing Levels.
- **Level-2A:** Surface reflectance imagery with atmospheric correction and reprojection to UTM/WGS84. See Processing Levels.

What is the spatial resolution?

5.3 meters ground sample distance (GSD) at nadir. See Product Specifications.

What is the spectral range?

- **Standard VNIR** 503–799 nm (23 bands)
- **Extended VNIR** 445–870 nm (31 bands) See Product Specifications and Dragonette Constellation.

What is the geolocation accuracy?

25–100 meters CE90 over land with <20% cloud cover. See Quality Assurance.

What are your Relative Spectral Responses (RSR)?

The Dragonette RSRs can be found on our GitHub.

Processing & Metadata

Is your data orthorectified?

Wyvern's L2A products are not orthorectified. We plan on improving geometric accuracy for a future release.

What metadata is included?

STAC-compliant JSON files with acquisition, sensor, geolocation, and processing details. See STAC Metadata.

Analytics

Can I derive indices from your data?

You can deliver many common indicies from Dragonette data including, but not limited to, NDVI and RENDVI. See our Knowledge Center.

Offline Access

Can I use the guide offline?

Yes! Wyvern's Data Product Guide can be accessed offline in two ways:

1. Download the PDF version of the guide.
2. Install the Progressive Web App (PWA).

For detailed instructions, see the Offline Access section of the Data Guide.

Support

Who do I contact for support?

For sales or technical questions, email sales@wyvern.space.

If your question is not answered here, please reach out to our support team for assistance.

About Wyvern

Wyvern is a Canadian aerospace company and Earth observation satellite imagery data provider headquartered in Edmonton, Alberta. Wyvern is the leading provider of high-quality hyperspectral imagery data products collected by a spaceborne constellation of satellites.

Wyvern's mission is to serve our clients satellite imagery using cutting-edge innovative sensor technology while focusing on affordability, capability, and convenience. Wyvern's hyperspectral imagery data reveals invisible insights and enables novel analytical use case applications across a wide variety of industries including precision agriculture, forestry, land administration, energy, mining, oil & gas, environmental sustainability, civil infrastructure, finance, mobility & logistics, insurance, peace & security, and regulatory compliance.

Wyvern Hyperspectral Imagery: Value Propositions

Wyvern's hyperspectral imagery data products and associated offerings deliver unique value across several key dimensions:

✅ High-Quality

- High spatial resolution
- Precise spectral accuracy
- Optimal signal-to-noise ratio for precise measurements

🔄 Reliable

- Designed for data consistency
- Supports advanced site monitoring analytics
- Enables derived information generation and novel intelligence insights

🌈 Comprehensive

- Full coverage of the Visible Near-Infrared (VNIR) spectrum
- Enables complete spectral measurements of the Earth's surface

🔗 Shareable

- Flexible data licensing options for commercial businesses
- Unclassified data can be shared with international mission partners

How to Take the Guide Offline

Wyvern's data product guide can be used offline using two methods:

PDF

Download the PDF version of the guide from the downloads page.

Progressive Web App

What is a Progressive Web App (PWA)?

A Progressive Web App (PWA) is a type of application delivered through the web, built using standard web technologies like HTML, CSS, and JavaScript. PWAs are designed to work on any platform that uses a standards-compliant browser, offering a native app-like experience.

Benefits of PWAs:

- **Offline Access**: PWAs can cache content, allowing users to access the app even without an internet connection.
- **No Installation Required**: Users can add PWAs to their home screen without going through an app store.
- **Automatic Updates**: PWAs update automatically in the background, ensuring users always have the latest version.

Chrome

1. Open the Wyvern Data Product Guide in Chrome.
2. Click the three-dot menu in the top-right corner.
3. Select **Cast, save, and share > Create shortcut**.
4. Click **Create**.

Edge

1. Open the Wyvern Data Product Guide in Edge.
2. Click the three-dot menu in the top-right corner.
3. Select **Apps > Install Wyvern Data Product Guide**.
4. Follow the prompts to install the PWA.

Unsupported Browsers

The following browsers do not support PWAs:

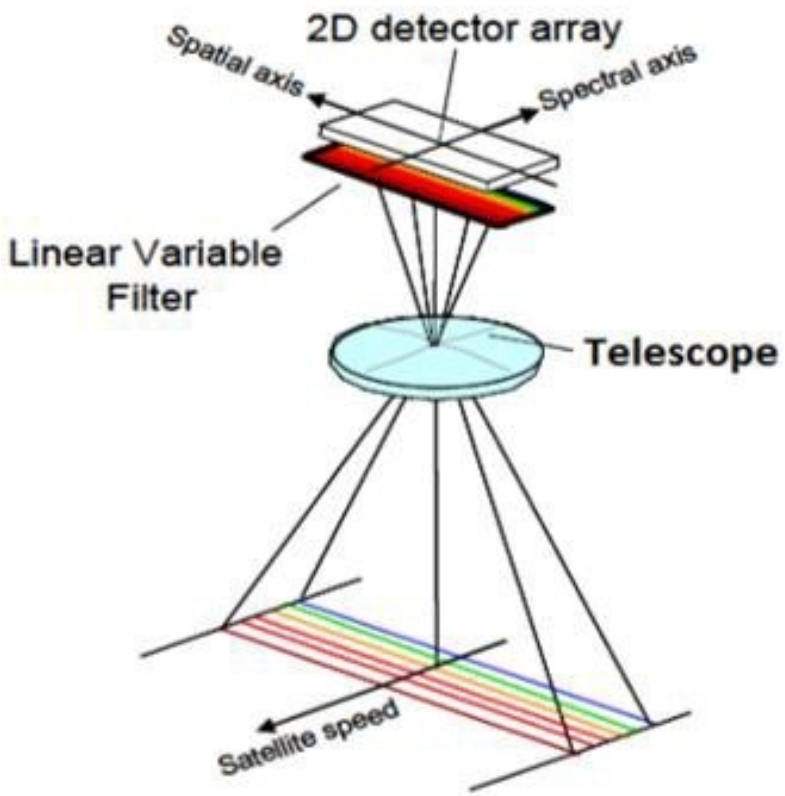
- Firefox
- Internet Explorer

Enjoy offline access to Wyvern's data product guides!

Hyperspectral Imaging

To effectively monitor and map the vast surface of the Earth, satellite-based remote sensing data collection and analysis is required. Wyvern's constellation of Earth observation satellites, ground segment, and product generation system is designed to provide the highest quality high-resolution, accurate, and timely electro-optical imagery. Wyvern's satellites are equipped with hyperspectral imaging (HSI) sensors that collect imagery data in many narrow spectral bands that enables the identification of unique chemical and physical properties of the Earth's surface unlocking novel spectroscopy analysis from space.

Wyvern's satellites in the Dragonette constellation are equipped with an advanced state of the art high-resolution hyperspectral imaging sensor that collects data in the visible to near-infrared (VNIR) spectral range of the electromagnetic spectrum. Each satellite's imaging sensor is a hyperspectral pushbroom line scan sensor with linear variable bandpass filter primarily designed for Earth Observation (EO) applications as a payload for CubeSats. It is based on a CMOS image sensor and custom continuously variable optical filter in the visible and near-infrared (VNIR) spectral range. The imaging sensor collects sunlight reflected from the Earth's surface then converts this electromagnetic radiation into electrical signals that are recorded via line-scan imaging with 12-bit pixel bit depth. The optical front-end which is used to focus the incoming light onto the focal plane has a large aperture diameter and long focal length within a compact form factor resulting in a high-resolution ground sampling distance (GSD) at operational orbital height altitudes.



Dragonette satellites are equipped with linear variable bandpass filter pushbroom line scan sensors with digital time delay integration. Graphic from Delauré, B. et al. - 2013

Wyvern is using a constellation of small cube satellites (CubeSats) to deliver hyperspectral Earth observation imagery which differs from traditional satellite imagery such as RGB colour imagery or multispectral data as HSI data products have significantly more spectral information. Hyperspectral remote sensing is an imaging spectroscopy technique that collects electro-optical imagery data across dozens of contiguous spectral bands with narrow bandwidths. Hyperspectral imaging sensors capture sunlight reflected from the surface of the Earth in dozens of spectrally narrow bands across VNIR range of the electromagnetic spectrum where natural and anthropogenic materials exhibit distinct spectral signatures.

Consequently, HSI data products enable spectroscopy analytical techniques not available with multispectral imaging (MSI) more commonly available from existing satellite platforms.

Calibration and Validation

The calibration of Earth observation imaging sensors hosted on satellite platforms is vital to generate radiometrically and geometrically corrected imagery data that can be scientifically analysed in a consistent manner with ability to perform relative comparison between datasets. A consistent radiometric and geometric correction of imagery data products must be achieved to perform change detection analysis of spatiotemporal collections over time from the same satellite, across multiple satellites in the Wyvern Dragonette constellation, and inter-platform comparisons of datasets acquired from other commercial or science mission satellites (e.g., Landsat, Sentinel, PRISMA, etc.). Consequently, Wyvern has performed a rigorous calibration and validation (cal/val) refinement of each operational satellite in the Dragonette constellation to ensure the best possible quality for every imagery data product.

Wyvern's calibration and validation (cal/val) process involves a radiometric vicarious calibration converting the imagery data pixel units to top-of-atmosphere (TOA) radiance via radiative transfer models and relative TOA reflectance data comparisons. This vicarious calibration approach involves using ground-truth reference imagery over well-characterized calibration sites including PICS, ECCOE, CEOS, CSIRO, RadCalNet and AERONET. Wyvern's radiometric calibration methodology involves routine dark frame snapshot collection with dark signal correction taken at varying exposure and frame intervals to generate results at different sensor temperatures. The pixel bias offsets for each wavelength are computed at 0.1 millisecond integration time. The absolute gain is characterized by converting image pixel units from digital number (DN) into at-sensor radiance. In addition, the cal/val process includes cross-platform radiometric normalization efforts to provide the best possible alignment of Wyvern imagery data products with datasets from the Landsat-8/9 and Sentinel-2 science mission platforms.

In addition to radiometric calibration and normalization efforts, Wyvern's cal/val process includes geometric correction of the data using ground control and reference basemap imagery to achieve best possible independent geolocation accuracy for each individual imagery data product. The consistent georeferencing of imagery data products within standard product specifications for geolocation accuracy enables accurate spatiotemporal

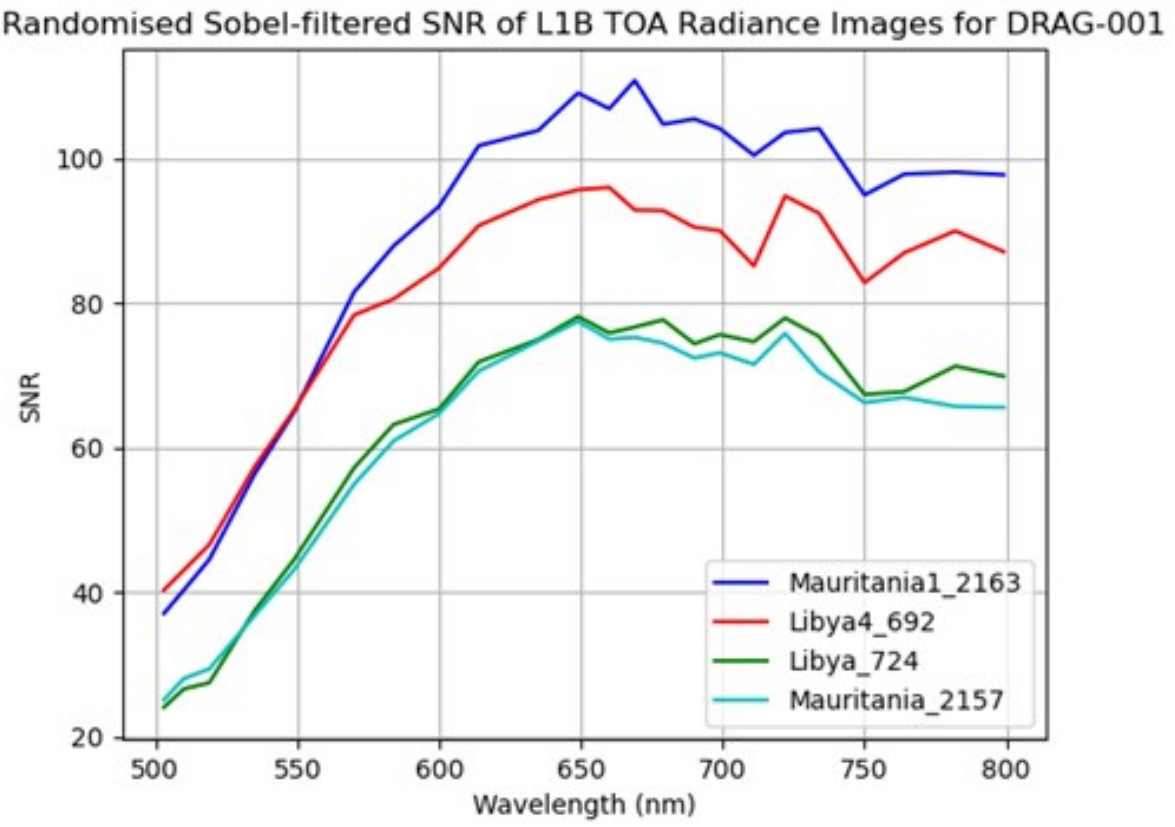
analysis of multiple datasets collected over time such as fully-automated change detection and predictive trend analysis.

Signal-to-Noise Ratio (SNR)

In the context of imaging, the Signal-to-Noise Ratio (SNR) is a fundamental measure that quantifies the quality of an image by comparing the level of the desired signal (the actual image information) to the level of background noise (random, unwanted fluctuations). A higher SNR indicates a cleaner image where the true image features are more distinct from the noise, while a lower SNR means the noise is more prominent, potentially obscuring details and degrading image quality.

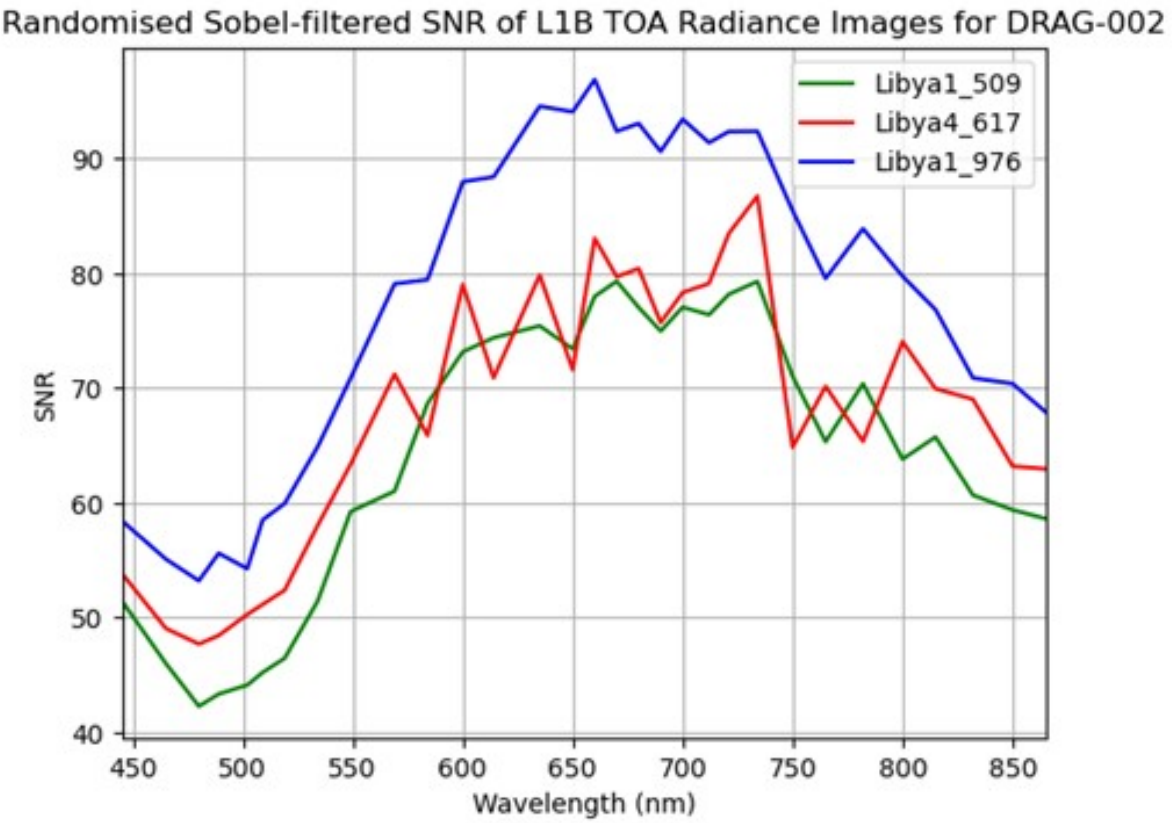
Below is the SNR for each Dragonette satellite for a selection of Pseudo-Invariant Calibration Site (PICS) sites.

Dragonette-1



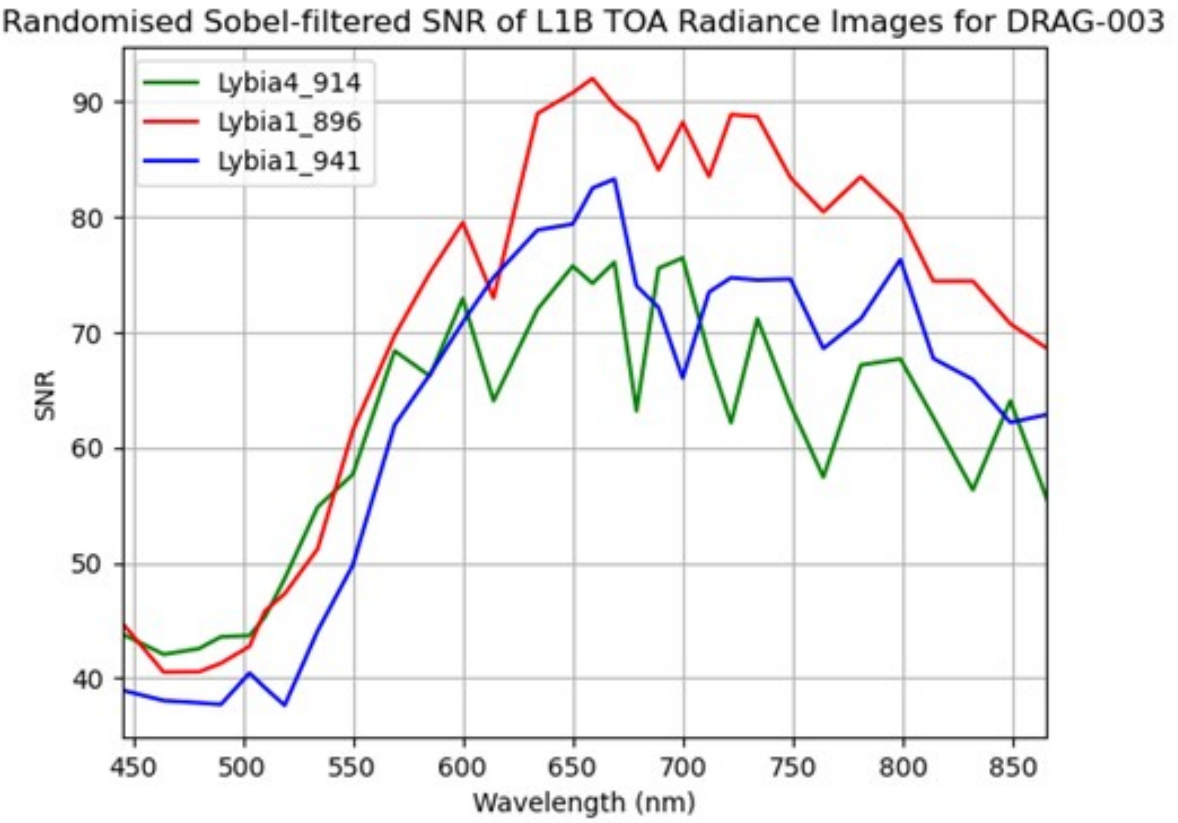
Measured signal-to-noise ratio for the Dragonette-1 satellite

Dragonette-2



Measured signal-to-noise ratio for the Dragonette-2 satellite

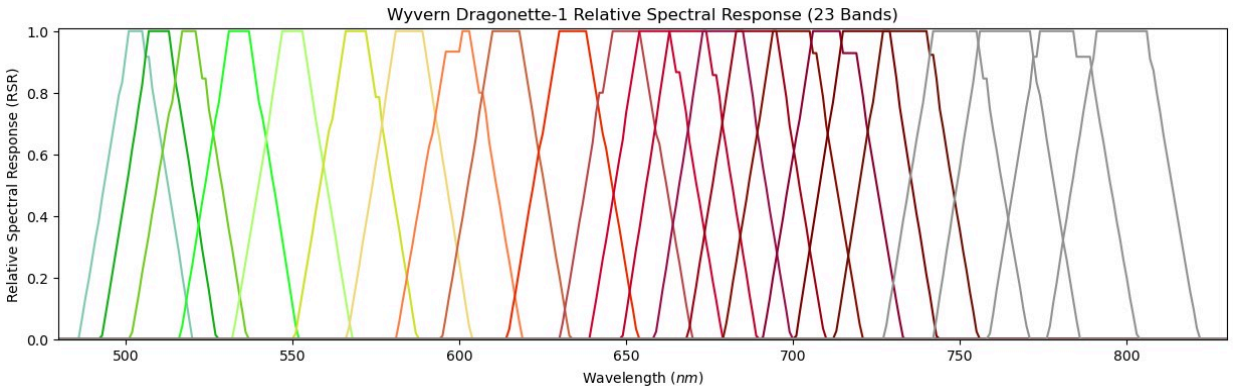
Dragonette-3



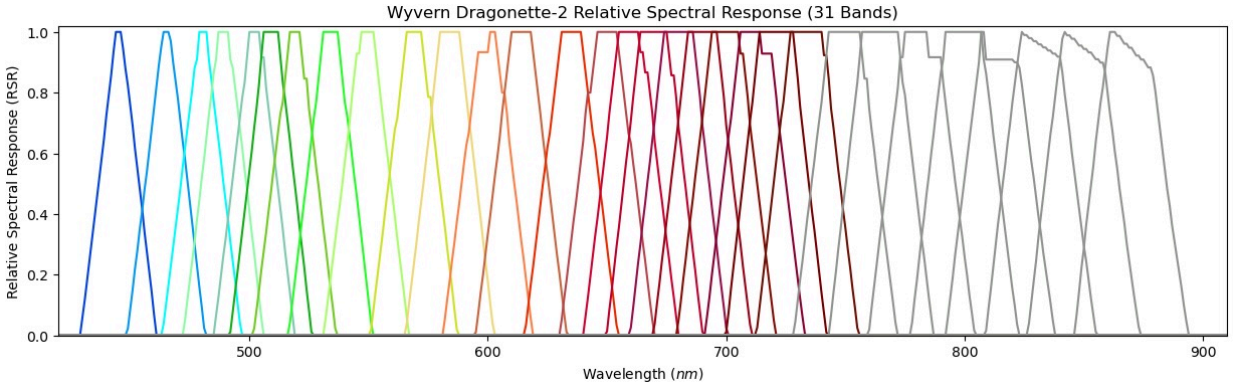
Measured signal-to-noise ratio for the Dragonette-3 satellite

Relative Spectral Response (RSR)

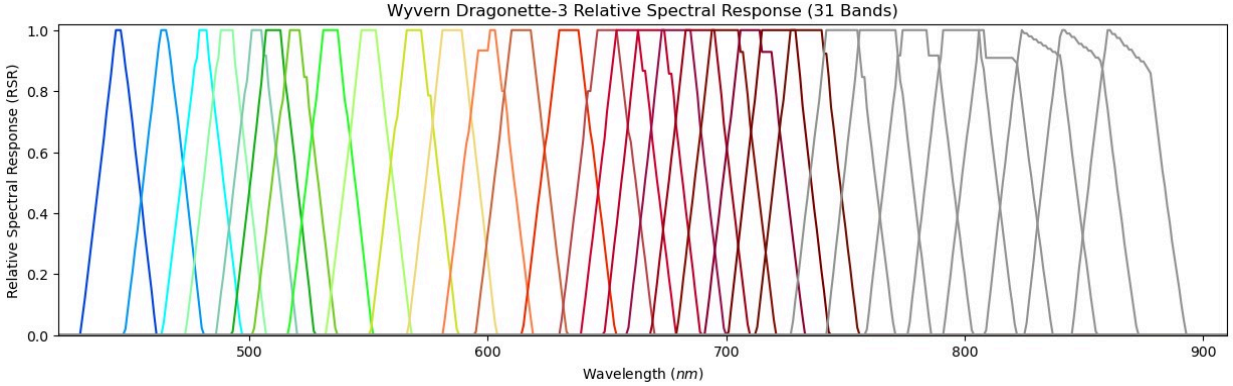
Details about the Dragonette relative spectral responses can be found on our GitHub.



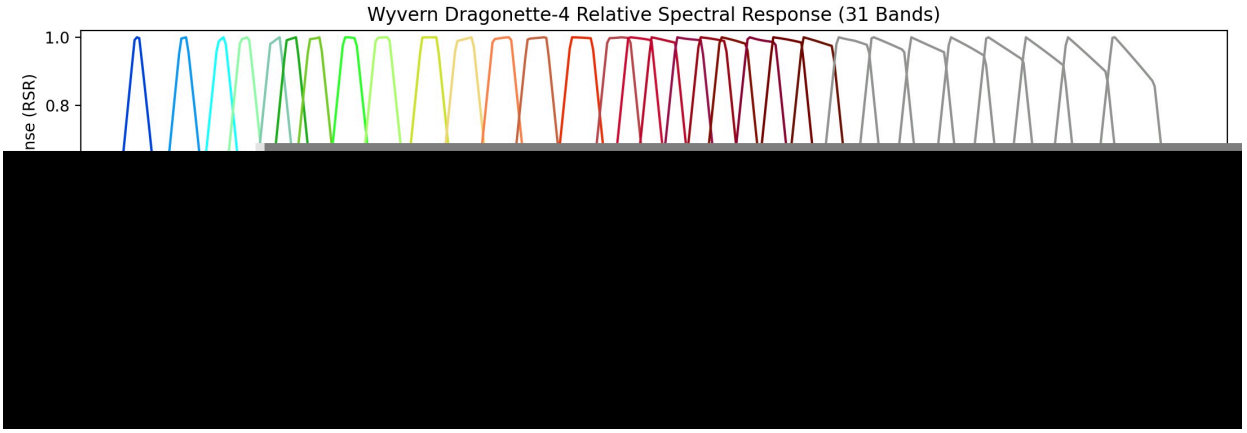
Relative spectral response for Dragonette-1 satellite



Relative spectral response for the Dragonette-2 satellite



Relative spectral response for the Dragonette-3 satellite



Relative spectral response for the Dragonette-4 satellite

Dragonette Constellation

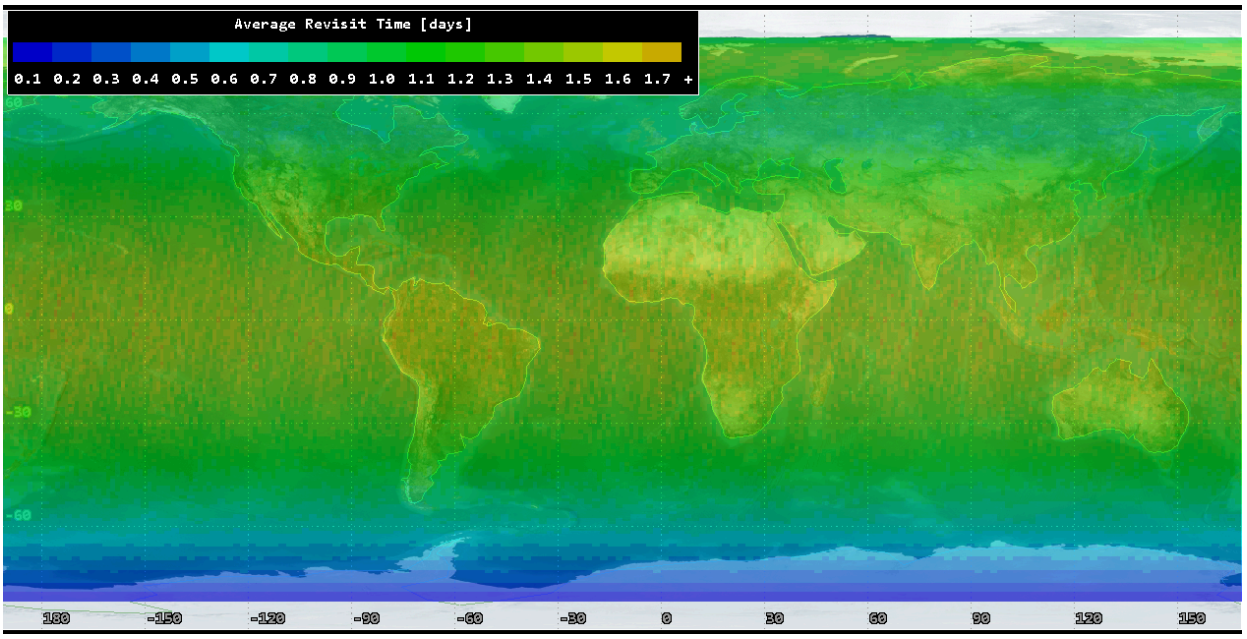
Wyvern's operational Dragonette constellation consists of 6U cubesat satellites that were launched into low Earth orbit (LEO). All satellites in the Dragonette constellation operate in sun-synchronous orbit (SSO) and provide hyperspectral imaging in the visible and near-infrared (VNIR) wavelengths. Each Dragonette satellite has an orbital period of approximately 15 orbits per day with approximately 24° of longitude ground-track separation between orbital passes at the equator. The imageable latitude range for the Dragonette satellites in SSO is within the range of +82°N to -82°S but at extreme high latitudes imaging is only available for a limited number of days near the summer solstice.

The orbital parameters for the Dragonette satellites for epoch date 2025-08-11 UTCG are in the table below.

Satellite Name	Launch Date	Altitude (km)	Orbit Period (minutes)	Orbit Inclination (degrees)	Crossing Node (time)	Nadir Repeat (days)
Dragonette-1	2023-04-15	534.3	95.2	97.4°	09:39 LTAN	15.13
Dragonette-2	2023-06-12	514.2	94.8	97.8°	14:33 LTDN	15.19
Dragonette-3	2023-11-11	525.4	95.0	97.4°	09:50 LTDN	15.16
Dragonette-4	2025-03-15	543.3	95.4	97.7°	10:31 LTAN	15.09

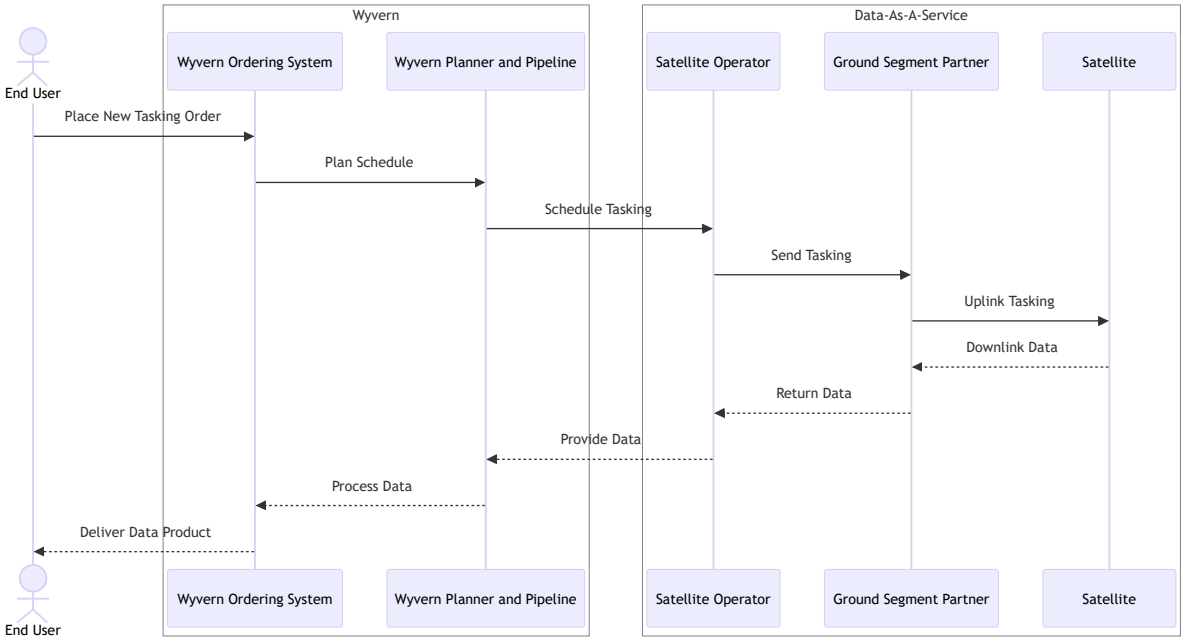
Orbital parameters for operational satellites in the Dragonette constellation

Wyvern's current Dragonette constellation has an average revisit time of 1.6 days at the equator with an at-nadir repeat cycle of approximately 15 days per individual satellite. While the satellites in the Dragonette constellation can collect imagery over open water their imaging operations are optimized and most well-suited for acquisition of HSI data over land.



Average revisit time for current Dragonette satellite constellation

Dragonette satellites are operated under spaceborne data-as-a-service (DaaS) agreements in partnership with AAC Clyde Space and Loft Orbital with additional uplink & downlink communication services provided by Kongsberg Satellite Services (KSAT). Furthermore, the order management workflow, data processing pipeline, imagery product generation and online HSI data product delivery are all hosted within Wyvern's secure AWS cloud infrastructure. The full order-to-delivery information management flow and data transmission pixel path for processing of tasking requests and collected raw data acquired by Dragonette satellites is illustrated in the figure below. Based on Wyvern's partnerships for space satellite communications and ground segment operations the HSI data collected by our Dragonette satellites is downlinked to various KSAT ground stations at strategic locations around the globe such as Svalbard and Troll. Wyvern has implemented rigorous operational protocols for Security & Confidentiality which includes strict privacy practices where no identifiable information is shared with any of our strategic space & ground segment mission partners.


Wyvern
Data-As-A-Service
End User
Wyvern Ordering System
Wyvern Planner and Pipeline
Satellite Operator
Ground Segment Partner
Satellite
Place New Tasking Order
Plan Schedule
Schedule Tasking
Send Tasking
Uplink Tasking
Downlink Data
Return Data
Provide Data
Process Data
Deliver Data Product
End User
Wyvern Ordering System
Wyvern Planner and Pipeline
Satellite Operator
Ground Segment Partner
Satellite

Processing Levels

When placing an order for satellite imagery, users can select the desired processing level to best suit their needs.

Level-2A Surface Reflectance

Level-2A products are surface reflectance imagery that have undergone atmospheric correction and reprojection to a projected map coordinate system. These products are designed for users who don't have unique atmospheric correction requirements and prefer ready-to-use data for analysis.

Atmospheric Correction

Level-2A products are atmospherically corrected using the 6S radiative transfer model and MODIS provided atmospheric data. When MODIS atmospheric data is unavailable for a scene, the correction falls back to forecasted atmospheric parameters.

Key Features

Pixel Units and Scale

- Units for surface reflectance are unitless, represented as an empty string (`""`) in the metadata.
- Delivered as a raster dataset with 16-bit unsigned integer (uint16) data type.
- Pixel values are scaled integers with a scale factor (i.e., 0.0001) to convert to float reflectance. This approach optimizes file size storage while maintaining precision.
- **Example:**

```
{
    "nodata": 65535,
    "sampling": "area",
    "data_type": "uint16",
```

```
    "unit": "",
    "scale": 0.0001,
    "offset": 0
}
```

Consistent Reprojection and Pixel Size

- Reprojected to Universal Transverse Mercator (UTM) / WGS84, with the UTM zone and hemisphere determined by the center pixel of the image scene.
  - **Example:**

    ```
    "proj:epsg": 32611
    ```

- Output pixel size is 5 m x 5 m in the projected coordinate system.
- Downstream masks (pixel quality mask, cloud mask, etc.) use the same projection and pixel size for consistency.

Geometric accuracy

- Wyvern's Level-2A products have the same geometric accuracy as Level-1B and are not orthorectified. We plan on improving the geometric accuracy in future releases.

Level-1B Top-of-Atmosphere Radiance

Level-1B products are hyperspectral imagery that have been geometrically corrected to a map-projected north-up Geographic WGS84 (EPSG:4326) coordinate system and radiometrically corrected to top-of-atmosphere radiance. These products are suitable for advanced analytical techniques and industry-standard radiometric and geometric processing.

Key Features

Radiometric Correction and Pixel Units

- Delivered as a raster dataset with 32-bit floating point (float32) data type.
- Pixel values represent top-of-atmosphere (TOA) radiance.
- Units are 'W / (m^2 * sr * μm)' (watts per square meter per steradian per micrometer).

- No scaling factor is required; values are in physical units.
- **Example:**

```
{
  "nodata": -9999,
  "sampling": "area",
  "data_type": "float32",
  "unit": "W·sr-1·m-2·µm-1",
  "scale": 1.0,
  "offset": 0
}
```

Geometric Correction and Coordinate System

- Imagery is georeferenced to Geographic WGS84 (EPSG:4326).
  - **Example:**

```
"proj:epsg": 4326
```

- The spatial X & Y cell size of each pixel is defined in angular longitude & latitude degrees.
- Pixel cell size is set to the angular degree equivalents of 5 m x 5 m at the latitude of the image center.
- Pixel cell size in will be non-square and vary based on latitude (e.g., at 40°N: Lon=0.0000586° x Lat=0.0000450°).

Metadata and Analytical Applications

- Metadata enables radiometric & geometric data processing and advanced analytics (deep learning, machine learning, spectral indices, classification, anomaly detection, material identification, sub-pixel mixture analysis, spectral target detection).

Product Delivery

Wyvern delivers imagery data products via Amazon Web Services (AWS) Simple Storage Service (S3) bucket storage and all imagery data products are deemed accepted upon delivery. Each individual client organization will have their own dedicated isolated S3 bucket for imagery data product delivery ensuring confidentiality and privacy is maintained via organizational data isolation while following standard cloud cybersecurity protocols.

Once imagery data products are delivered to the S3 bucket within Wyvern's AWS S3 an email notification is sent with temporary download links that expire after 7 days. However, any given imagery data product delivery can be re-fulfilled upon request to Wyvern.

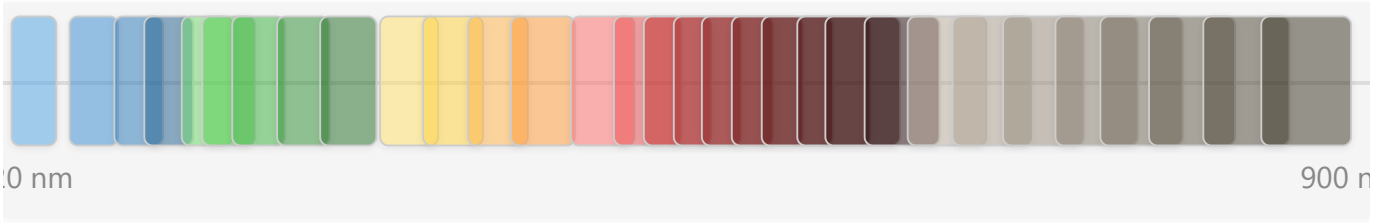
Data products can also be delivered via Wyvern's Tasking API for API users.

See Product Format for details on the structure of the delivered ZIP bundle package.

Product Specifications

Below are the key specifications for Wyvern's imagery data products. For details on spectral, spatial, temporal, and geolocation accuracy, see the tables that follow.

Dragonette Spectral Bands Overview



Dragonette Constellation Specifications

Property	Dragonette-1	Extended VNIR (Dragonette-2/3/4)
Number Of Spectral Bands	23 Bands	31 Bands
Spectral Band Centre Wavelength Range (VNIR)	503 nm – 799 nm	445 nm – 870 nm
Spectral Sampling – Band Centre-to-Centre	7 nm – 21 nm	10 nm – 20 nm
Spectral Resolution – Bandwidth (FWHM)	20 nm – 32 nm	16 nm – 30 nm

Wyvern's spectral imagery data product specifications

Property	Dragonette-1/2/3/4
Ground Sample Distance (GSD)	5.3 m
Constellation Average Revisit Time At Equator	1.6 Days
Constellation Average Revisit Time At 20° Latitude	1.5 Days
Constellation Average Revisit Time At 40° Latitude	1.2 Days
Constellation Average Revisit Time At 60° Latitude	0.7 Days
Minimum Sun Elevation Angle (SEA)	+15° Above Horizon
Imageable Latitude Range	+82°N to -82°S
Imaging Sensor Bit Depth	10-Bit
Estimated Average Signal-to-Noise (SNR) At Nadir	60:1 (Wavelength Dependent)
Image Raster File Format	Cloud-Optimized GeoTIFF (COG)
Metadata Sidecar File Format	STAC Text (JSON)
Image Scene Swath Width At Nadir	20 km (Fixed)
Off-Nadir Angle (ONA) Range	0° – 20°
Standard Image Scene Size	400 km2

Wyvern's standard imagery data product specifications

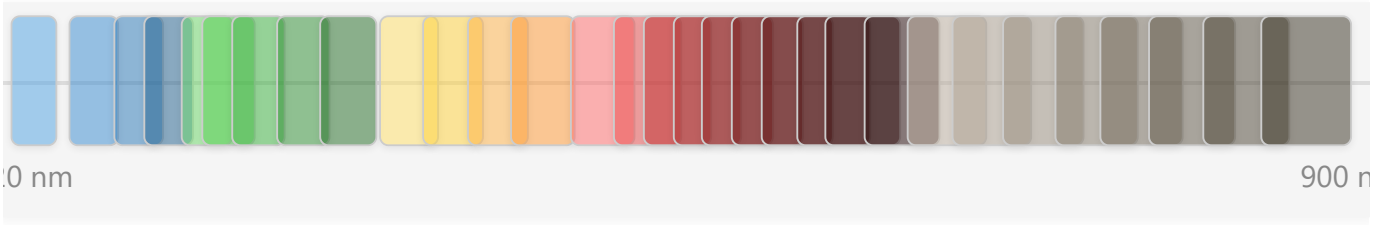
Comparison of Processing Levels

Property	L1B	L2A
Image Raster Data Type	32-Bit Floating Point (float32)	16-Bit Unsigned Integer (uint16), scaled reflectance
Geolocation Accuracy Over Land (CE90)	25 m to 100 m (Dependent Upon Location)	25 m to 100 m (Dependent Upon Location)
Image Pixel Units	Top-of-Atmosphere Radiance ($W / (m^2 * sr * \mu m)$)	Surface Reflectance (unitless, scaled)
Map Projection Coordinate System	Geographic WGS84 (EPSG 4326)	UTM / WGS84

Spectral Bands

The tables below delineate the spectral characteristics of the hyperspectral imaging sensor on each of the Dragonette satellites. Wyvern strategically operates the hyperspectral imaging sensor on each Dragonette satellite to collect HSI data products with band centre wavelengths that are aligned with existing commercial (e.g., PlanetScope) and science mission (e.g., Landsat, Sentinel, etc.) satellite remote sensing data sources.

Dragonette Spectral Bands Overview



Constellation Spectral Bands

Dragonette-1 Band Centre Wavelength (CWL) (nm)	Dragonette-1 Full Width at Half Maximum (FWHM) (nm)	Extended VNIR (Dragonette-2/3/4) Band Centre Wavelength (CWL)* (nm)	Extended VNIR (Dragonette-2/3/4) Full Width at Half Maximum (FWHM) (nm)
n / a	n / a	445	15.6
n / a	n / a	465	16.3
n / a	n / a	480	16.8

Dragonette-1 Band Centre Wavelength (CWL) (nm)	Dragonette-1 Full Width at Half Maximum (FWHM) (nm)	Extended VNIR (Dragonette-2/3/4) Band Centre Wavelength (CWL)* (nm)	Extended VNIR (Dragonette-2/3/4) Full Width at Half Maximum (FWHM) (nm)
n / a	n / a	490	17.2
503	20.1	503	17.6
510	20.4	510	17.9
519	20.8	520	18.2
535	21.4	535	18.7
549	22.0	550	19.3
570	22.8	570	20.0
584	23.4	585	20.5
600	24.0	600	21.0
614	24.6	615	21.5
635	25.4	635	22.2
649	26.0	650	22.8
660	26.4	660	23.1
669	26.8	670	23.5
679	27.2	680	23.8
690	27.6	690	24.2
699	28.0	700	24.5

Dragonette-1 Band Centre Wavelength (CWL) (nm)	Dragonette-1 Full Width at Half Maximum (FWHM) (nm)	Extended VNIR (Dragonette-2/3/4) Band Centre Wavelength (CWL)* (nm)	Extended VNIR (Dragonette-2/3/4) Full Width at Half Maximum (FWHM) (nm)
711	28.4	712	24.9
722	28.9	722	25.3
734	29.4	735	25.7
750	30.0	750	26.3
764	30.6	765	26.8
782	31.3	782	27.4
799	32.0	800	28.0
n / a	n / a	815	28.5
n / a	n / a	832	29.1
n / a	n / a	850	29.8
n / a	n / a	870	30.5

The spectral characteristics of the Dragonette satellites imaging sensor.

**Extended VNIR band center wavelengths are within +/- 1 nm from these values. Individual satellites have consistent band center wavelengths.*

Individual Satellite Spectral Bands

Dragonette-1 Band Centre Wavelength (CWL) (nm)	Dragonette-2 Band Centre Wavelength (CWL) (nm)	Dragonette-3 Band Centre Wavelength (CWL) (nm)	Dragonette-4 Band Centre Wavelength (CWL) (nm)
n / a	445	445	444
n / a	465	464	464
n / a	480	480	480
n / a	490	490	490
503	503	503	503
510	510	510	510
519	520	519	520
535	535	534	535
549	550	550	549
570	570	569	569
584	585	585	584
600	600	600	600
614	615	614	615
635	635	634	634
649	650	650	650
660	660	659	659
669	670	669	669
679	680	679	680

Dragonette-1 Band Centre Wavelength (CWL) (nm)	Dragonette-2 Band Centre Wavelength (CWL) (nm)	Dragonette-3 Band Centre Wavelength (CWL) (nm)	Dragonette-4 Band Centre Wavelength (CWL) (nm)
690	690	689	690
699	700	700	699
711	712	712	711
722	722	722	722
734	735	734	735
750	750	749	750
764	765	764	765
782	782	781	782
799	800	799	799
n / a	815	814	815
n / a	832	832	832
n / a	850	849	850
n / a	870	869	870

The spectral characteristics of the each Dragonette satellites.