

# HySpex

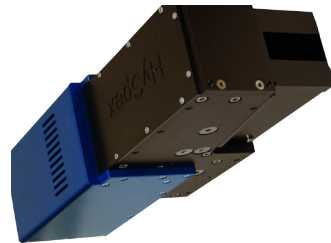
## HySpex models overview

All HySpex cameras (except ODIN) can be used for both ground based and airborne applications. The cameras can be delivered with a wide range of close-up lenses, making them very versatile and ideal for a wide range of applications requiring different spatial resolutions without compromising the optical performance of the system.

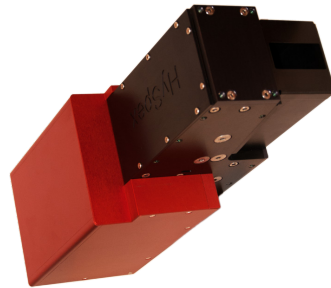
### Main specifications

	VNIR-1024	VNIR-1600	VNIR-1800	SWIR-384	ODIN-1024
<b>Spectral sampling</b>	400 – 1000 nm	400 – 1000 nm	400 – 1000 nm	930-2500 nm	400 - 2500 nm
<b>Spatial pixels</b>	1024	1600	1800	384	1024
<b>Spectral channels</b>	108	160	182	288	427
<b>Spectral sampling</b>	5.4 nm	3.7 nm	3.26 nm	5.45 nm	3.0 nm   6.1 nm
<b>FOV</b>	16.1°	17°	17°	16°	15°
<b>Pixel FOV across/along</b>	0.28/0.56 mrad	0.18/0.36 mrad	0.16/0.32 mrad	0.73/0.73 mrad	0.25/.025 mrad
<b>Bit resolution</b>	12 bit	12 bit	16 bit	16 bit	16 bit
<b>Noise floor</b>	11 e <sup>-</sup>	40 e <sup>-</sup>	2.4 e <sup>-</sup>	150 e <sup>-</sup>	2.4 e <sup>-</sup>   150 e <sup>-</sup>
<b>Dynamic range</b>	3400	1000	20000	7500	37000   7500
<b>Peak SNR</b>	> 330	> 200	> 255	> 1100	> 500   > 1300
<b>Max speed</b>	690 fps	160 fps	180 fps	450 fps	180 fps   450 fps
<b>Power consumption</b>	6 W	6 W	30 W	30 W	60 W
<b>Dimensions (l-w-h)</b>	30.5 – 9.9 – 15 cm	36 – 9.9 – 15 cm	39 – 9.9 – 15 cm	38 – 12 – 17.5 cm	113.4 – 42.3 – 72.6 cm
<b>Weight</b>	4.2 kg	4.6 kg	5.0 kg	5.7 kg	105 kg

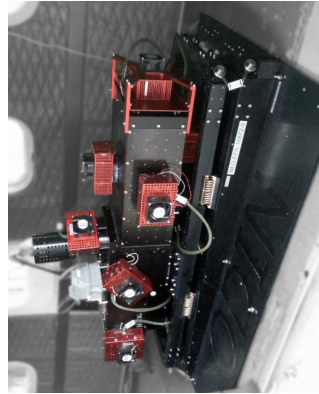
(VNIR | SWIR)



HySpex VNIR-1800



HySpex SWIR-384



HySpex ODIN-1024

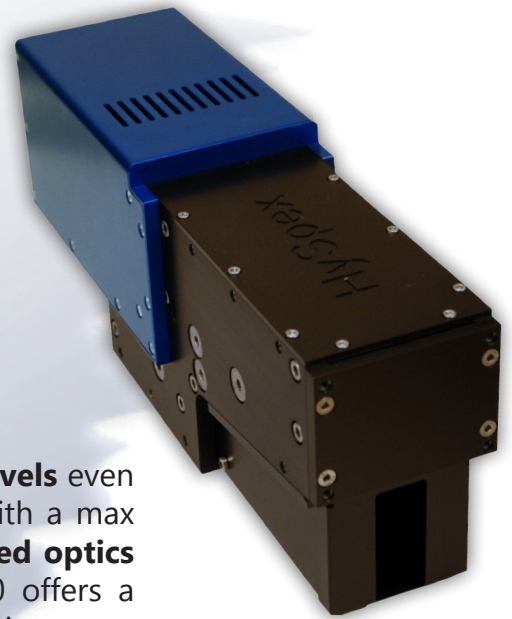
## HySpex VNIR-1800

The new HySpex VNIR-1800 **hyperspectral camera** from NEO, is developed for **field, laboratory, airborne** and **industrial** applications.

HySpex VNIR-1800 utilize a cutting edge **actively cooled and stabilized scientific CMOS** detector. This makes VNIR-1800 the ideal camera for high-end data acquisitions where **high radiometric accuracy** is required.

The dynamic range of 20 000 ensures **outstanding SNR levels** even in darker areas of an image of highly dynamic scenes. With a max frame rate of **180 fps**, combined with **aberration corrected optics** and **high optical throughput** (f/2.5), HySpex VNIR-1800 offers a unique combination of data quality, high speed and sensitivity.

A wide range of **close-up lenses** allows the use of the camera at working distances ranging from a few cm **with a spatial resolution of 24  $\mu\text{m}$** , to infinity for e.g. **airborne remote sensing**.



*Flight line with vegetation enhanced in red to the right.*

### Main specifications

Spectral sampling	400 – 1000 nm
Spatial pixels	1800
Spectral channels	182
Spectral sampling	3.26 nm
FOV	17°
Pixel FOV across/along	0.16/0.32 mrad
Bit resolution	16 bit
Noise floor	2.4 e <sup>-</sup>
Dynamic range	20000
Peak SNR (at full resolution)	> 255
Max speed	180 fps
Power consumption	30 W
Dimensions (l-w-h)	39 – 9.9 – 15 cm
Weight	5.0 kg

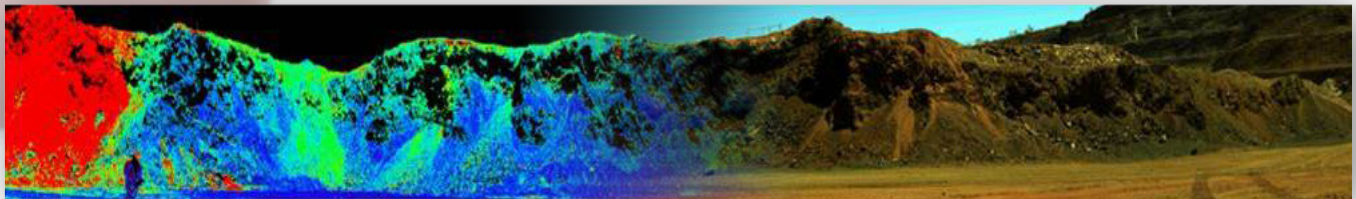
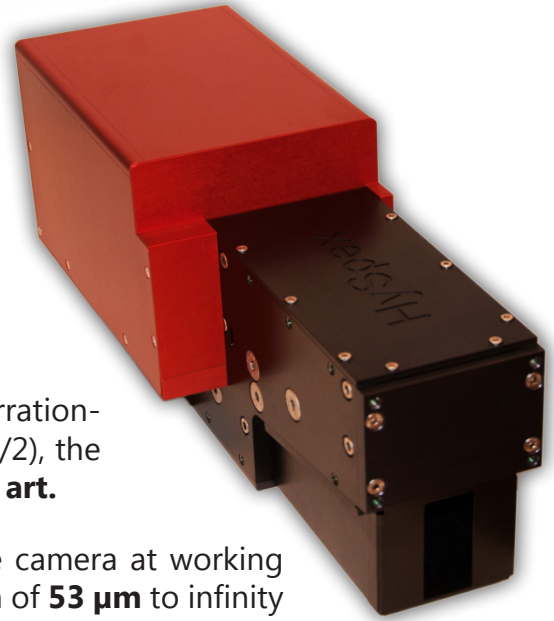


## HySpex SWIR-384

The new HySpex SWIR-384 hyperspectral camera from NEO, is developed for **field, laboratory, airborne and industrial applications**. The new state of the art MCT sensor with cooling down to 150K yields low background noise, high dynamic range and **exceptional SNR levels**.

With a max frame rate of **450 fps**, combined with an aberration-corrected optical system with high optical throughput (f/2), the **data quality, speed and sensitivity** is truly **state of the art**.

A wide range of **close-up lenses** allows the use of the camera at working distances ranging from a few cm with a spatial resolution of **53  $\mu\text{m}$**  to infinity for e.g. airborne remote sensing.



*Kaolinite abundance map (courtesy: CSIRO, Minerals Down Under Flagship Minerals Down Under Flagship)*

### Main specifications

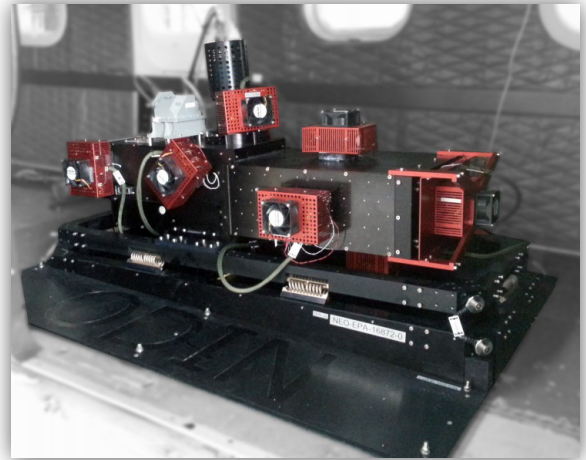
Spectral sampling	930-2500 nm
Spatial pixels	384
Spectral channels	288
Spectral sampling	5.45 nm
FOV	16°
Pixel FOV across/along	0.73/0.73 mrad
Bit resolution	16 bit
Noise floor	150 e <sup>-</sup>
Dynamic range	7500
Peak SNR (at full resolution)	> 1100
Max speed	450 fps
Power consumption	30 W
Dimensions (l-w-h)	38 – 12– 17.5 cm
Weight	5.7 kg

## HySpex ODIN-1024

HySpex ODIN-1024 is a **next generation** state-of-the-art airborne hyperspectral imager, covering the spectral range from **400 to 2500 nm**.

**Perfect co-registration** between 1024 spatial pixels for VNIR and SWIR is achieved by employing a novel **common fore-optics** design.

In addition to the **extreme resolution**, the unique design provides high sensitivity and low noise, low spatial and spectral misregistration (smile and keystone).



In addition to its supreme data quality, HySpex ODIN-1024 includes **real-time data processing** functionalities such as **real-time georeferencing** of acquired images. It also features built-in **on-board calibration** system to monitor the stability of the instrument.



*False color VNIR and SWIR representation of flight line acquired during ODIN test flight.*

### Main specifications

Spectral sampling	0.4 - 1.0 $\mu\text{m}$   0.95 - 2.5 $\mu\text{m}$
Spatial pixels	1024
Spectral channels	427
Spectral sampling (VNIR   SWIR)	3.0 nm   6.1 nm
FOV	15°
Pixel FOV across/along	0.25/.025 mrad
Bit resolution	16 bit
Noise floor (VNIR   SWIR)	2.4 e <sup>-</sup>   150 e <sup>-</sup>
Dynamic range (VNIR   SWIR)	37000   7500
Peak SNR (at full resolution)	> 500   >1300
Max speed	180 fps   450 fps
Power consumption	60 W
Dimensions (l-w-h)	113.4 – 42.3 – 72.6 cm
Weight	105 kg

(VNIR | SWIR)



# HySpex

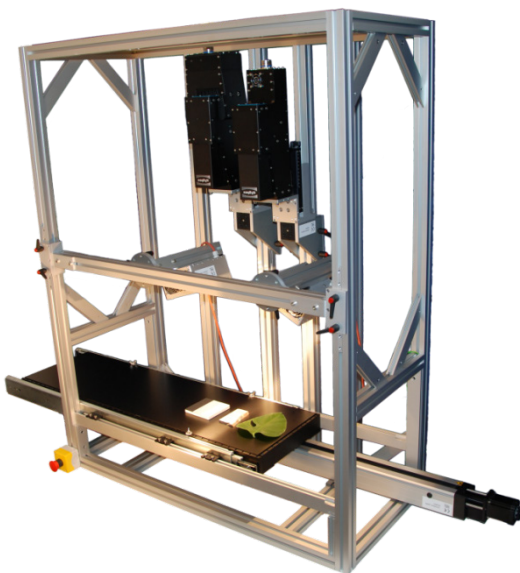
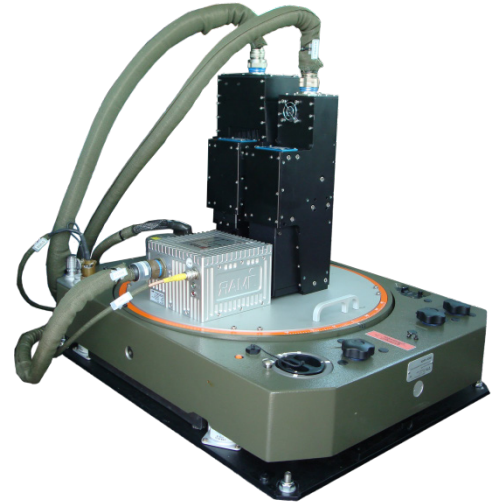
## Airborne Applications

**High resolution** and **high speed**, combined with **low weight and power** consumption, make NEO's HySpex cameras very well suited for airborne data acquisition.

A typical airborne installation consists of the **HySpex cameras** coupled with an **airborne data acquisition unit**, a navigation system (**IMU/GPS**) and a **mounting platform**.

Both **actively stabilized** and **passively damped** mounting platforms can be supplied, as well as standard mounting plates with **no damping**.

**IMU/GPS solutions** from **leading manufacturers** can be supplied and integrated with the cameras. Alternatively, HySpex systems can be interfaced with the customer's existing navigational hardware.



## Laboratory Setup

For lab and field use, a scanning stage is needed to scan the cameras and build the hyperspectral data cube of the scene. A **user friendly table-top lab setup** with translation stage, VNIR-SWIR light sources and close-up lenses can also be supplied for scanning of samples of varying sizes.

The scanning speed is **automatically controlled** by the data acquisition unit, based on the selected lens option. The lab rack includes a camera adjustment platform, to facilitate camera **focus adjustment** when using different close-up lenses.

## Field Setup

For **field operations**, NEO supplies a range of high precision rotation stages tailored to fit the number of cameras and the operational scheme. Long-life Li-ion **battery powered** solutions are available for increased **portability**

For **fast and precise scanning** of larger areas, such as a **mine face, outcrop** or **building**, NEO can supply an **automatic pan-tilt scanner**. By inputting the number of degrees and scan lines to scan in both the horizontal and vertical direction, the stage will automatically scan the **pre-programmed area**, ensuring the desired overlap between scan lines.

To ensure **stable and reliable acquisitions** in challenging field conditions, a **rugged, yet portable, tripod** is supplied. NEO supplies a variety of tripods with pan/tilt-heads that will accommodate the payload of the cameras and rotation stage used.

