



The Portable Remote Imaging Spectrometer (PRISM): High altitude platform installation



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PRISM Sensor and history

PRISM is a state-of-the-art imaging spectrometer optimized for the needs of coastal ocean science, providing high SNR and dynamic range, low polarization sensitivity, high spatial resolution, and high uniformity.

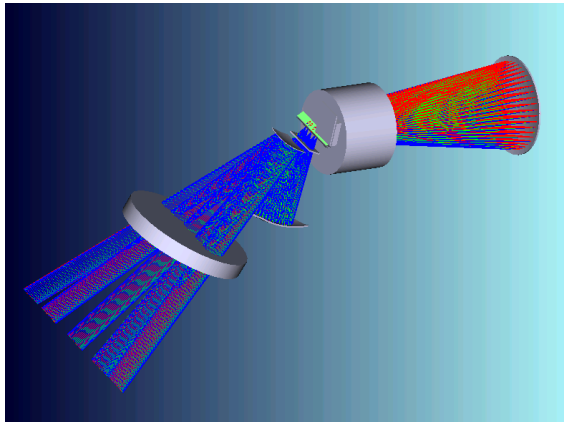


- PRISM development award: 2009
- First flight: May 2012
- First science campaign: Aug. 2012
- Additional science campaigns: January 2014, May 2014, September 2014

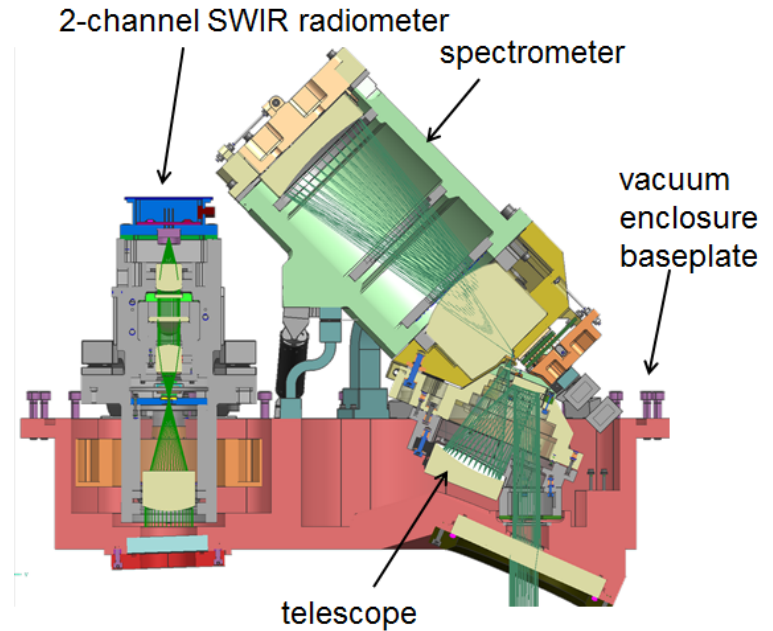
- All campaigns utilized Twin Otter Aircraft (GRC and TOIL).
- Typical altitude range 1-10 kft.
- Reached maximum TO aircraft altitude of >20 kft in May 2014.



PRISM specifications and design



High throughput and high uniformity Dyson spectrometer

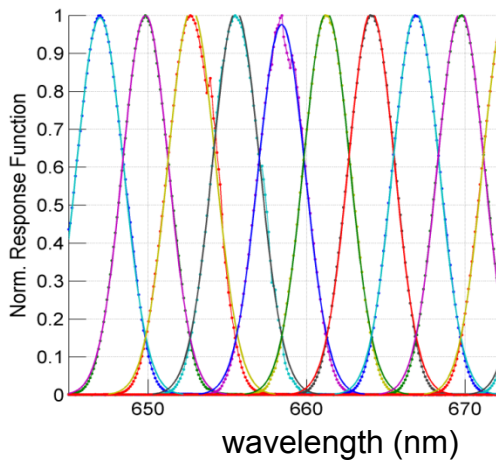


Spectral	Range	349.9 – 1053.5 nm
	Sampling	2.83 nm
	Resolution (FWHM)	3.5 nm typ
	Calibration uncertainty	<0.1 nm
Spatial	Field of view	30.7°
	Instantaneous FOV sampling	0.882 mrad
	IFOV resolution (FWHM)	0.97 mrad
	Cross-track spatial pixels	608
Radiometric	Range	0 – 99% R
	Sampling	14 bit
	Calibration uncertainty	<2%
	Signal to Noise Ratio *	500 @ 450 nm
	Polarization variation	<1%
Uniformity	Spectral cross-track uniformity	>95%
	Spectral IFOV uniformity	>95%

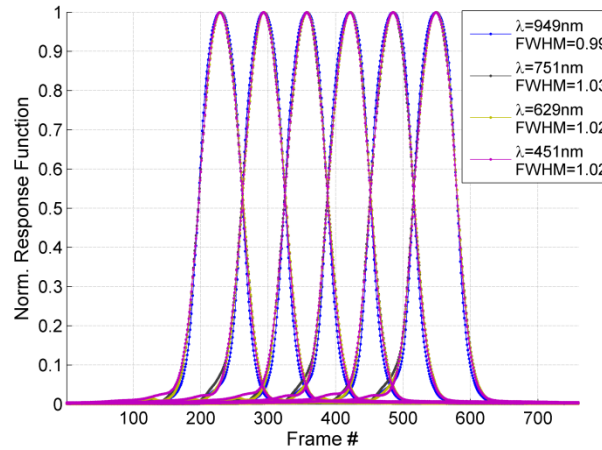
Parameter	Channel 1	Channel 2
Channel center (nm)	1242	1608
Bandwidth (nm, FWHM)	22	56
FOV (mrad, FWHM)	2.4	2.4
Boresight knowledge (mrad, rel. to spectr.)	0.05	0.05
Sampling	13 bit	13 bit
SNR @ 1.2 mW/cm ² sr	325	390



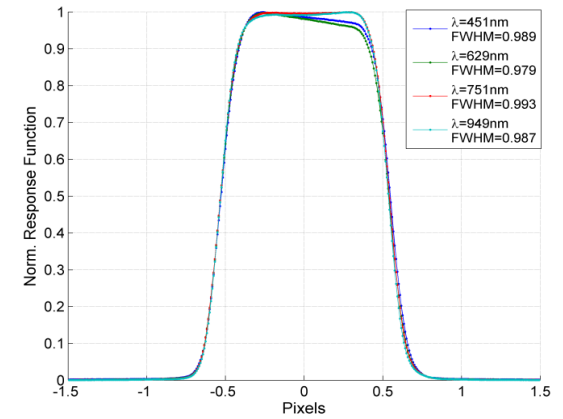
PRISM characteristics



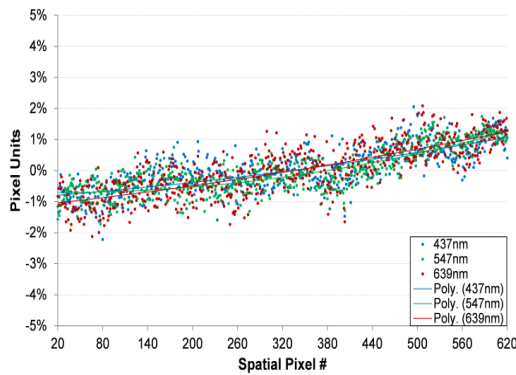
Spectral response uniform through field



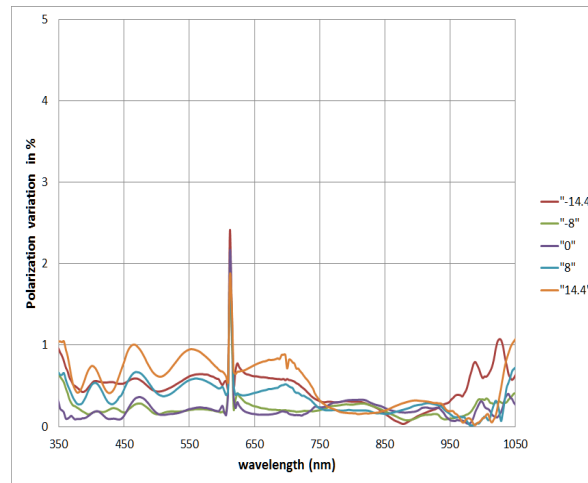
Spatial response uniform through wavelength (x)



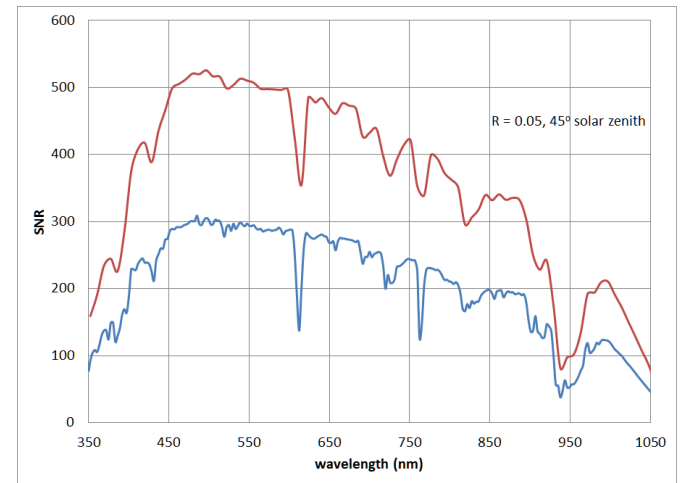
Spatial response uniform through wavelength (a)



Spectral calibration constant through field



Polarization sensitivity <1%



High SNR for single read one channel, and 3-channel aggregate, 5% R.

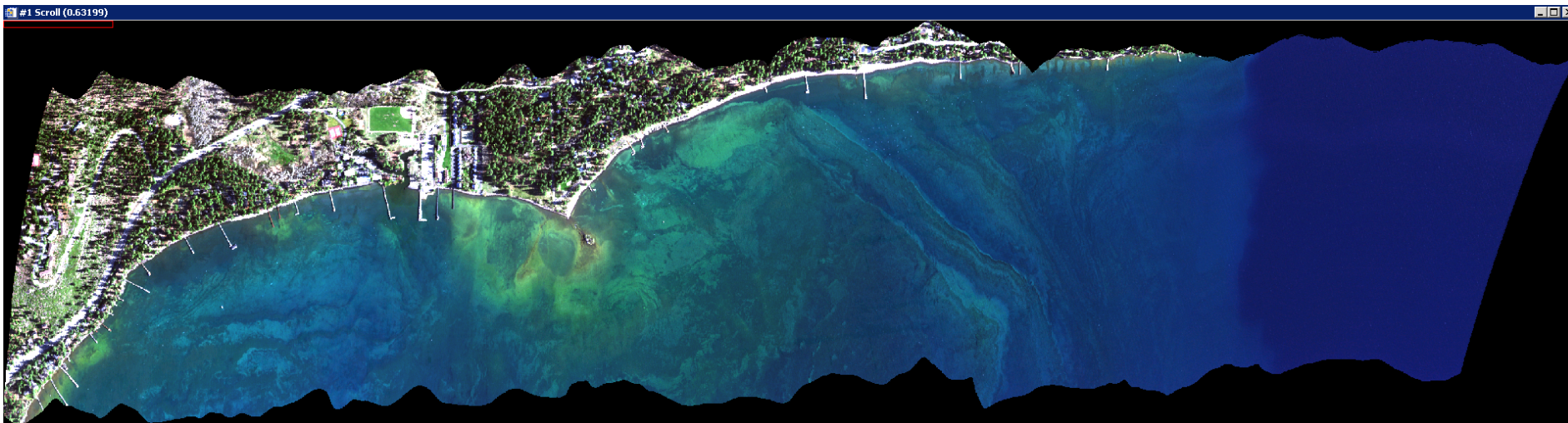


Orthorectification

PRISM Tahoe Radiance before and after orthorectification

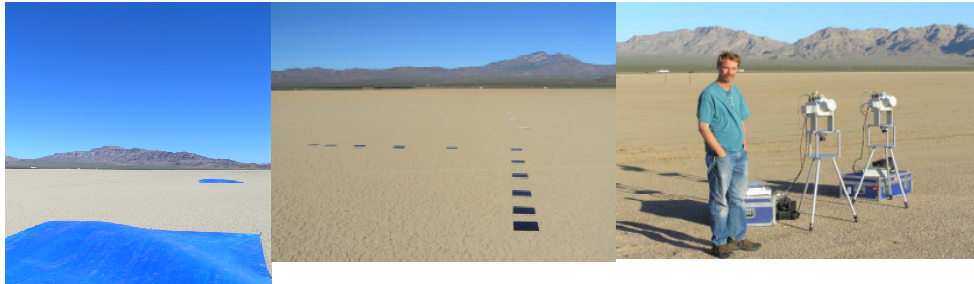


PRISM along track oversampling increases SNR





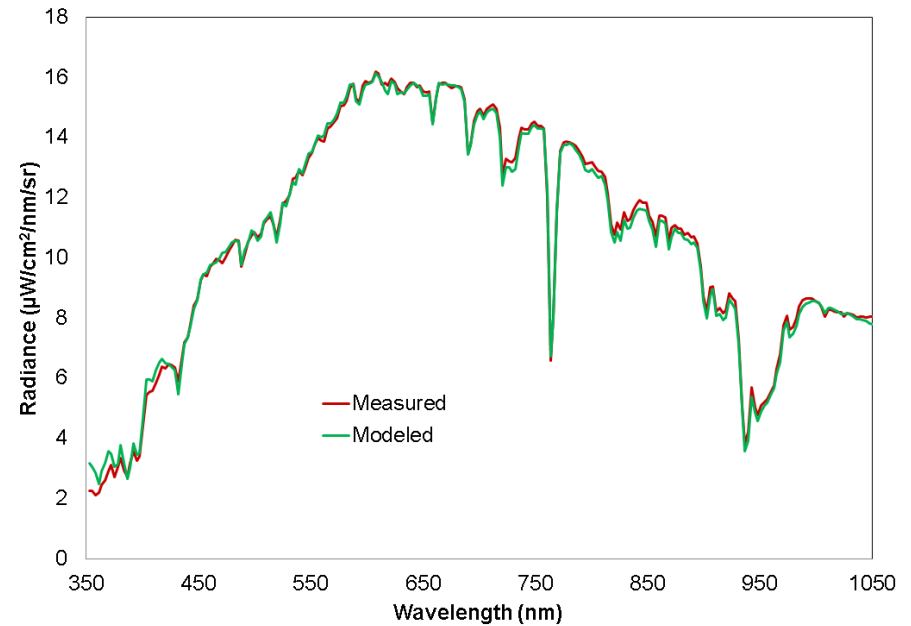
PRISM calibration



From left to right, Ivanpah Playa calibration site marked with tarps, dark tile targets, portable solar radiometers.



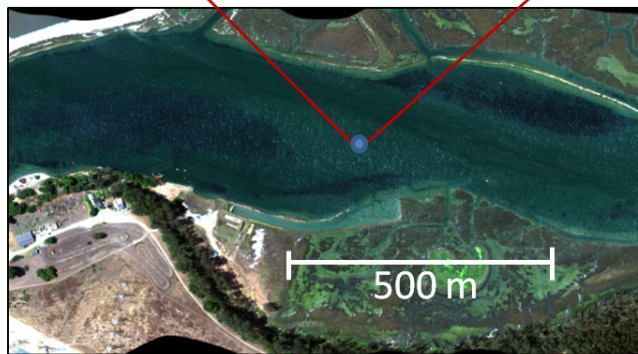
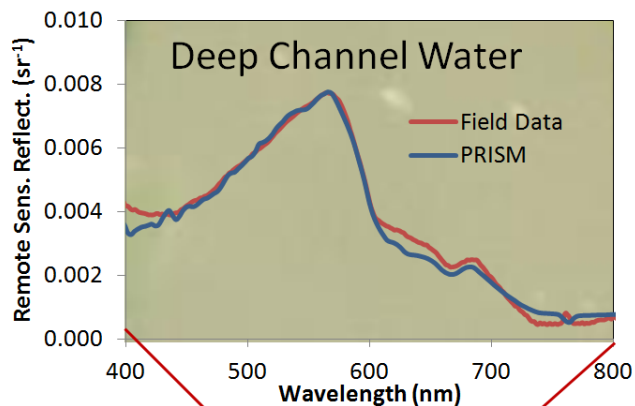
1' sq. targets placed 1' apart at corner, well resolved by PRISM



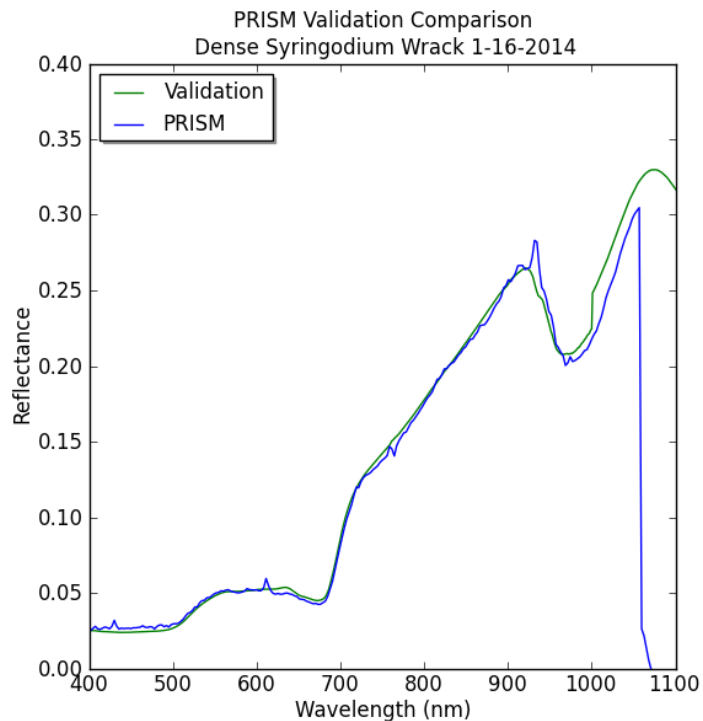
PRISM-measured radiance vs. ground radiance with MODTRAN atmospheric model



PRISM validation



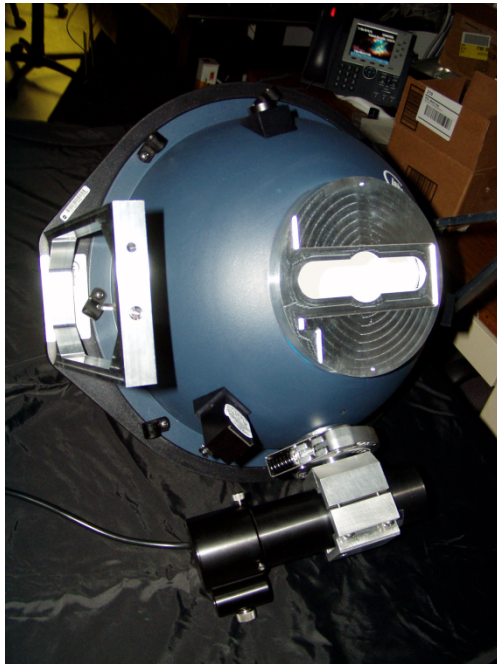
Elkhorn Slough, 2012



Florida Keys, 2014

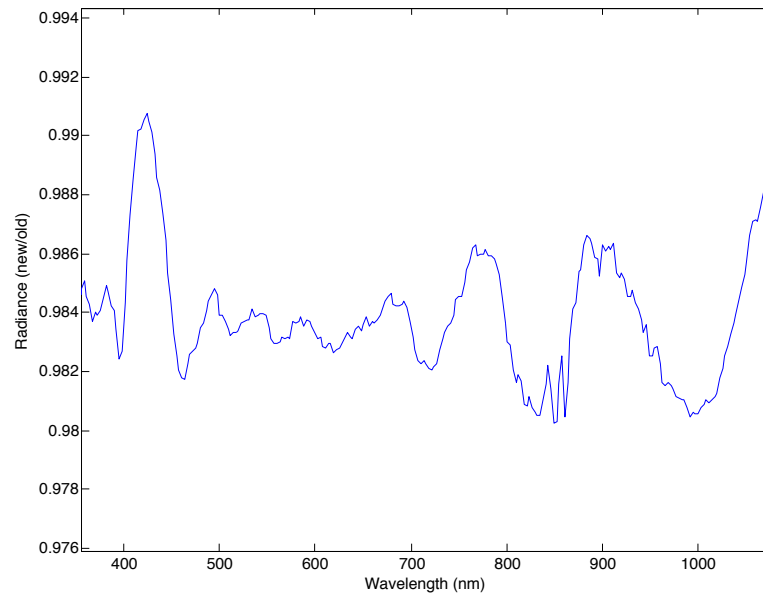


Calibration and stability



Integrating sphere for spectral and radiometric field calibration

Radiance ratio (Sept / Feb)





Data dissemination

<http://prism.jpl.nasa.gov>

File Edit View History Bookmarks Tools Help

PRISM website: Home

prism.jpl.nasa.gov

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PRISM

Portable Remote Imaging Spectrometer

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- PRISM Data
- Quicklooks
- Publications
- Contact
- News and Information

About PRISM

The coastal zone is home to a high fraction of humanity and is increasingly affected by natural and human-induced events from tsunamis to toxic blooms and oil spills. Current satellite data provide a broad overview of these events but do not have the necessary spectral, spatial and temporal resolution to characterize and understand them.

To address this gap, a compact, lightweight, airborne Portable Remote Imaging Spectrometer (PRISM) compatible with a wide range of piloted and Uninhabited Aerial Vehicle (UAV) platforms was developed at the Jet Propulsion Laboratory. Optimized for the spectral range between 350 nm and 1050 nm, PRISM offers high temporal resolution and below cloud flight altitudes to resolve spatial features as small as 30 cm. The sensor performance defines the state of the art in light throughput, spectral and spatial uniformity, and polarization insensitivity.

Latest News

- View 2014 Quicklooks
- Download sample PRISM data products

PORTABLE REMOTE IMAGING SPECTROMETER
PRISM
JET PROPULSION LABORATORY • NASA

10:37 AM
10/19/2014



Downloadable data

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PRISM Data Products

Below are sample data sets as acquired on 18 and 19 of January 2014 in Florida and 24 July 2012 in the Monterey Bay County area.

If you would like a copy of the [historic PRISM data](#), please contact Pantazis Mouroulis (zakos@jpl.nasa.gov), Robert Green (rog@jpl.nasa.gov), or Sarah Lundeen (sarah.r.lundeen@jpl.nasa.gov) and we will place the data on an FTP site for you to download.

L1B Data Products

Grass Line, FL - [View quicklook](#) | [Download data \(4.5 GB\)](#)

Island Line, FL - [View quicklook](#) | [Download data \(4 GB\)](#)

Elkhorn, CA - [View quicklook](#) | [Download data \(19 GB\)](#)

Elkhorn, CA - [View quicklook](#) | [Download data \(21 GB\)](#)

Elkhorn, CA - [View quicklook](#) | [Download data \(21 GB\)](#)

[View data product readme file.](#)

L2 Data Products

Grass Line, FL - [View quicklook](#) | [Download data \(4.8 GB\)](#)

Island Line, FL - [View quicklook](#) | [Download data \(4.1 GB\)](#)

Elkhorn, CA - [View quicklook](#) | [Download data \(7.4 GB\)](#)

Elkhorn, CA - [View quicklook](#) | [Download data \(8.2 GB\)](#)

Elkhorn, CA - [View quicklook](#) | [Download data \(8.1 GB\)](#)

[View data product readme file.](#)

NOTE: If you are having difficulty accessing the sample data sets above, please follow the instructions below.

For Windows Users using Internet Explorer,

- 1. Open "My Computer.*
- 2. Copy and paste the text below in the field at the top, <ftp://popo.jpl.nasa.gov/PRISMData/>*

For Windows and Mac Users using Google Chrome, Firefox, or Safari,

Click the link below. <ftp://popo.jpl.nasa.gov/PRISMData/>





Example data upon request

2014 PRISM Flights

Click on Site Info to view Flight Information

Flight ID	Site Info
prm20140107t	Grand Junction Airport runway and wiggle test
prm20140113t	Sea Grass Lines 49-59
prm20140114t	Grass to Reef Lines 16-26
prm20140116t	Airport/Ortho and Long Key
prm20140118t	Sea Grass Lines 60 - 64
prm20140119t	Island and Grass to Reef Lines
prm20140122t	Grand Junction Wiggle Test and Airport/Ortho Lines
prm20140416t	Airport wiggle test, Fruita, Airport runway
prm20140423t	Hangar calibration (spectral/SWIR)
prm20140428t	Hangar calibration (SWIR/spectral), Suisun Marsh
prm20140429t	Hangar calibration (spectral/SWIR), Suisun Marsh
prm20140507t	Suisun Marsh
prm20140929t	Agua Hediona, Batiquitos, La Jolla, CA
prm20140930t	San Diego Bay, CA

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Quicklooks

prism....prm20120724t

prism.jpl.nasa.gov/cgi/flights_12.cgi?step=view_flightlog&flight_id=prm20120724t

Getting Started

PRISM Flight: prm20120724t

Science Data

Click on Site Name to view Quicklook image

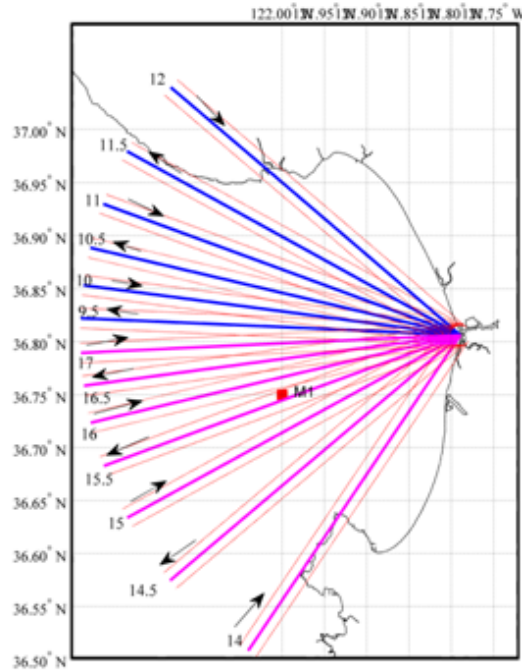
Run ID	Site Name	NASA Log #	Start Lat	Start Lon	Stop Lat	Stop Lon	Start GMT	Stop GMT	Comments
001645	Abort due to clouds		Heidi Dierssen				0016		Line aborted due to clouds
213510	Elkhorn Afternoon 4 (ortho-corrected)		Heidi Dierssen	36.79150525	-121.8377581	36.83910525	-121.7269517	2135	
214306	Elkhorn Afternoon 3 (ortho-corrected)		Heidi Dierssen	36.79535394	-121.8403434	36.84295394	-121.7295386	2143	
215220	Elkhorn Afternoon 2 (ortho-corrected)		Heidi Dierssen	36.79920263	-121.8429288	36.84680263	-121.7321256	2152	
220155	Elkhorn Afternoon 1 (ortho-corrected)		Heidi Dierssen	36.80305131	-121.8455143	36.85065131	-121.7347127	2201	
221057	Elkhorn Afternoon 5 (ortho-corrected)		Heidi Dierssen	36.78765656	-121.835173	36.83525656	-121.7243649	221057	
222029	Elkhorn Afternoon 6 (ortho-corrected)		Heidi Dierssen	36.78380788	-121.832588	36.83140788	-121.7217783	2220	
222910	Elkhorn Afternoon 7 (ortho-corrected)		Heidi Dierssen	36.77995919	-121.8300031	36.82755919	-121.7191918	2229	
223844	Elkhorn Afternoon 20 (ortho-corrected)		Heidi Dierssen	36.7956	-121.8384	36.8162	-121.7262	2238	
224716	Elkhorn Afternoon 19 (ortho-corrected)		Heidi Dierssen	36.7999	-121.8396	36.8205	-121.7274	2247	
225619	Elkhorn Afternoon 21 (ortho-corrected)		Heidi Dierssen	36.7913	-121.8372	36.8119	-121.7250	2256	
230459	Elkhorn Afternoon 22 (ortho-corrected)		Heidi Dierssen	36.7871	-121.8360	36.8077	-121.7237	2304	
231308	Elkhorn Afternoon 23 (ortho-corrected)		Heidi Dierssen	36.7828	-121.8347	36.8034	-121.7225	2313	
233522	Monterey Bay Hourly 1630		Heidi Dierssen	36.8063	-121.7893	36.7586	-122.2345	2335	
235603	Monterey Bay Hourly 1700		Heidi Dierssen	36.7896	-122.2381	36.8063	-121.7893	2356	





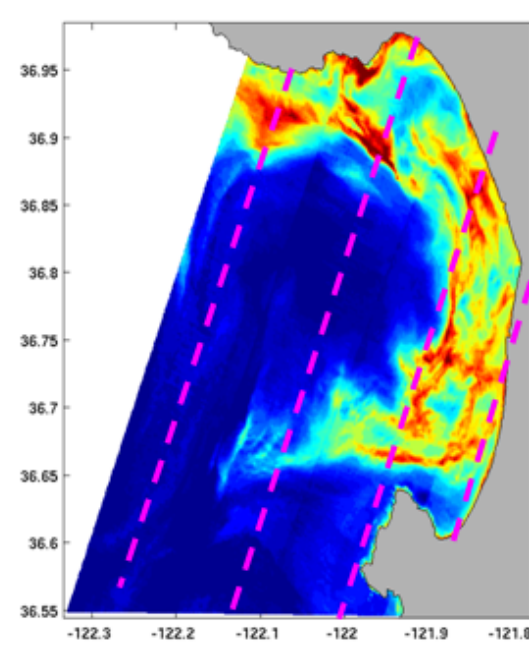
High altitude for wide area coverage

Twin Otter @ 10,500 ft



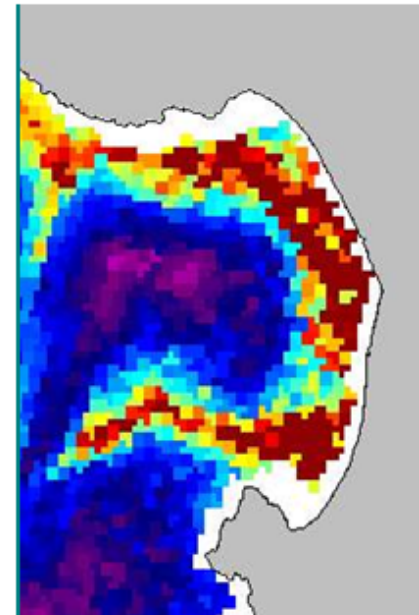
Example coverage with low altitude flights

ER-2 @ 60,000 ft



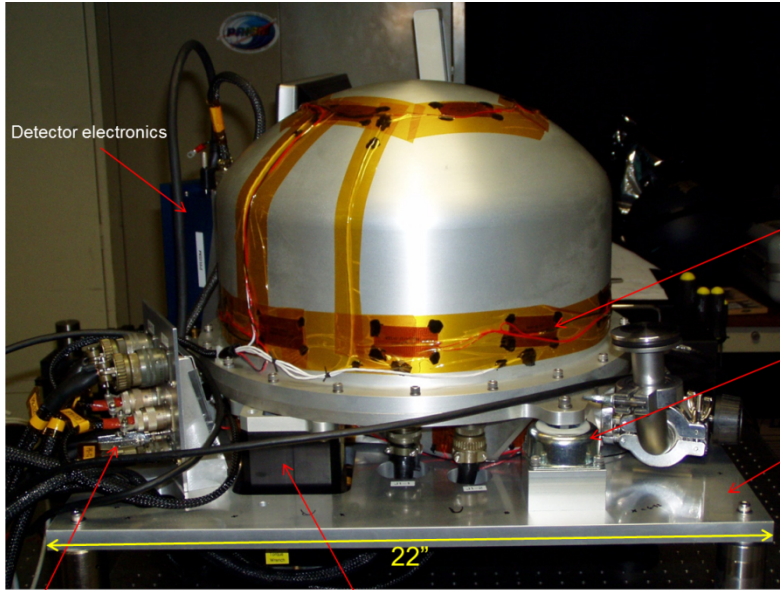
AVIRIS image, PRISM would be similar FOV

Satellite (1 km res.)





PRISM on the Twin Otter



Detector electronics

Heater strips

Vibration isolators

Aircraft mounting plate

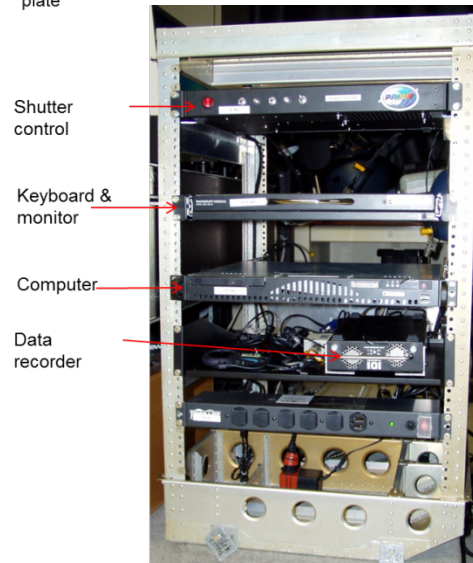
22"

Connector plate

INS/GPS unit



Racks have been consolidated,
UPS added for Twin Otter

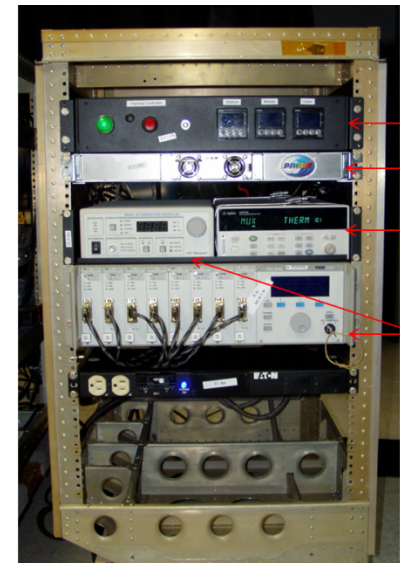


Shutter control

Keyboard & monitor

Computer

Data recorder



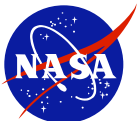
External heater control
External heater PS

Housekeeping data logging

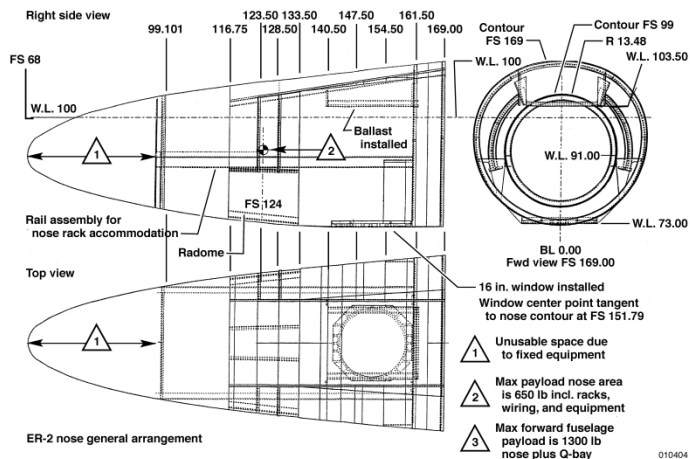
Internal thermal control

Operator rack

Control rack

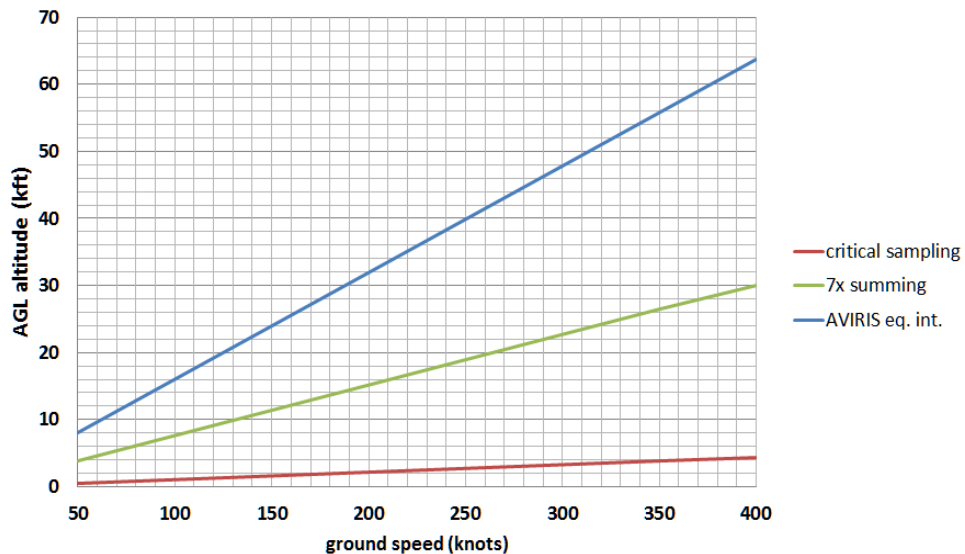


Move to ER-2



nadir port & window

PRISM flight envelope



Frame averaging will increase SNR at high altitude



Modifications & upgrades for ER-2

Modification	Reason	Impact	Twin Otter
Additional window	Pressurized cabin	~0.3% polarization	No
Add getter pump	Longer flight duration	7x better vacuum lifetime	Optional
FPA thermal control	Potential of extreme heat in ER-2 nose environment	Better calibration stability, better SNR from lower T	Yes
New thermal control electronics	Compatibility with automated operation	Significant size reduction, more robust	Yes
Software for automated operation	No operator	None	Optional
New external heater controller	Failure at low pressure, new power supply voltage	None	Yes
New power supplies	Enable multi-instrument accommodation on ER-2, survival margin for power interruption event	None	Yes
New calibration sphere	New window and distance to instrument port	Harder to compare with historical data	Optional



Acknowledgments

The PRISM Team:

PI: Pantazis Mouroulis

Science Co-I: Heidi Dierssen, U. Connecticut

Flight coordinator: Ian McCubbin, DRI, U. Nevada

Co-Is: Byron Van Gorp, Rob Green, Michael Eastwood, Bo-Cai Gao (NRL), Jose Rodriguez, Joe Boardman (AIGLLC)

Engineering Team: Asad Aboobaker, Frank Loya, Chuck Sarture, David Thompson, Scott Nolte, Didier Keymeullen, Sarah Lundeen

NASA Partner: AFRC