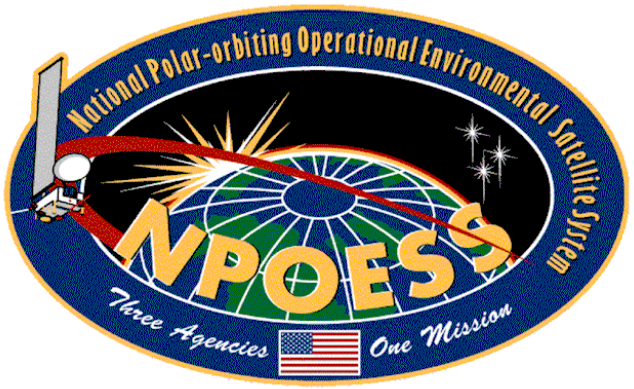


Raytheon

NPOESS/VIIRS Oceans Mission Overview

Dorlisa Hommel

Raytheon ITSS, Lanham, MD

National Polar-orbiting Environmental Satellite System (NPOESS)

- NPOESS is jointly funded by DOD, NOAA, and NASA.
- The NPOESS mission consists of 8 satellites. The first operational launch is planned for 2009 and the mission continues until 2018.

Raytheon

NPOESS Sensors

Visible/Infrared Imager/Radiometer Suite (VIIRS)

data includes clouds, net heat flux, surface temperature, ice/snow, ocean color, aerosols, fire, and low light imagery

Conical Microwave Imager/Sounder (CMIS)

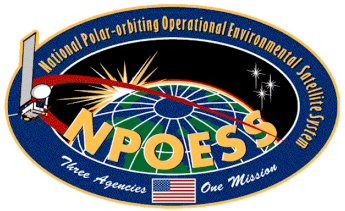
data includes clouds, sea winds, rainfall.

Crosstrack Infrared Sounder (CrIS)

profiles of moisture, temperature, and pressure.

Ozone Mapping and Profiler Suite (OMPS)

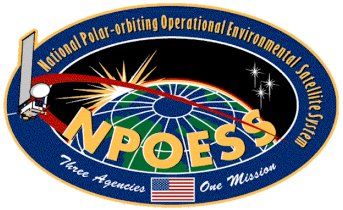
vertical and horizontal distribution of ozone



Raytheon

VIIRS Sensor

- Multiple VIS and IR channels between 0.3 and 14 micrometers
- Moderate spatial resolution: 750m at nadir, 1.3km at EOS
- Improved pixel aggregation reduces bow tie effect at EOS
- Rotating telescope (SeaWiFS heritage) allows low straylight performance
- VIIRS ocean data products include sea surface temperature, atmospheric correction, and ocean color



Raytheon

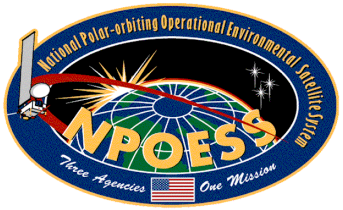
VIIRS Sensor Calibration

VIS:

- View of Spectralon plate at poles every few days.
- Deep space view.

IR:

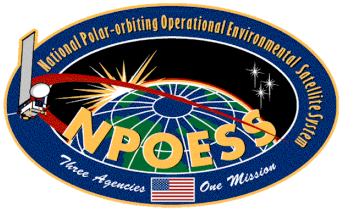
- View of MODIS-like blackbody every scan.
- Deep space view.



Raytheon

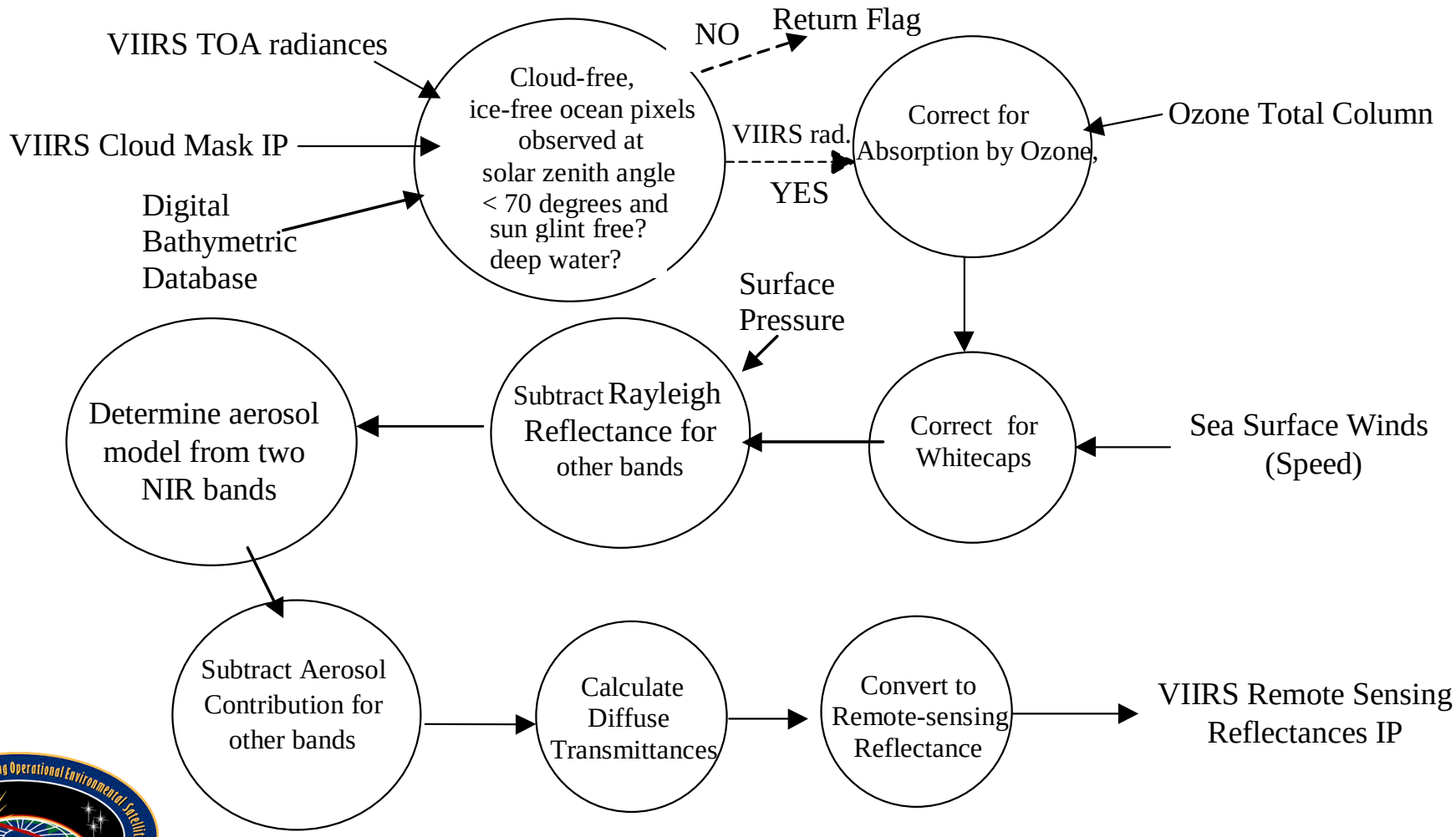
VIIRS/MODIS/SeaWiFS Ocean Band Comparison

VIIRS			MODIS Equivalent			SeaWiFS Equivalent		
VIIRS Band	Spectral Range (um)	Nadir HSR (m)	Band	Range	HSR	Band	Range	HSR
M1	0.402 - 0.422	750	8	0.405 - 0.420	1000	1	0.402 - 0.422	1130
M2	0.436 - 0.454	750	9	0.438 - 0.448	1000	2	0.433 - 0.453	1130
M3	0.478 - 0.498	750	10	0.483 - 0.493	1000	3	0.480 - 0.500	1130
M4	0.545 - 0.565	750	4	0.545 - 0.565	500	5	0.545 - 0.565	1130
M5	0.662 - 0.682	750	13 14	0.662 - 0.672 0.673 - 0.683	1000 1000	6	0.660 - 0.680	1130
M6	0.744 - 0.759	750	15	0.743 - 0.753	1000	7	0.745 - 0.785	1130
M7	0.846 - 0.885	750	16	0.862 - 0.877	1000	8	0.845 - 0.885	1130
	visible bands							
	near-IR bands							



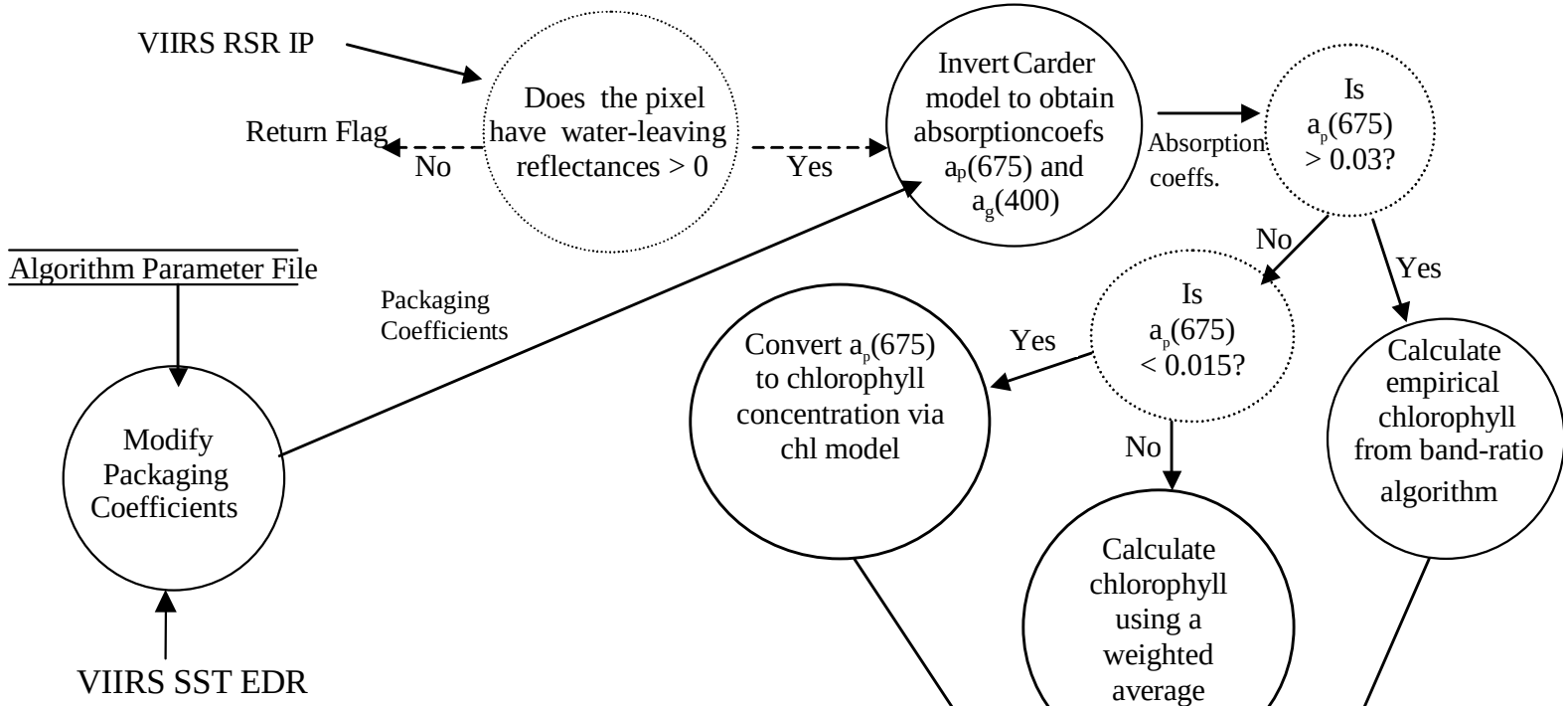
Raytheon

Data flow for VIIRS Atmospheric Correction over Ocean processing



Raytheon

Data Flow Diagram Showing Ocean Color/chlorophyll Processing

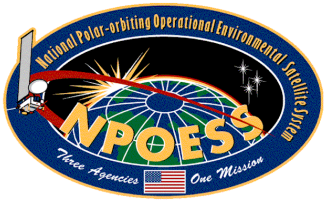


Raytheon

Sea Surface Temperature Requirements

	Thresholds	Objectives	Spec
Measurement Range (K)	271-313	271-313	271-313
Measurement Uncertainty	0.5	0.35	0.35
Measurement Accuracy	0.2	0.1	0.2
Measurement Precision	TBD	TBD	0.27
HCS (km)			
At nadir	1	0.25	0.75
EOS	1.3	TBD	1.3

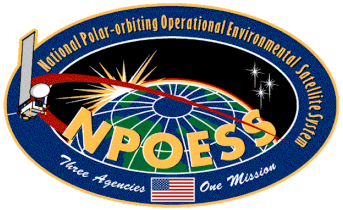
(From TRD)



Raytheon

Ocean Color/chlorophyll Requirements

Ocean Color	Thresholds	Objectives	Spec
Measurement Range	0.05-50 mg/m^3	0-100 mg/m^3	0.05-50 mg/m^3
Uncertainty (nadir)	30% or (TBD)mg/m^3	TBD	
Chl< 1.0 mg/m^3	TBD	TBD	20%
Accuracy (EOS)	30% or (TBD)mg/m^3	30% or (TBD) mg/m^3	
Chl< 1.0 mg/m^3	TBD	TBD	15%
Precision (EOS)	20% or (TBD)mg/m^3	10% or (TBD)mg/m^3	
Chl< 1.0 mg/m^3	TBD	TBD	20%
HCS (km)			
At nadir	1	0.25	0.75
EOS	1.3	TBD	1.3



Raytheon

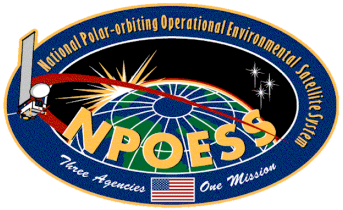
Sea Surface Temperature Validation

Skin:

- Global interferometry data sets

Bulk:

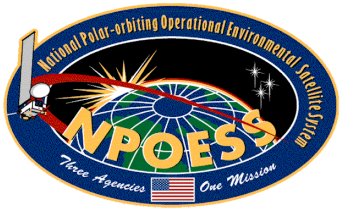
- Buoy data
- Ship data
- AVHRR and MODIS data sets



Raytheon

Validation of Atmospheric Correction Over Ocean

- Vicarious calibration will be accomplished using measurements from ships and fixed moorings.
- Intercomparison between VIIRS, MODIS, and SeaWiFS

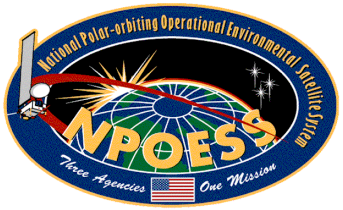


Raytheon

Validation of Ocean Color/Chlorophyll

Validation will rely on:

- In situ Measurements of spectral water-leaving radiances
- In situ measurements of chlorophyll *a* concentration
- Intercomparison between VIIRS, MODIS, and SeaWiFS



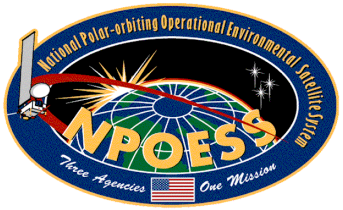
Raytheon

NPOESS Websites

For additional information on the NPOESS project:

http://www.ipo.noaa.gov/

http://npoesslib.ipo.noaa.gov/Released_papers/pdr_subset2_revised.pdf



Raytheon