Evaluation of GOCI, MODIS, and VIIRS Imagery

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Evaluation of GOCI, MODIS, and VIIRS Imagery Outline

- Background
- Study Site
- Results
  - Spectra
  - Time Series
  - Image/Data Comparisons
  - Full Image
- Conclusions

Evaluation of GOCI, MODIS, and VIIRS Imagery Background

- MODIS
  - Processed with MOBY gains
- VIIRS
  - Processed with MOBY (blue-water) gains
- GOCI
  - GOCI data from 4 pm GTM, corresponds to local noon
    - Reduces sun glint and sensor issues
- Aeronet SeaPrism
  - Gageocho Aeronet (SeaPrism #624) was moved to Ieodo
    - Results in a data gap from May 2012 – December 2013

Evaluation of GOCI, MODIS, and VIIRS Imagery

Sources of Variability

Sensor	MODIS	VIIRS	GOCI	In Situ
Center Frequency	412.5	412	412	411
	443	445	443	442
	488	488	490	490
	551	555	555	551
	667	672	660	668

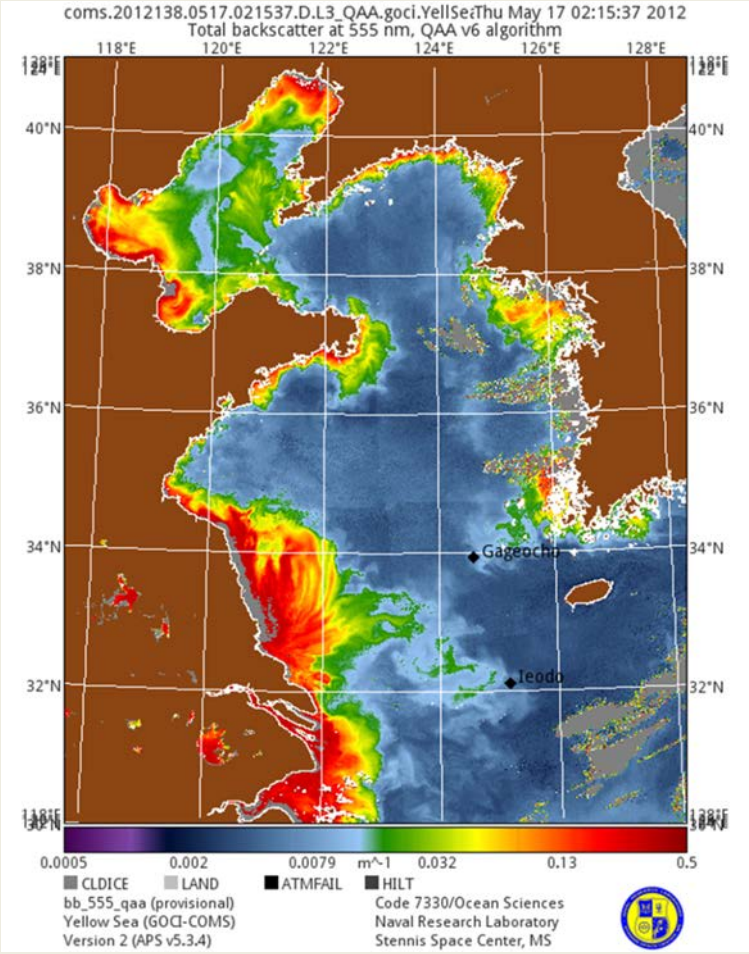
Evaluation of GOCI, MODIS, and VIIRS Imagery

Ieodo nLw to rrs conversion for JD 335 2013

		nLw(411)	nLw(442)	nLw(490)	nLw(551)	nLw(668)
F sub 0 values are not for same lambda	nLw/Fsub0_eq	0.00966	0.01202	0.01576	0.02097	0.007459
	nLw/Fsub0_ne	0.00908	0.01271	0.01654	0.02087	0.007451
nLw values are not the same	nLw_f/Q/Fsub0_eq	0.00851	0.01034	0.01290	0.01658	0.006360
	nLw_f/Q/Fsub0_ne	0.00801	0.01093	0.01354	0.01650	0.006353
Differences	eq-ne	0.00057	-0.00069	-0.00078	9.8259E-05	8.0951E-06
	nLw/Fsub0 – nLw_f/Q/Fsub0	0.00051	-0.00059	-0.00063	7.7676E-05	6.9022E-06
Ratio of methods	eq/ne	1.06355662	0.94560905	0.95279461	1.00470619	1.00108642
	nLw/Fsub0 / nLw_f/Q/Fsub0	1.06355662	0.94560905	0.95279461	1.00470619	1.00108642

Evaluation of GOCI, MODIS, and VIIRS Imagery

Study site – Total Backscatter at 555 nm image



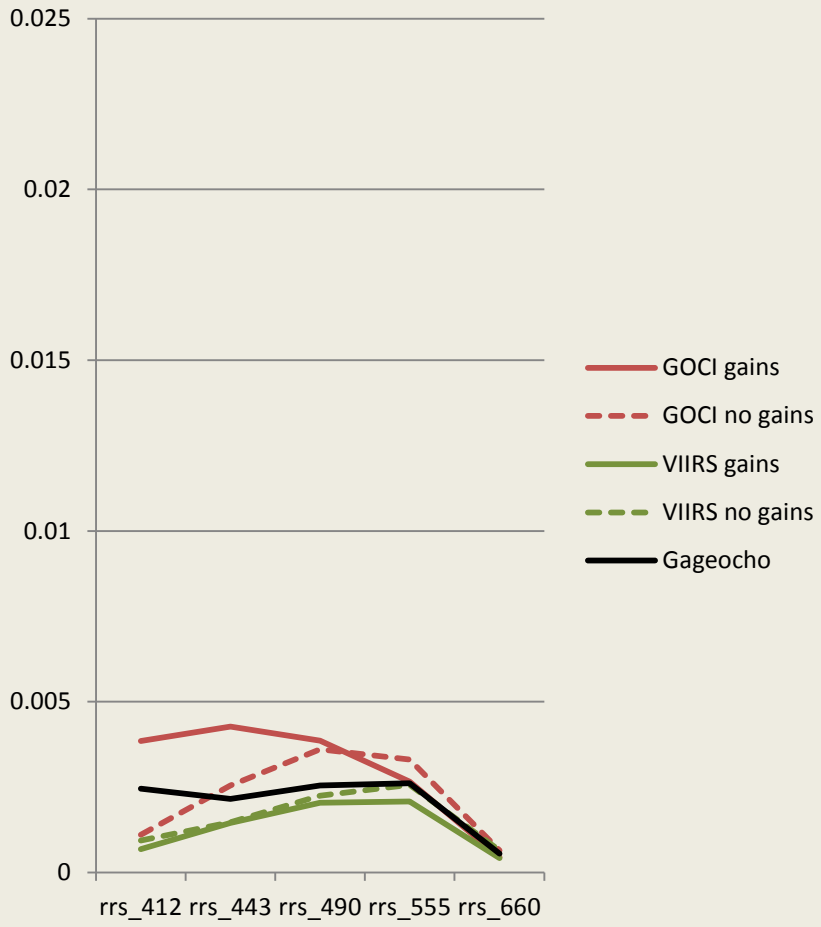
Evaluation of GOCI, MODIS, and VIIRS Imagery

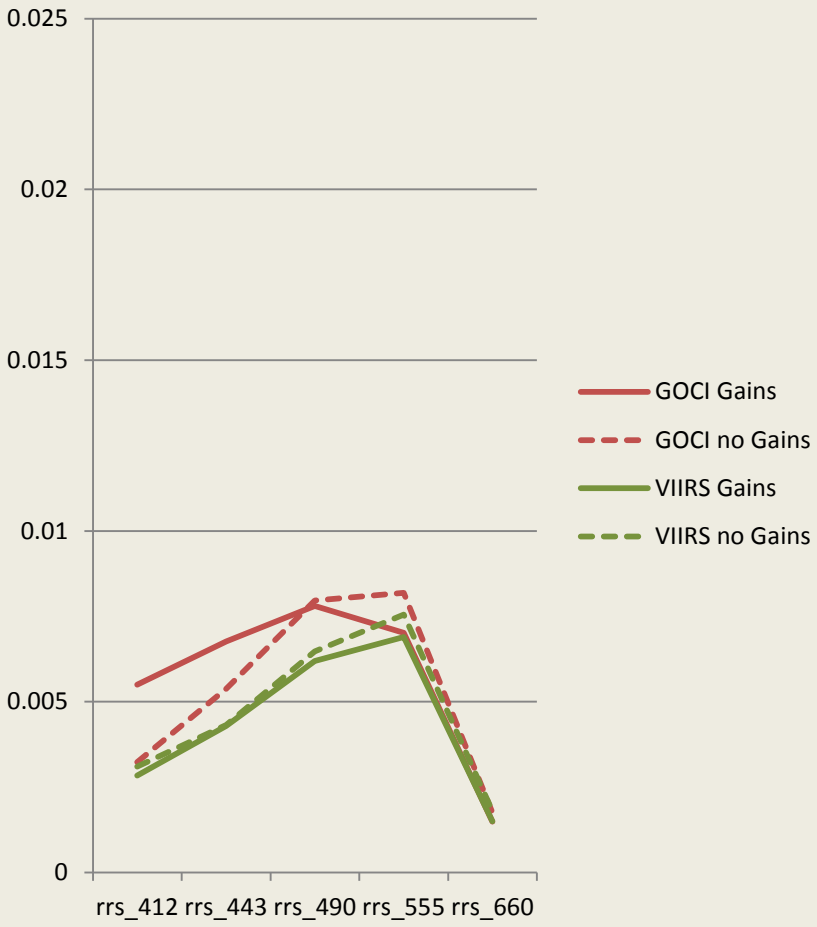
Data Availability

JD Year	In situ	MODIS	VIIRS	GOCI	Analyzed	Presented
085 2012	Gageocho	Yes	No	Yes	No	
108 2012	Gageocho	PRODFAIL	Yes	Yes	Yes	
117 2012	Gageocho	PRODFAIL	Yes	Yes	Yes	
118 2012	Gageocho	Yes	Yes	Yes	Yes	Yes
124 2012	Gageocho	PRODFAIL	Yes	Yes	Yes	
138 2012	Gageocho	PRODFAIL	Yes	Yes	Yes	
277 2013	No	Yes	Yes	Yes	Yes	Yes
304 2013	No	Invalid	No	Yes	No	
335 2013	Ieodo	PRODFAIL	Yes	Yes	Yes	
339 2013	No	PRODFAIL	Yes	Yes	Yes	
341 2013	Ieodo	Yes	Yes	Yes	Yes	Yes
346 2013	Ieodo	Yes	Yes	Yes	Yes	Yes

Evaluation of GOCI, MODIS, and VIIRS Imagery

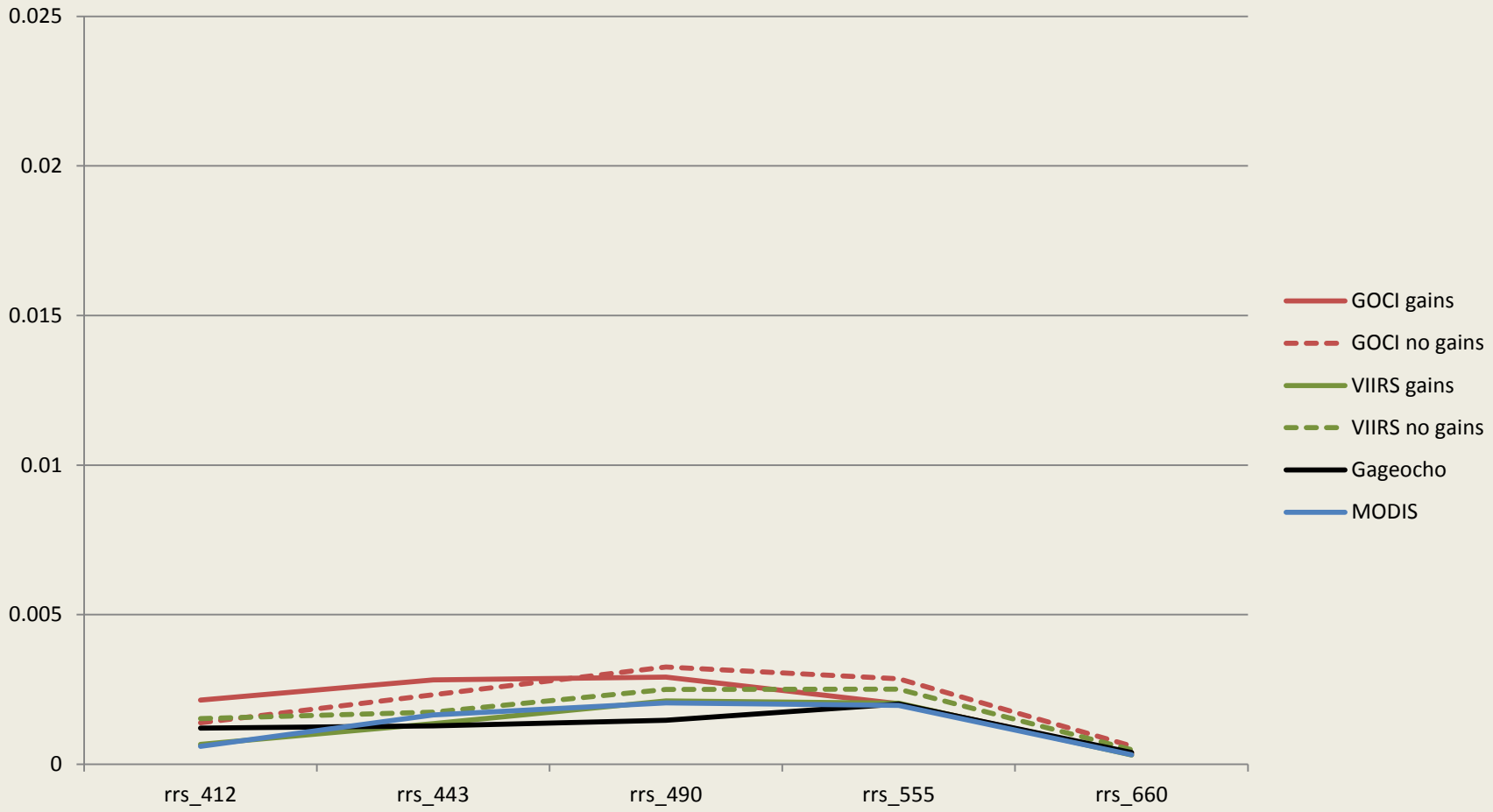
JD 117 2012 Spectra





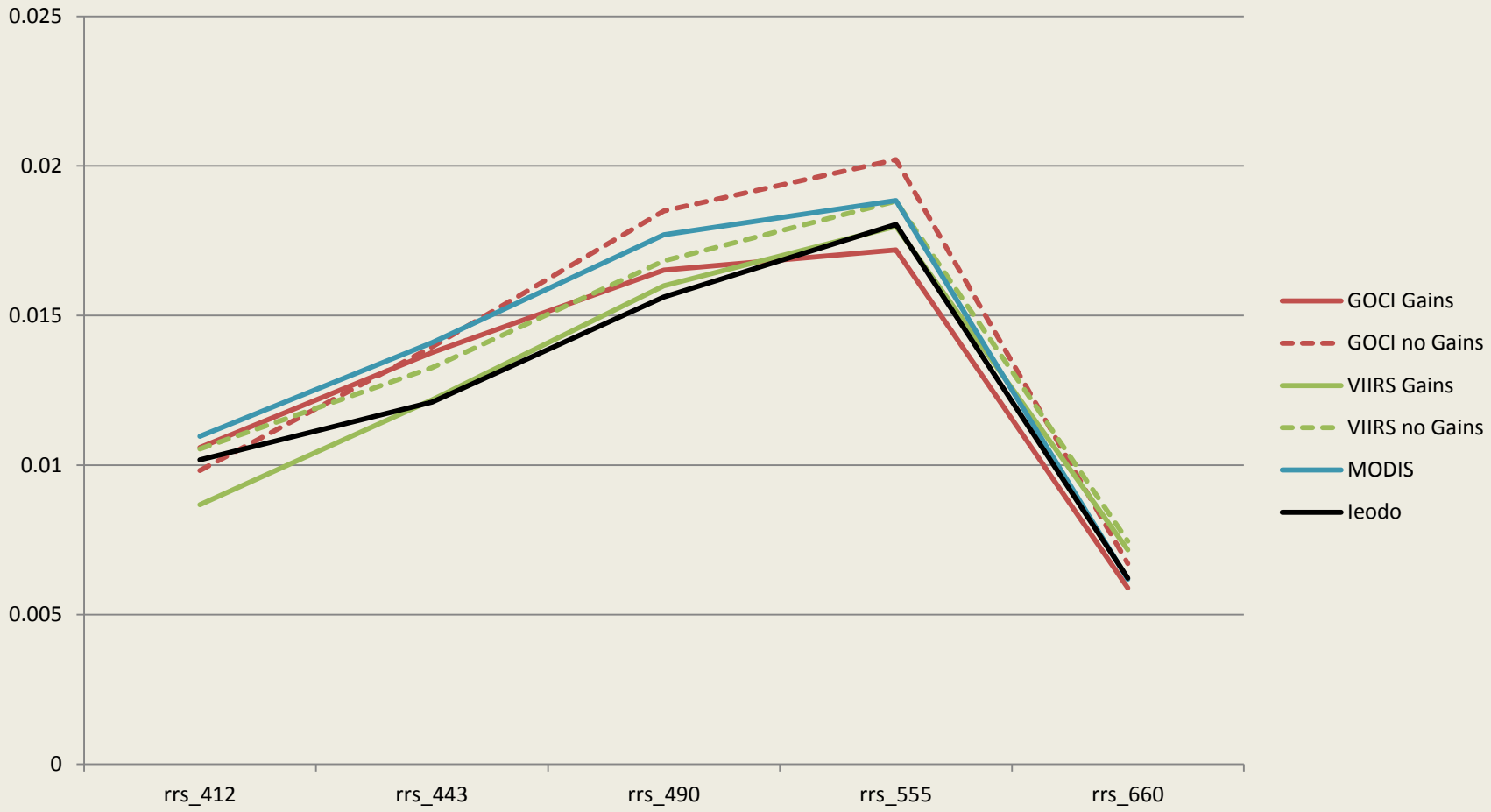
Evaluation of GOCI, MODIS, and VIIRS Imagery

JD 118 2012 Spectra – Gageocho Site



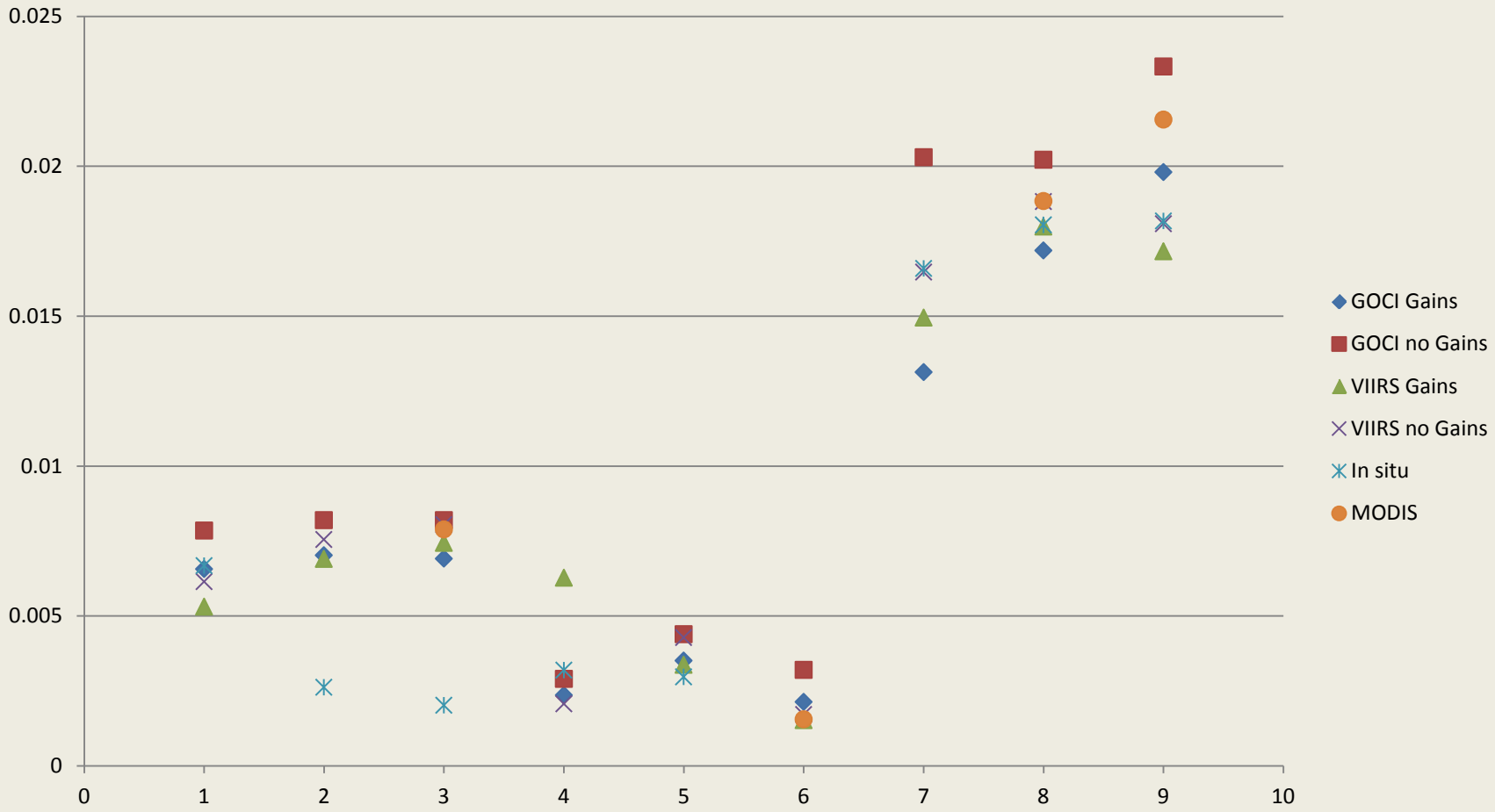
Evaluation of GOCI, MODIS, and VIIRS Imagery

JD 341 2013 spectra – Iedeo Site



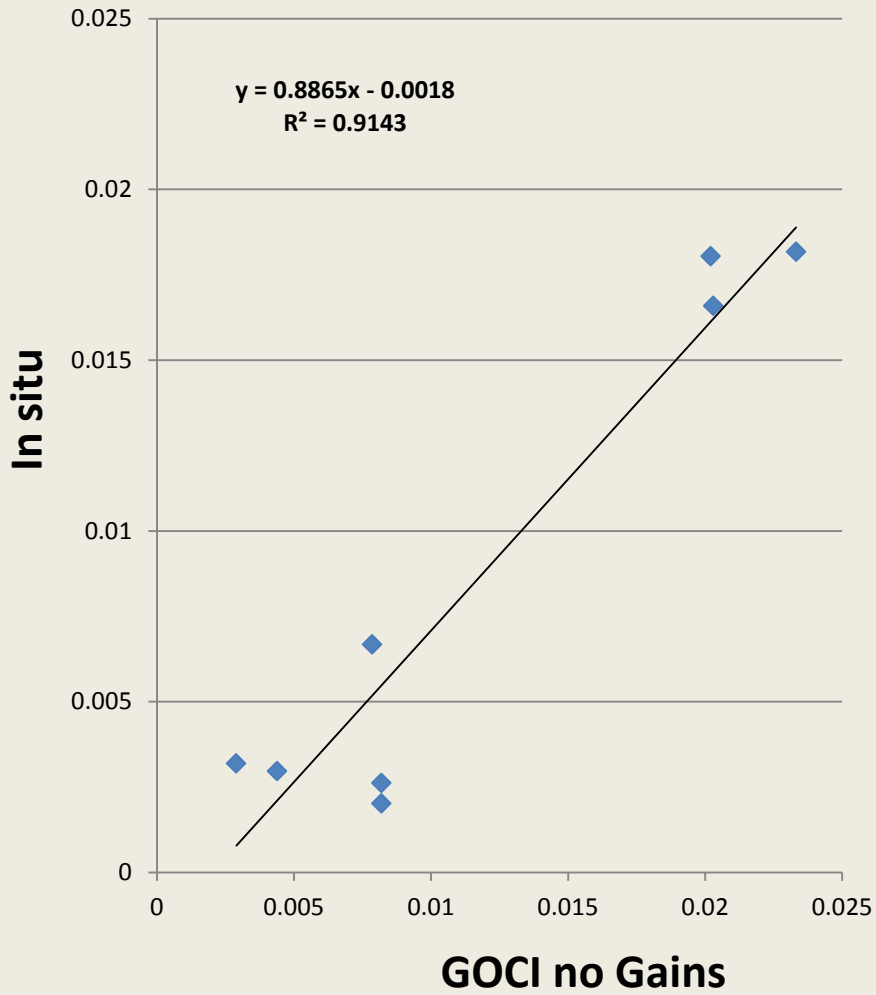
Evaluation of GOCI, MODIS, and VIIRS Imagery

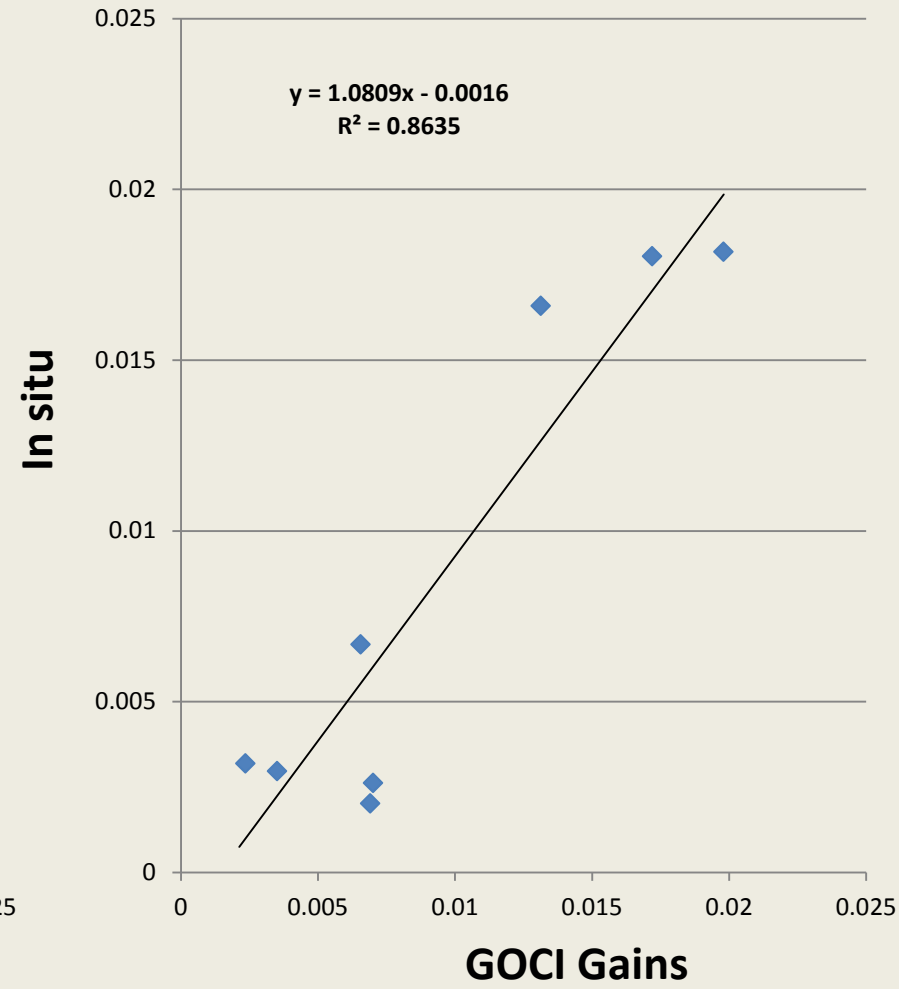
All sensors time series - rrs 550



Evaluation of GOCI, MODIS, and VIIRS Imagery

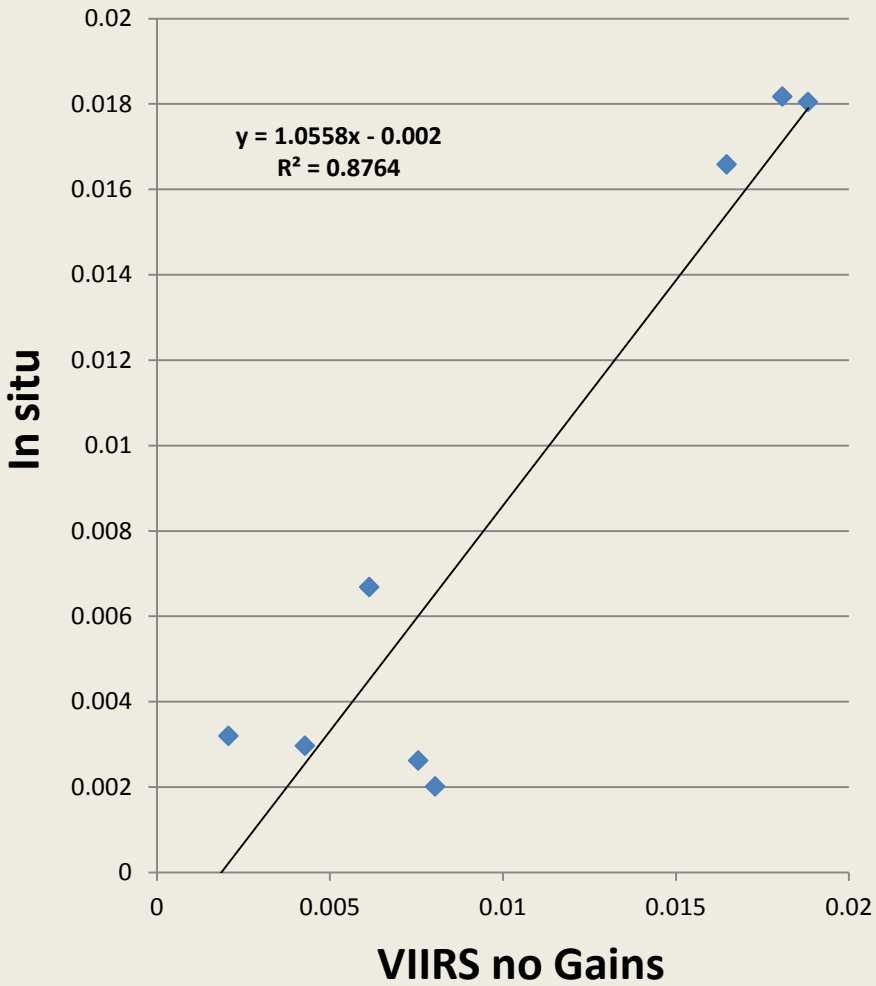
rrs 555 GOCI – in situ

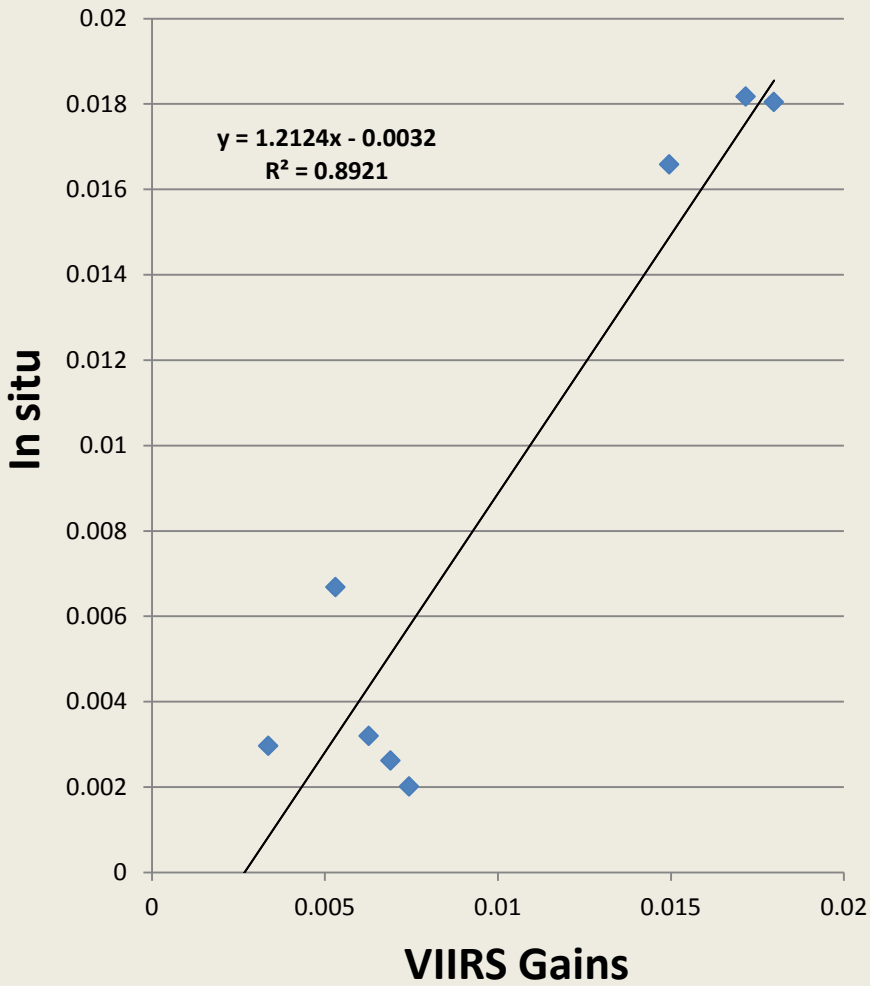




Evaluation of GOCI, MODIS, and VIIRS Imagery

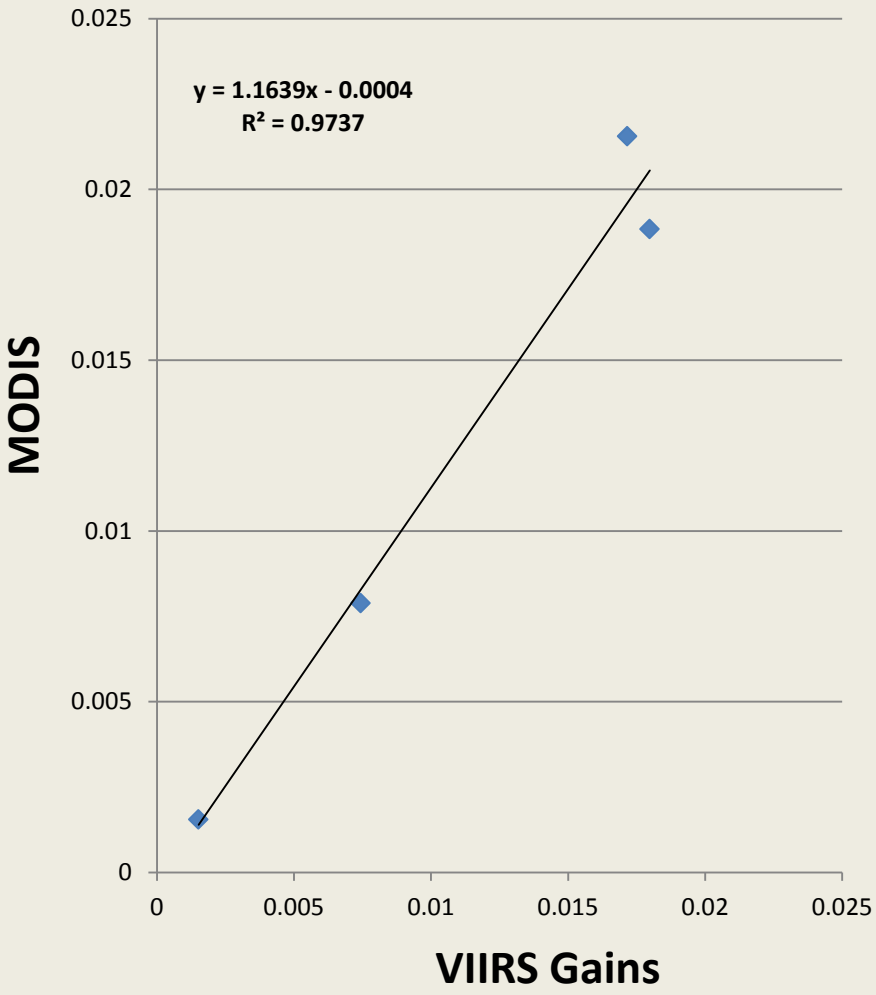
rrs 555 VIIRS – in situ

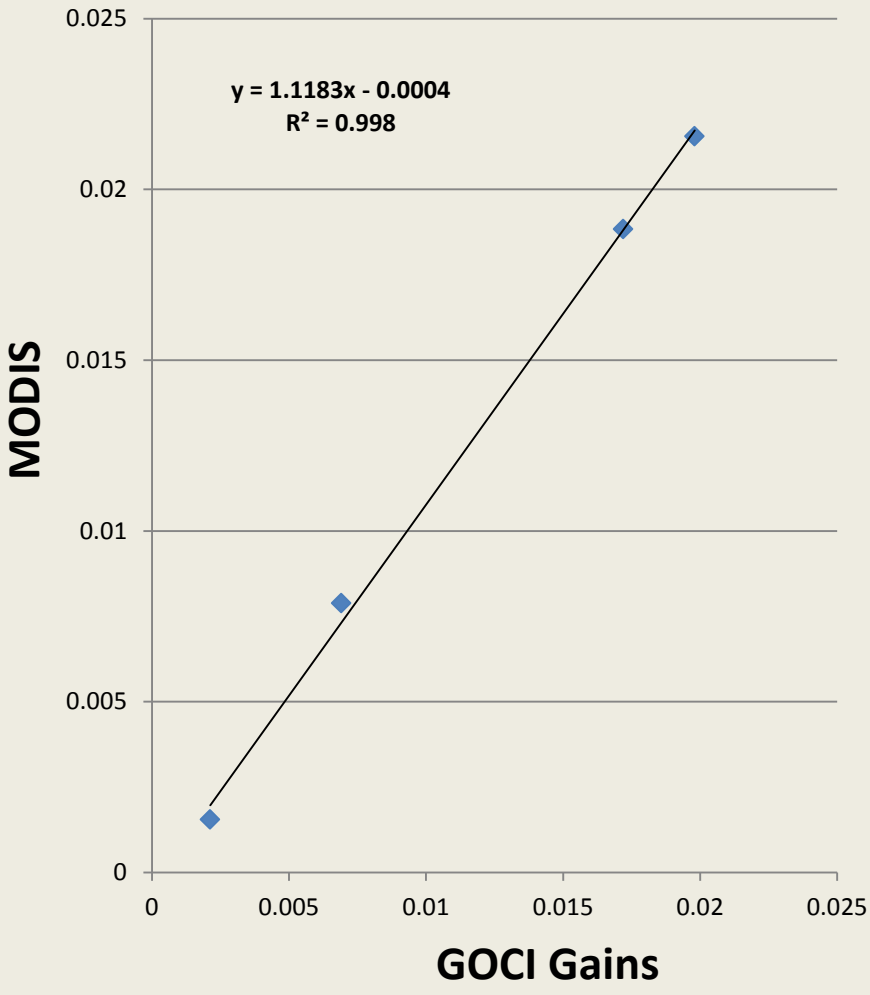




Evaluation of GOCI, MODIS, and VIIRS Imagery

rrs 555 GOCI/VIIRS - MODIS





Evaluation of GOCI, MODIS, and VIIRS Imagery

Sensor Comparisons

rrs 412	Slope	Intercept	R^2
GOCI no Gains In situ	0.9089	+0.0002	0.9056
GOCI Gains In situ	0.9061	-0.0014	0.8811
GOCI Gains MODIS	0.8824	-0.0006	0.9407
VIIRS no Gains In situ	0.8486	+0.0005	0.9060
VIIRS Gains In situ	0.9350	+0.0007	0.6379
VIIRS Gains MODIS	1.2074	-0.0002	0.9979

rrs 443	Slope	Intercept	R^2
GOCI no Gains In situ	0.8499	-0.0012	0.8891
GOCI Gains In situ	0.9392	-0.0028	0.8928
GOCI Gains MODIS	0.9795	-0.0010	0.9930
VIIRS no Gains In situ	0.9226	-0.0006	0.8958
VIIRS Gains In situ	1.0460	-0.0014	0.7464
VIIRS Gains MODIS	1.1413	+0.0002	0.9869

Evaluation of GOCI, MODIS, and VIIRS Imagery

Sensor Comparisons

rrs 490	Slope	Intercept	R^2
GOCI no Gains In situ	0.9362	-0.0023	0.8411
GOCI Gains In situ	0.9362	-0.0011	0.6347
GOCI Gains MODIS	1.1021	-0.0011	0.9966
VIIRS no Gains In situ	1.0249	-0.0020	0.8653
VIIRS Gains In situ	1.1840	-0.0034	0.8163
VIIRS Gains MODIS	1.1783	-0.0003	0.9904

rrs 660	Slope	Intercept	R^2
GOCI no Gains In situ	0.8458	-0.0004	0.9718
GOCI Gains In situ	1.0452	-0.0004	0.9542
GOCI Gains MODIS	1.0653	-0.0002	0.9984
VIIRS no Gains In situ	1.0248	-0.0005	0.9562
VIIRS Gains In situ	1.0489	-0.0007	0.8498
VIIRS Gains MODIS	1.0564	-0.00005	0.8973

Evaluation of GOCI, MODIS, and VIIRS Imagery

Statistics for Sensor Comparisons

rrs 555	Slope	Intercept	R^2
GOCI no Gains In situ	0.8865	-0.0018	0.9143
GOCI Gains In situ	1.0809	-0.0016	0.8635
GOCI Gains MODIS	1.1183	-0.0004	0.9980
VIIRS no Gains In situ	1.0558	-0.0020	0.8764
VIIRS Gains In situ	1.2124	-0.0032	0.8921
VIIRS Gains MODIS	1.1639	-0.0004	0.9737

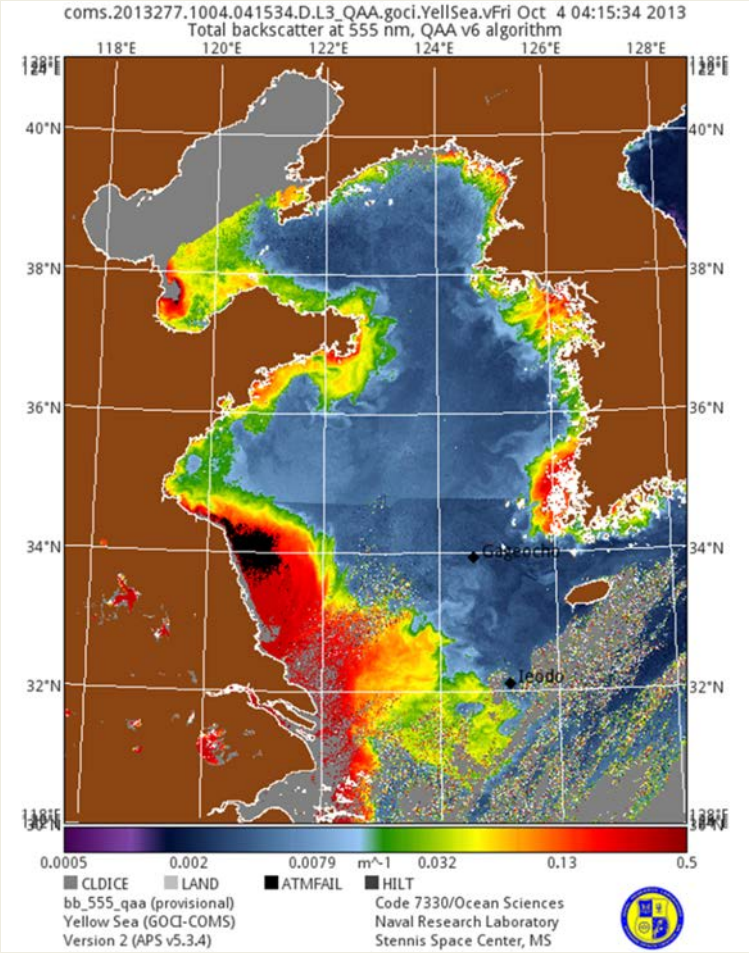
Evaluation of GOCI, MODIS, and VIIRS Imagery

Single Point to Full Image comparison

R^2 Values	Single Sample, Multiple Images		Single Image, all samples	
Channel	GOCI-MODIS	VIIRS-MODIS	GOCI-MODIS	VIIRS-MODIS
412	0.941	0.998	0.834	0.942
443	0.993	0.987	0.923	0.971
490	0.997	0.990	0.976	0.985
555	0.998	0.974	0.984	0.990
690	0.998	0.897	0.975	0.983

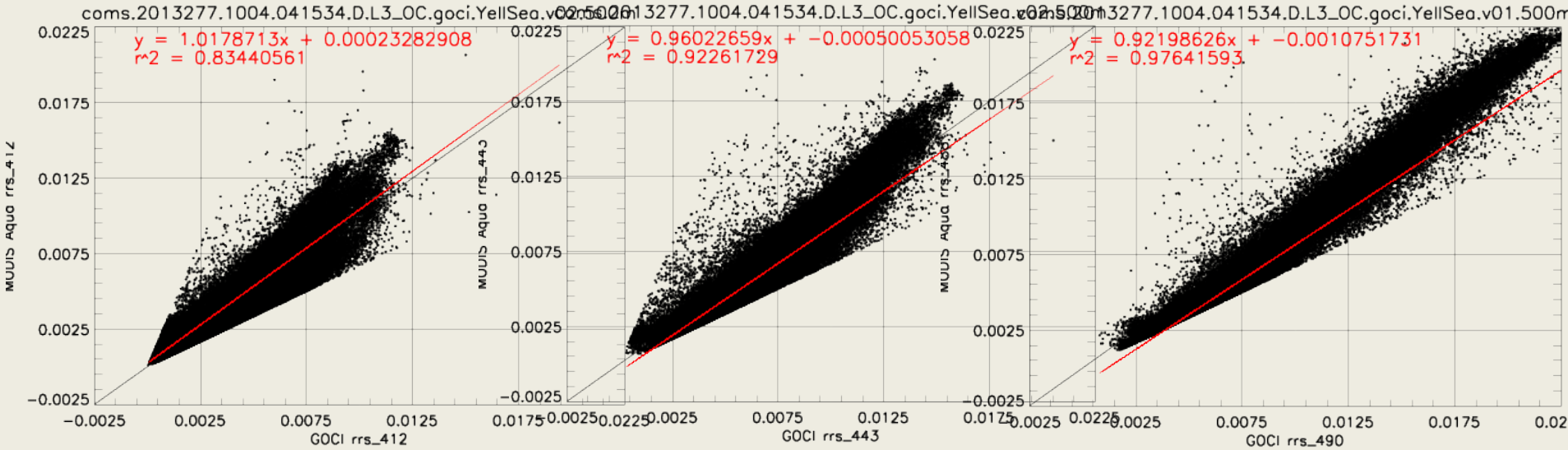
Evaluation of GOCI, MODIS, and VIIRS Imagery

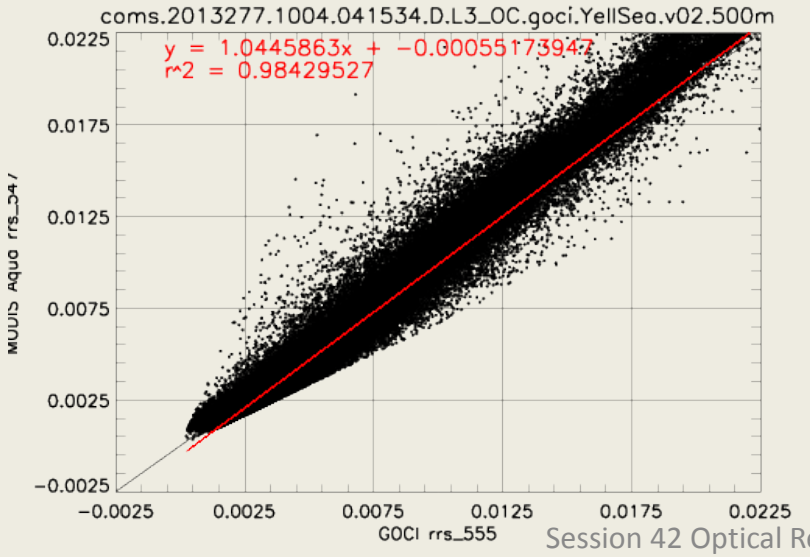
JD 277 GOCI Total Backscatter at 555 nm Image

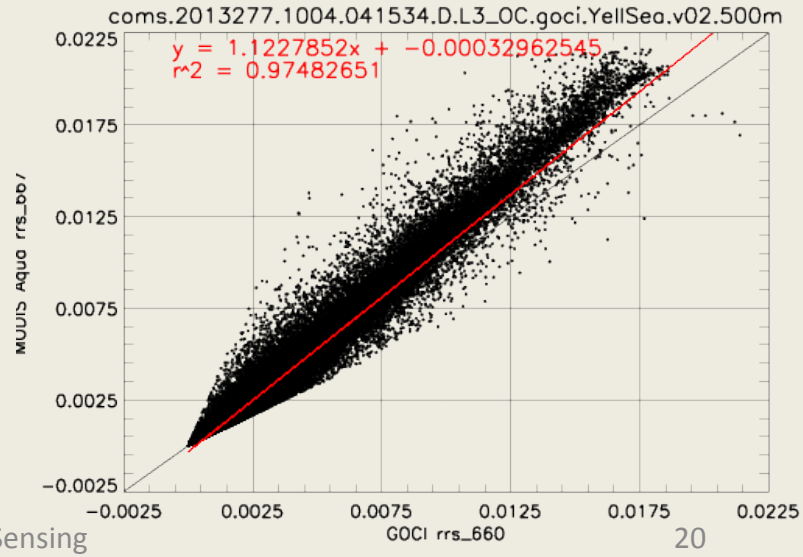


Evaluation of GOCI, MODIS, and VIIRS Imagery

JD 277 MODIS – GOCI Image Comparison

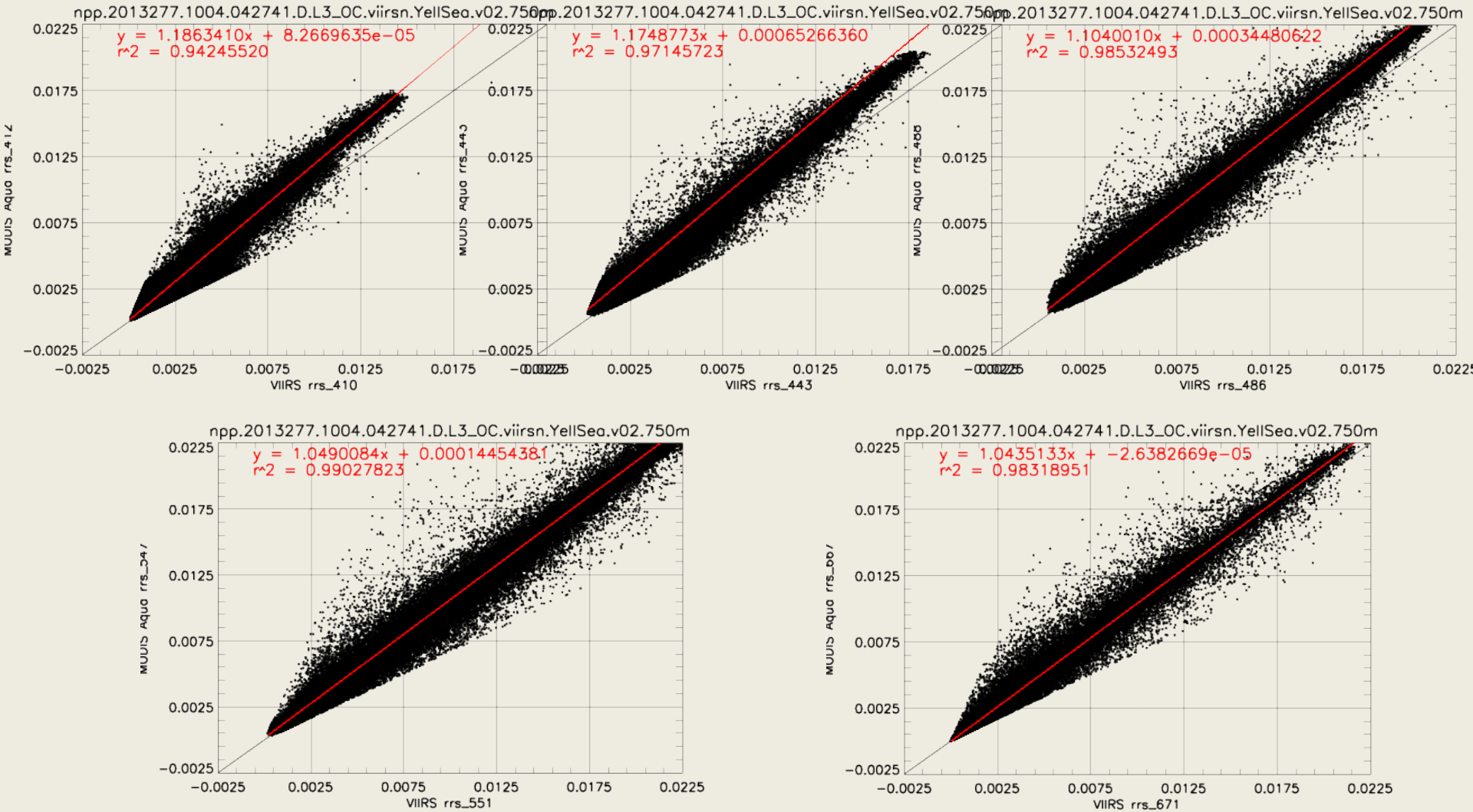






Evaluation of GOCI, MODIS, and VIIRS Imagery

JD 277 MODIS – VIIRS Image Comparison



Conclusions

- VIIRS and GOCI compare favorably to MODIS in the Yellow Sea
- R2 values impacted by the green water sites at Ieodo
  - Optical properties at two sites are different, Gageocho more representative of blue water and Ieodo more representative of mixed water
  - MOBY (blue water) gains applied to VIIRS do not work as well in green water
- Data from single points and imagery show similar statistics
- Application of gains lowers rrs in most cases

Future Efforts

- Develop green-water gains for VIIRS and MODIS