Current Application of Vicarious Calibration for Geostationary Ocean Color Imager (GOCI) DATA

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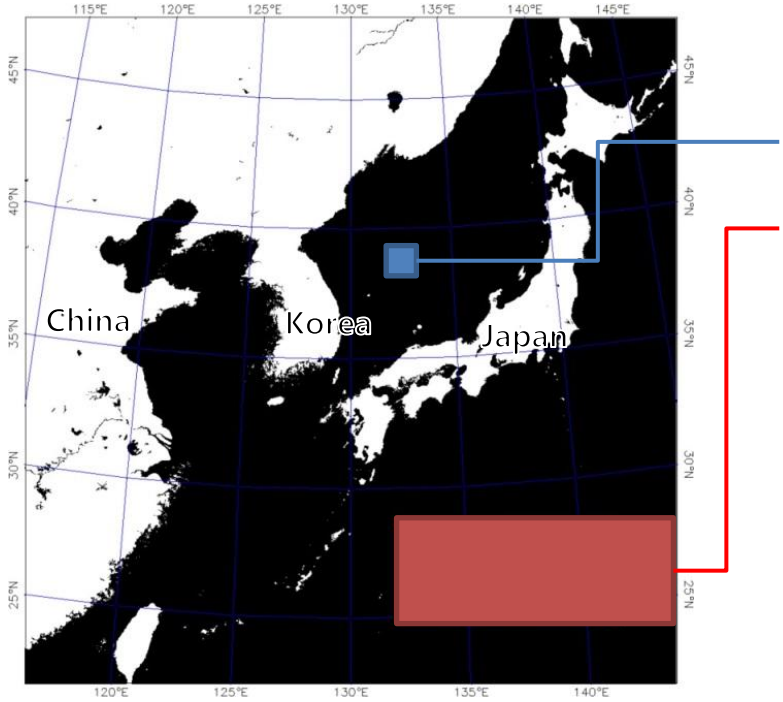
Calibration Region for 745nm Centered Band



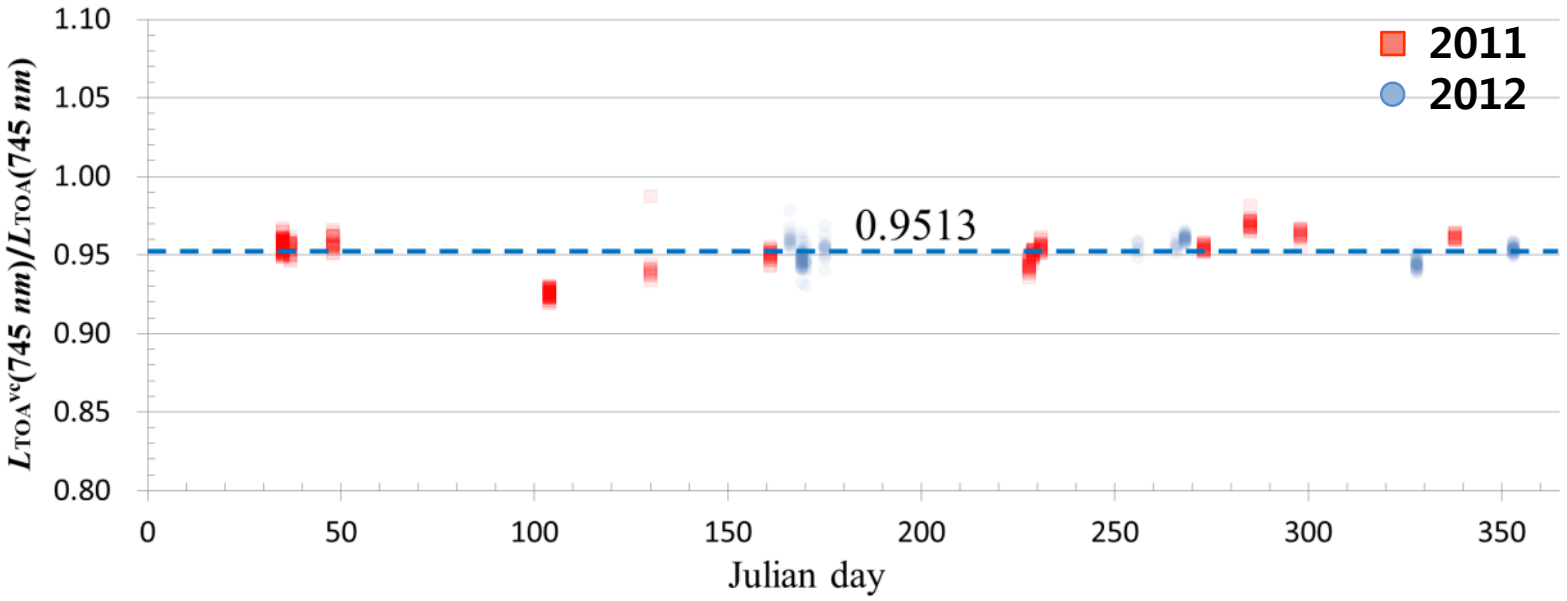
Region of vicarious calibration by Wang et al. (2013)

Region of vicarious calibration by KOSC (2013)

Basic assumption for NIR correction

- 865nm band is perfectly calibrated, **gain(865nm)=1.0**
- NIR Vicarious calibration site
  - → Maritime relative humidity 99% (M99) aerosol

Calibration Result of 745nm Centered Band

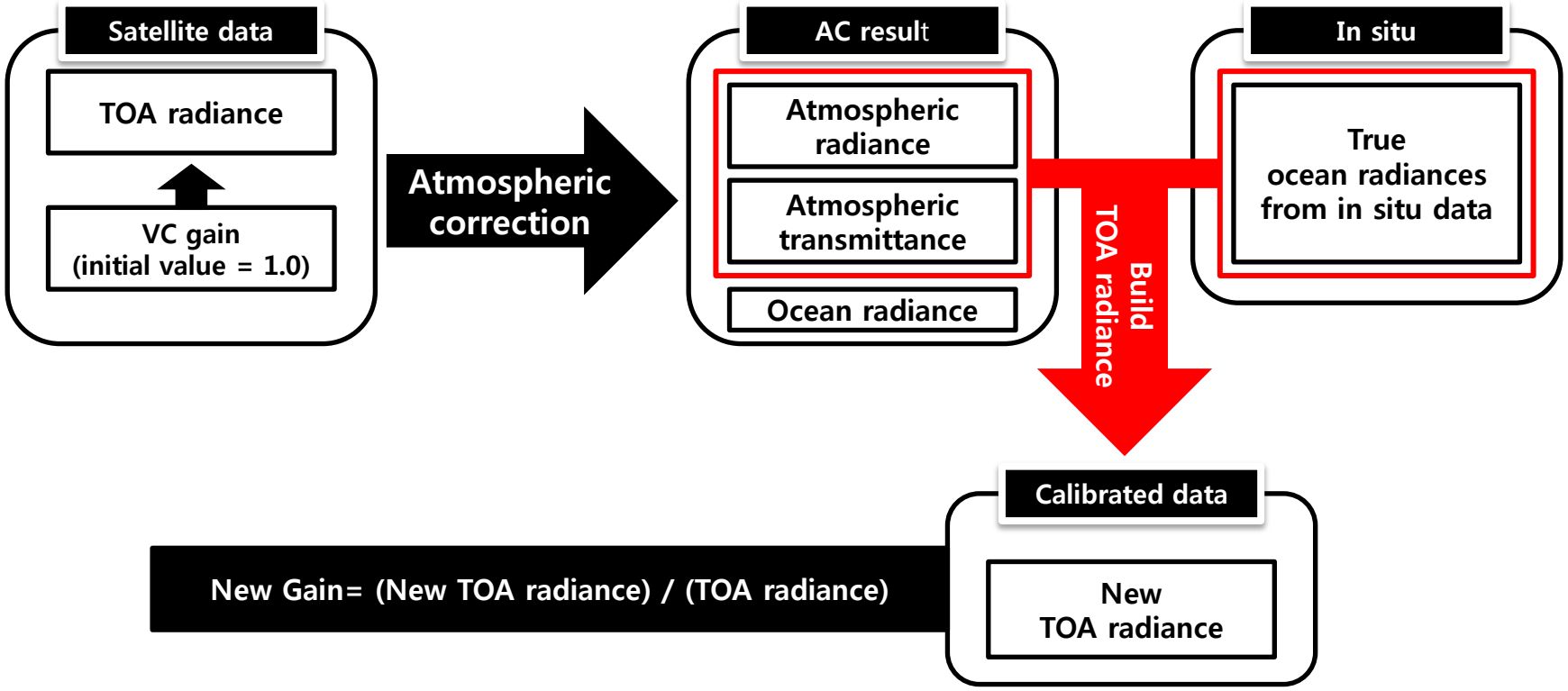


Sampling constraints (KOSC, 2013)

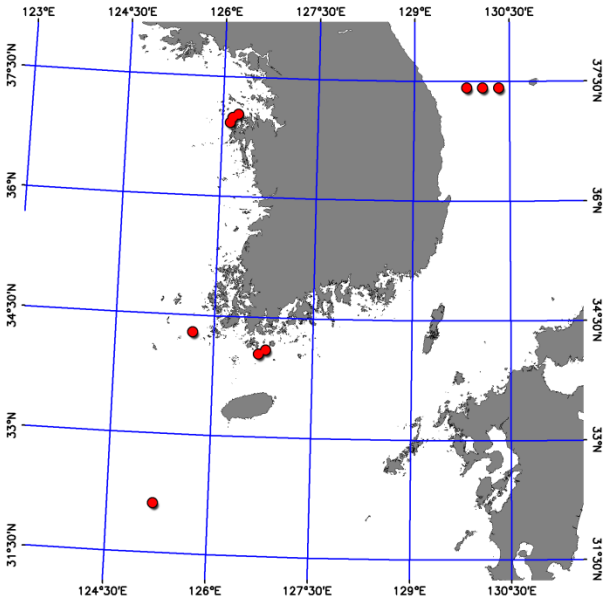
- Wind speed < 4 *m/s*
- $\rho_{TOA}(865nm)$-$\rho_r(865nm)$ < 0.006
- Slot border distance to Eastward < 400 pxls
- Slot border distance to Southward < 400 pxls
- Bright pixel distance for all directions> 100 pxls
  - Bright pixel : $\rho_{TOA}(865nm)$-$\rho_r(865nm)$ > 0.1
- Negative radiance pixel > 500 pixels
  - Negative radiance pixel : $\rho_{TOA}(865nm)$-$\rho_r(865nm)$ < 0.0

Vicarious Calibration of Visible Bands

- **Approach**
  - Vicarious calibration without sharing aerosol models with some other sensors
  - Franz et al. (2007)
- **Flowchart**



In-situ Data for Visible Bands Calibration

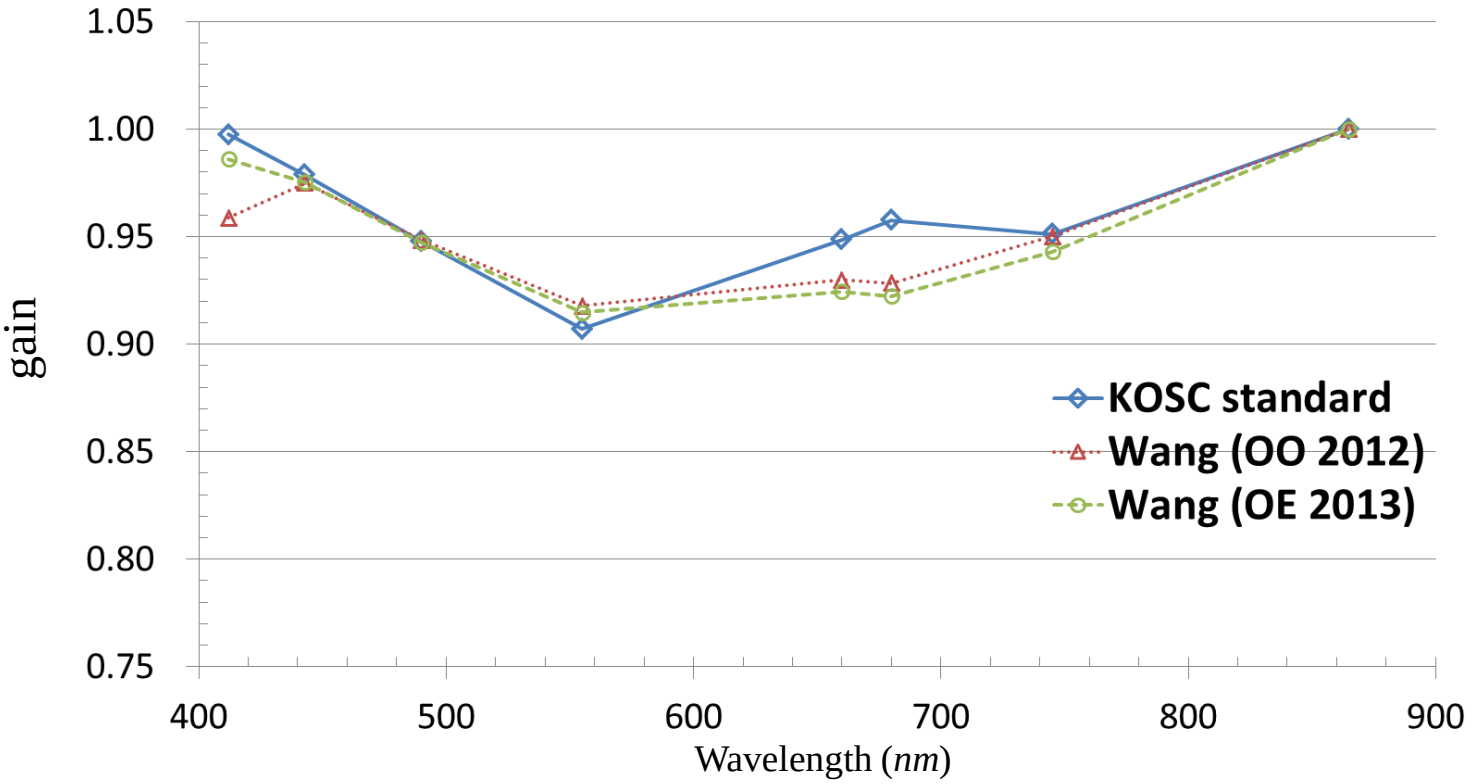


In-situ clear water spectra list, nL_w(660 *nm*) < 2.5 $w/m^2/um/sr$

Year	Month	Day	Hour	Min	Latitude	Longitude	nL_w(412*nm*)	nL_w(443*nm*)	nL_w(490*nm*)	nL_w(555*nm*)	nL_w(660*nm*)	nL_w(680*nm*)	nL_w(745*nm*)	nL_w(865*nm*)
2011	5	17	0	25	37.417417	129.834900	6.716984	7.686478	8.245895	4.816862	**0.987198**	0.870289	0.193089	0.029028
2011	5	17	1	55	37.416750	130.081733	7.520310	7.811414	8.379118	5.559213	**1.054751**	0.950229	0.265660	-0.006773
2011	5	17	3	55	37.417083	130.333583	5.364198	5.583701	6.090469	4.222234	**0.721591**	0.672702	0.150324	0.037736
2011	6	11	3	2	36.9279	126.1256	6.01	8.17	11.8	12.3	**2.24**	2.00	0.300	0.0941
2011	6	11	4	10	36.9960	126.1671	6.91	8.44	10.7	10.8	**2.07**	1.92	0.389	0.0647
2011	6	11	4	52	37.0333	126.2507	6.68	8.32	11.1	10.7	**1.86**	1.68	0.253	0.0234
2011	9	23	0	49	32.127400	125.191400	3.945337	4.301660	5.068432	4.562556	**0.899686**	1.036202	0.139957	0.052250
2011	9	24	0	30	34.282050	125.679050	5.251176	5.328061	6.488149	6.454895	**1.562935**	1.847668	0.269547	0.110306
2011	10	27	5	50	34.041750	126.689633	5.506780	6.429425	8.349292	6.501642	**1.163757**	1.098042	0.173651	0.082246
2011	10	27	6	24	34.090733	126.796767	4.720842	6.273734	9.204304	7.073832	**1.017904**	1.036202	0.046652	0.015482

* nL_w : normalized water leaving radiance ($w/m^2/um/sr$)

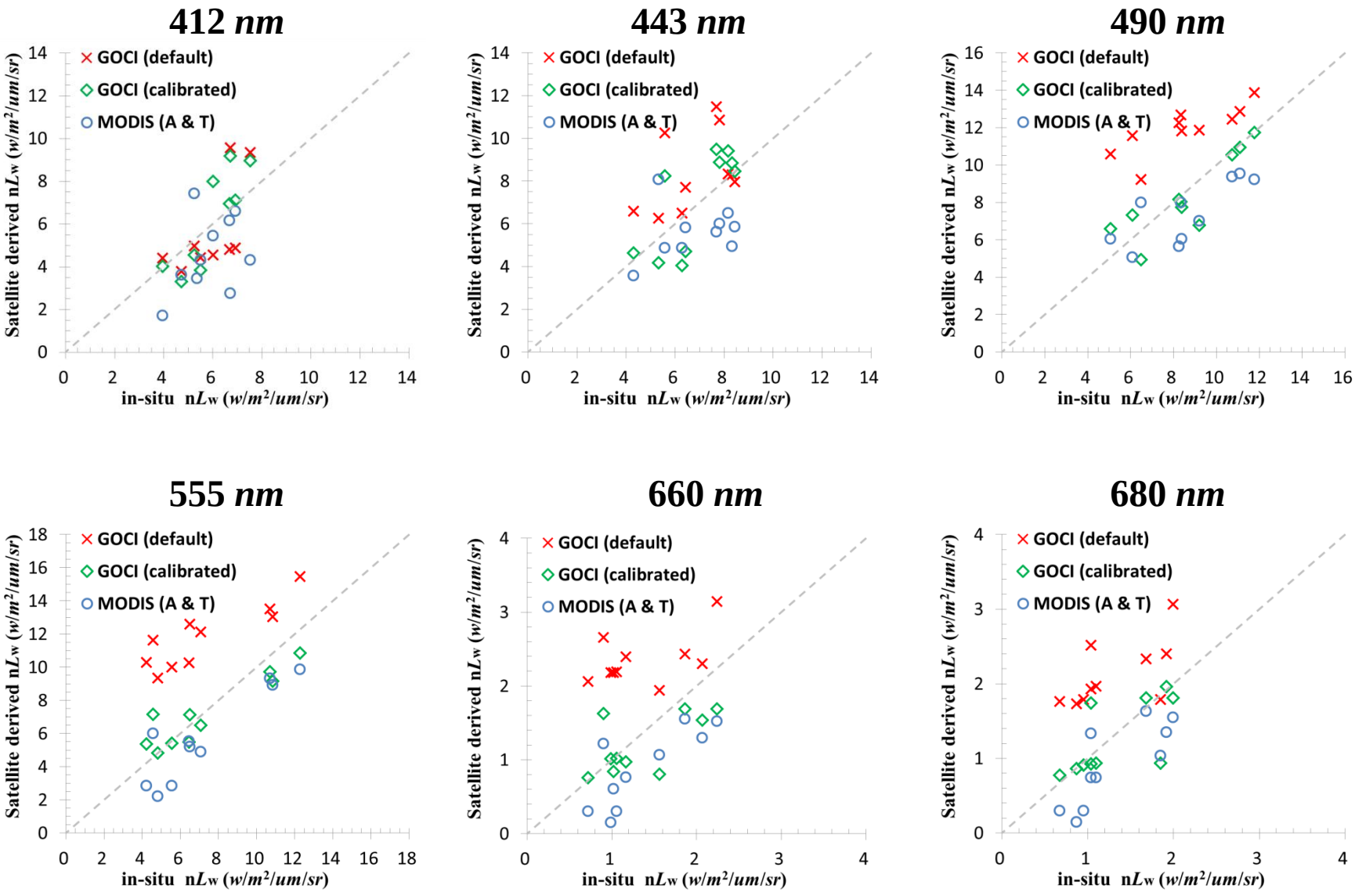
Derived gain



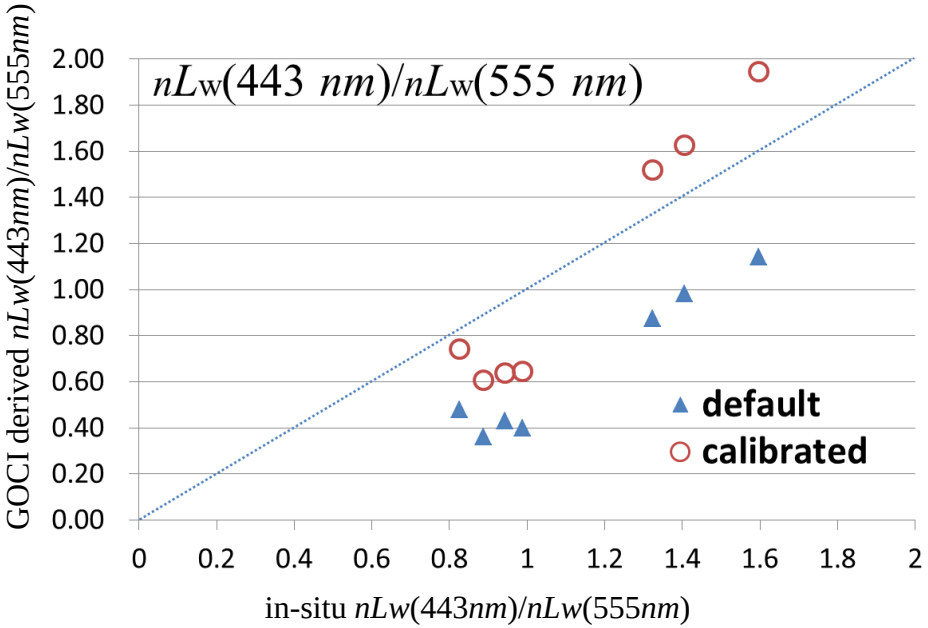
Wavelength (nm)	412	443	490	555	660	680	745	865
KOSC standard	0.99644	0.97967	0.94617	0.90701	0.94888	0.95785	0.95125	1.0
Wang (OO 2012)	0.9588	0.97493	0.94839	0.91791	0.92988	0.92835	0.95022	1.0
Wang (OE 2013)	0.9862	0.9753	0.9473	0.9149	0.9245	0.9223	0.943	1.0

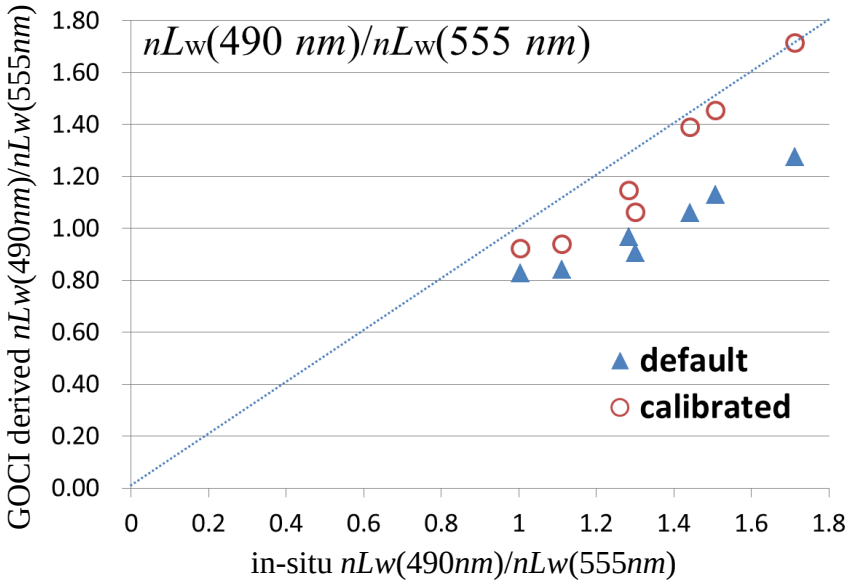
KOSC standard : newly derived in 2013 by Ahn
Wang (OO 2012) : Ocean optics 2012 by Wang
Wang (OE 2013) : Optics express 2013 by Wang

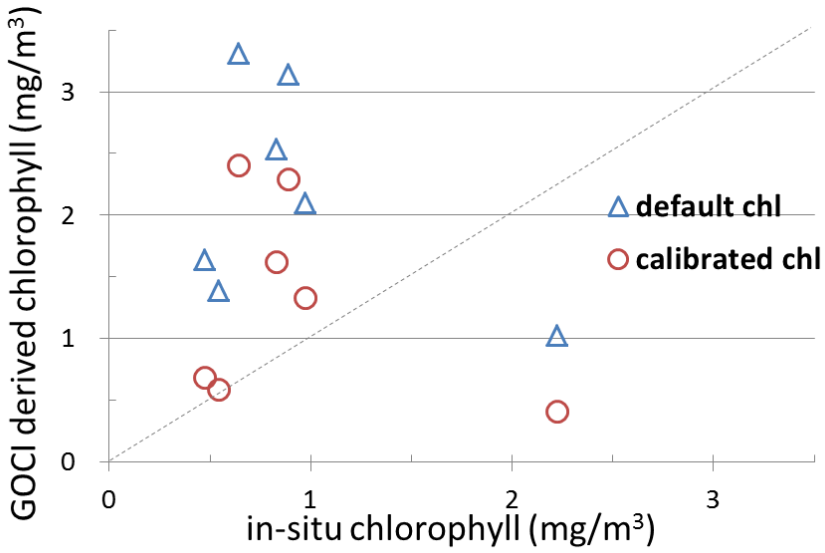
Improvement of accuracy by the application vicarious calibration

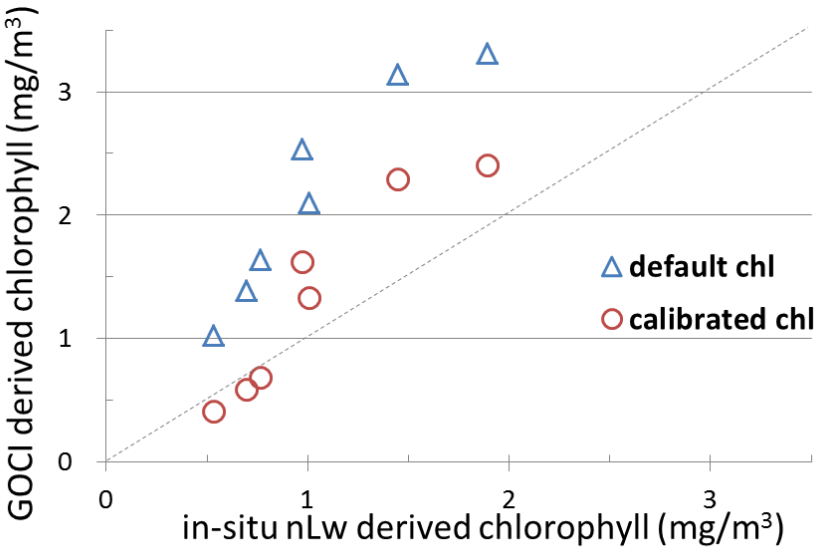


Improvement of accuracy by the application vicarious calibration

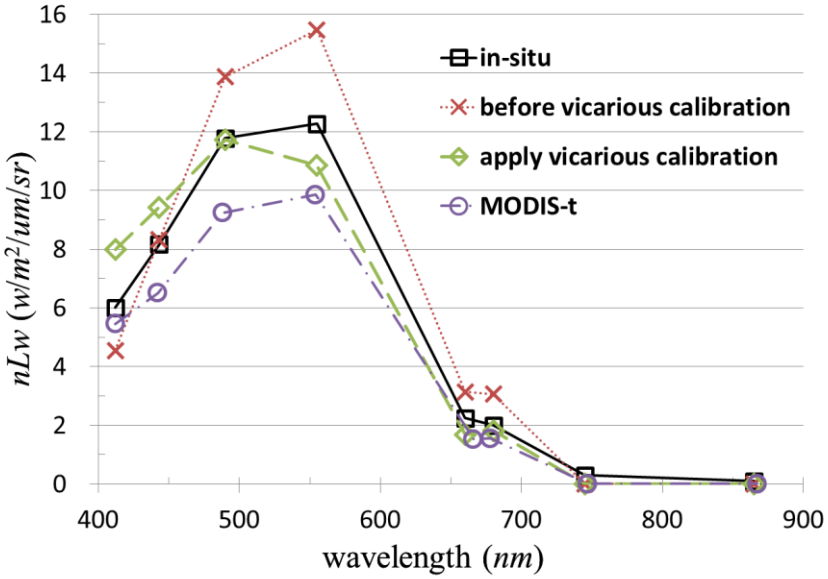


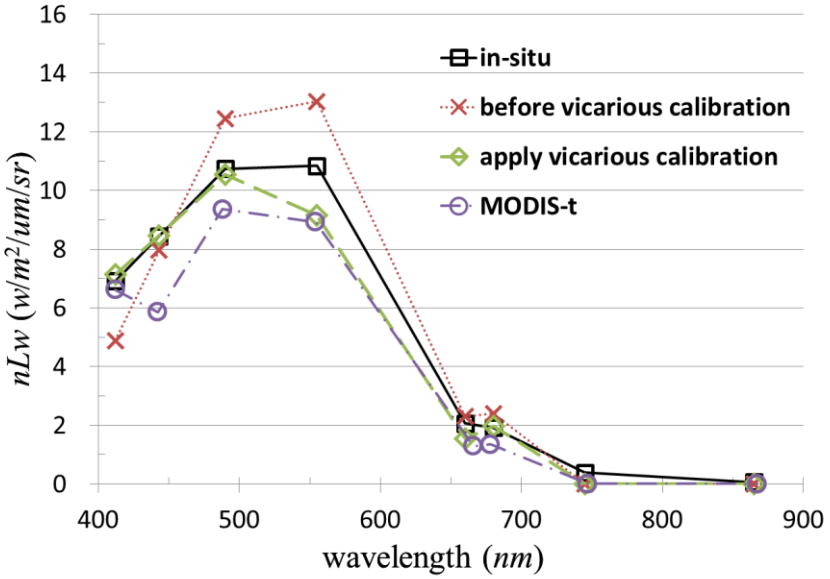


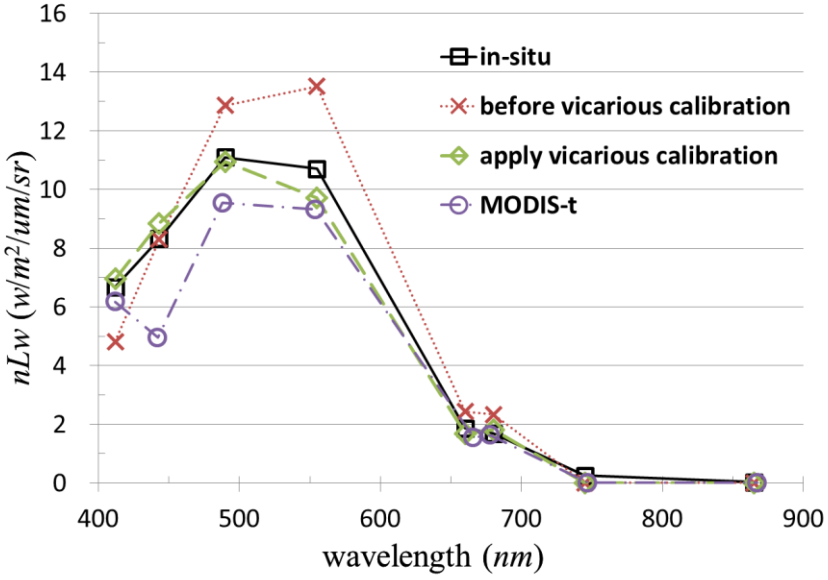




Improvement of accuracy by the application vicarious calibration

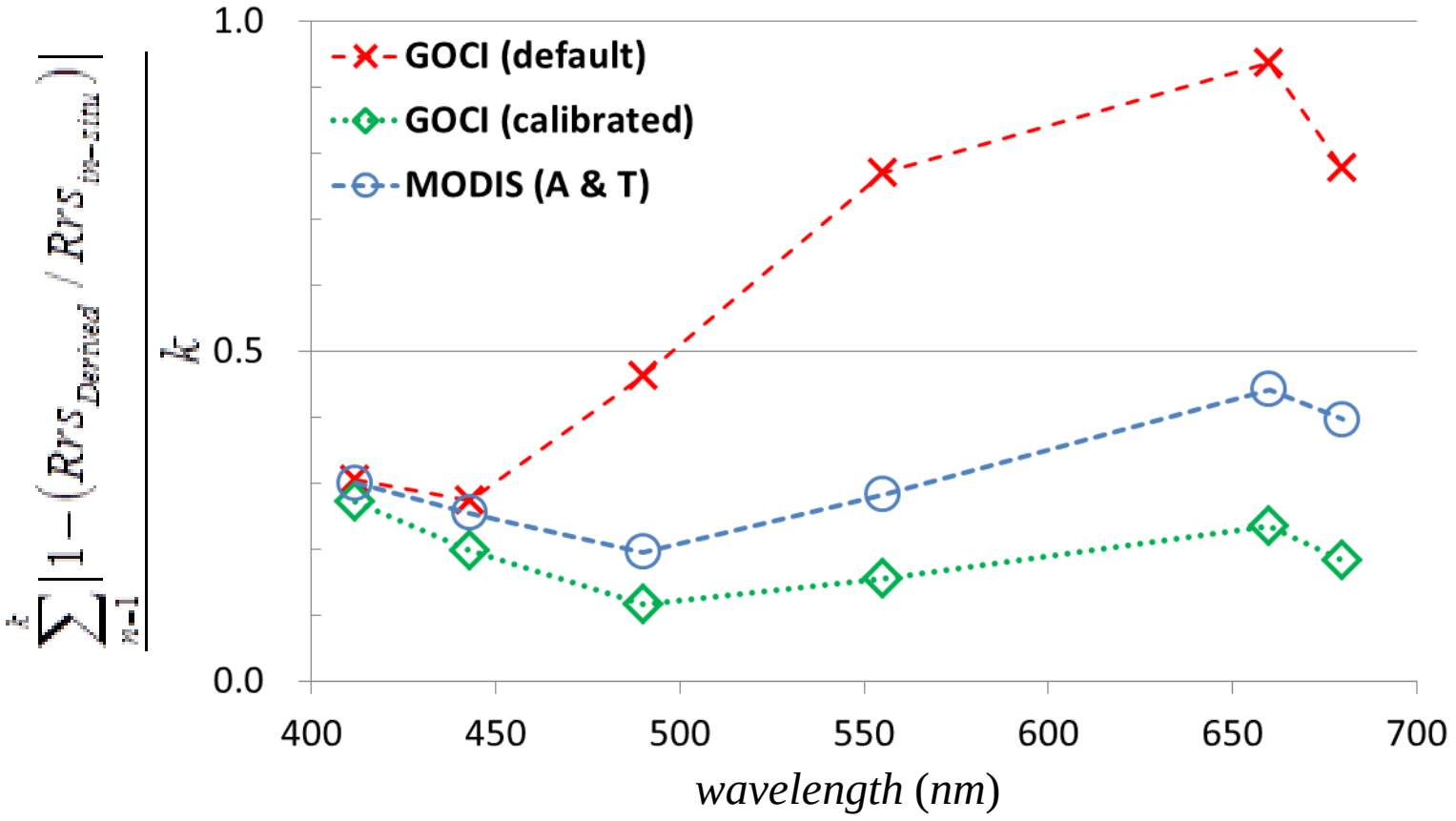






Validation with new data
Pungdo, 2011 / 06 / 11

Improvement of accuracy by the application vicarious calibration



* k : station number

Conclusion & Discussion & To Do

1. **Conclusion**
    - Vicarious calibration process improved accuracy (59% → 19% error)
2. **Discussion**
    - In-situ dataset
        - Insufficient data
        - Above water measurement
            - Data reliability
        - Inter-sensor calibration
    - M99 aerosol model assumption for 745nm centered band calibration
        - Turbid water NIR correction model of atmospheric correction can be effected


Thank you!!
For Further Questions,
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Regional Issues for a Vicarious Calibration Application

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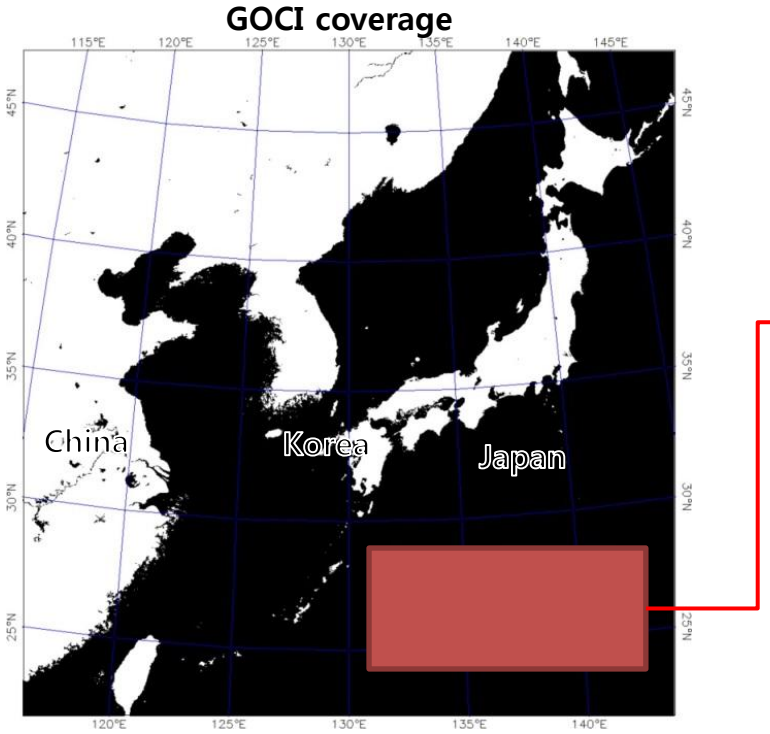
Site Selection for 745nm Centered Band Calibration



Region of vicarious calibration by KOSC (2013)

24.8000~29.0000˚ N
132.000~142.000˚ E

- NIR Vicarious calibration site
  - → Maritime relative humidity 99% (M99) aerosol
  - → Avoid continental aerosol

- Issues for NIR band (745nm) calibration region
  - Still can be influenced by continental aerosol
  - Accessibility

- Issues for VIS band (412~745nm) calibration region
  - Data quality issue
    - Spatial / temporal variability
    - In-situ radiometric measurements for vicarious calibration
      - Above water measurement
  - Inter-sensor calibration issue
    - Difference between MERIS / MODIS / GOCI / in-situ water reflectance spectra
      - Discrepancies between MERIS / MODIS / GOCI / in-situ water reflectance spectra
      - Data quality issue
  - Steady and lasting in-situ radiometric monitoring site is needed (such as MOBY site)
    - Plan to deploy a buoy in the East Sea

Further questions

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Data sharing policy of KOSC

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- KOSC in-situ data sharing /distribution policy
  - Open policy for international Cal/Val cooperation
  - Agreement required for other works

- Also other institutions' shared in-situ dataset will be helpful for GOCI Cal/Val

Further questions

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