

The SeaBASS AOP processor

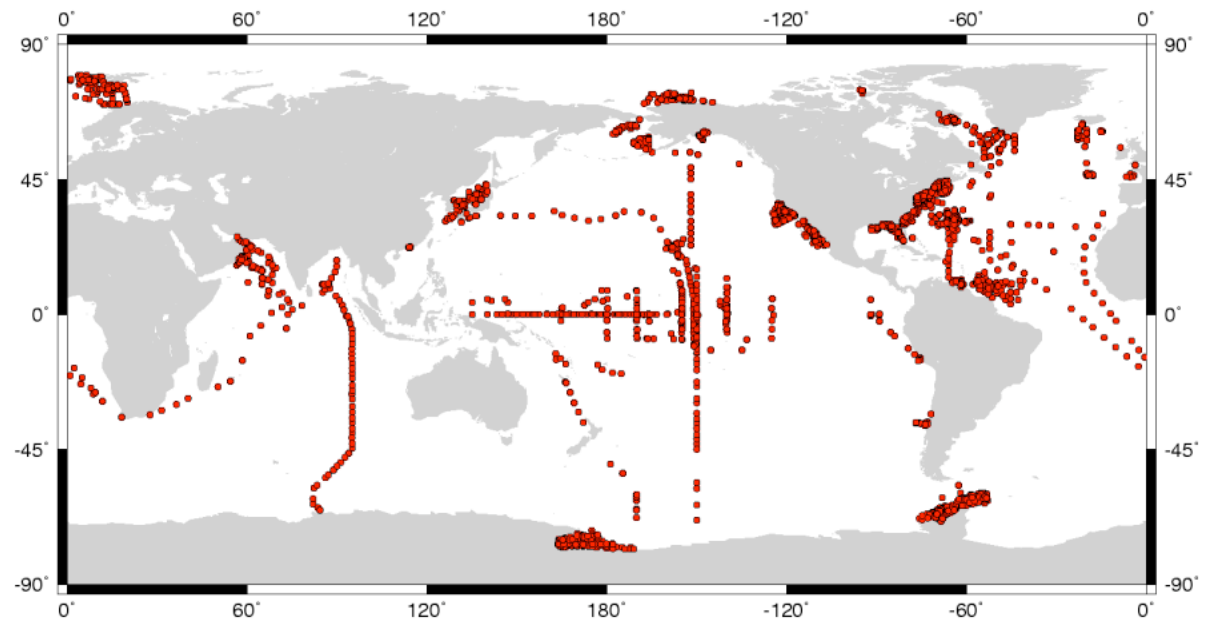
Jeremy Werdell

NASA-GSFC / Science Systems & Applications, Inc.

SeaBASS includes ~12,000 AOP depth profiles ...

... collected on ~850 field campaigns ...

... by ~30 different PIs & a variety of instruments



want generic post-processor to minimize PI / instrument differences

written in IDL (Interactive Data Language), initiated in 2001

operates independently of instrument & PI

requires only $L_U(\lambda, z)$ or $E_D(\lambda, z)$ & SeaBASS file format

primary assumptions:

calibration & immersion coefficients applied

depth offset(s) applied

standard deployment protocols followed

secondary assumptions (things we look for):

normalization to $E_s(\lambda, t)$

correction for self-shading

nominal QC applied, incl. tilt / roll exclusion

calculate & report:

$$L_W(\lambda)$$

$$E_D(o^+, \lambda), E_S(\lambda)$$

$$K_D(\lambda), z_{90}(\lambda) \text{ [Mueller 2000; } E_D(z_{90}) = E_D(o^-) e^{-1} \text{]}$$

$$K_{PAR}, z_{PAR}(37,10,1\%) \text{ [Morel et al. 2007]}$$

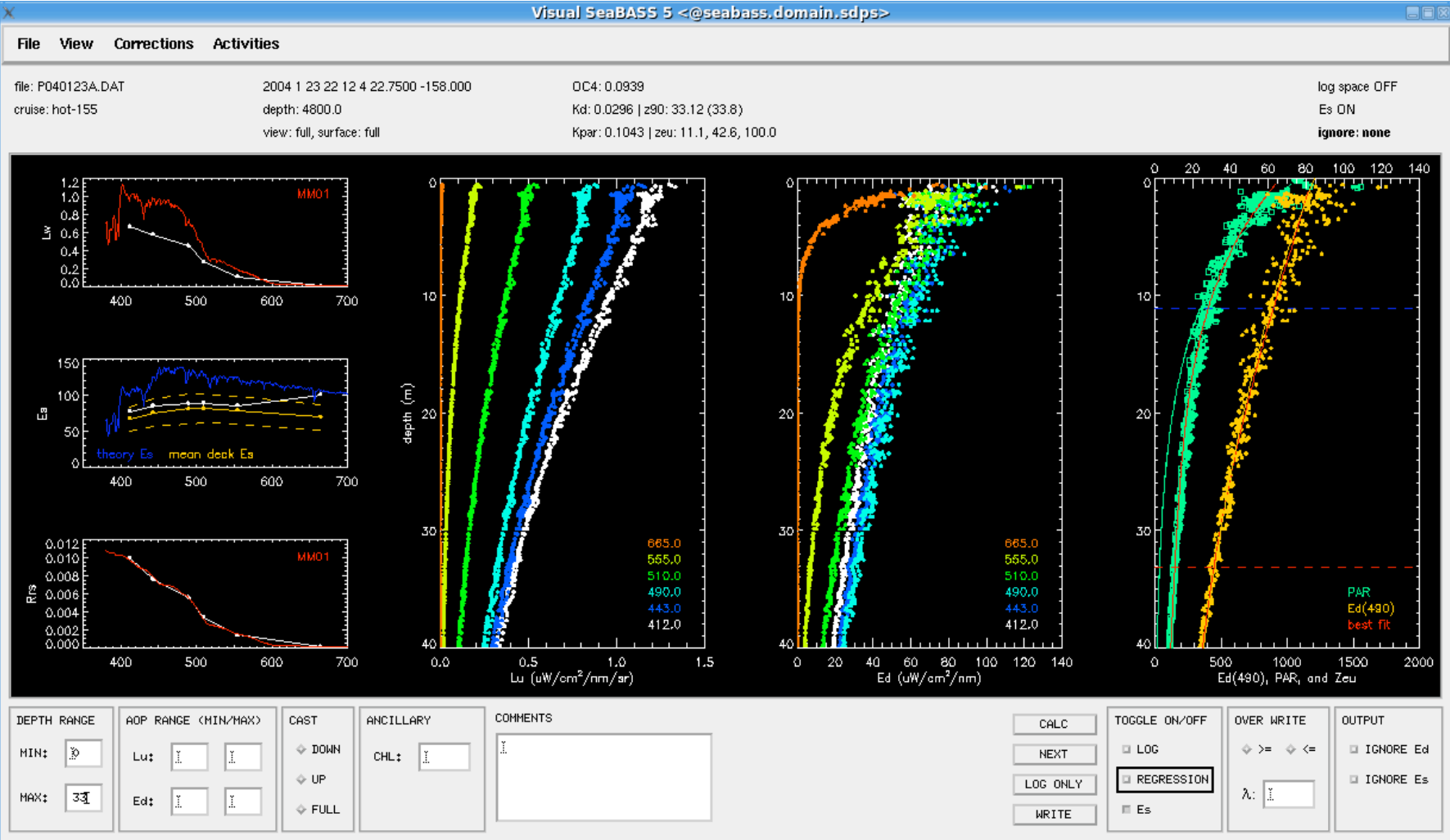
regression statistics [incl. near-surface $K_D(\lambda)$ & $K_{LU}(\lambda)$]

processing flags

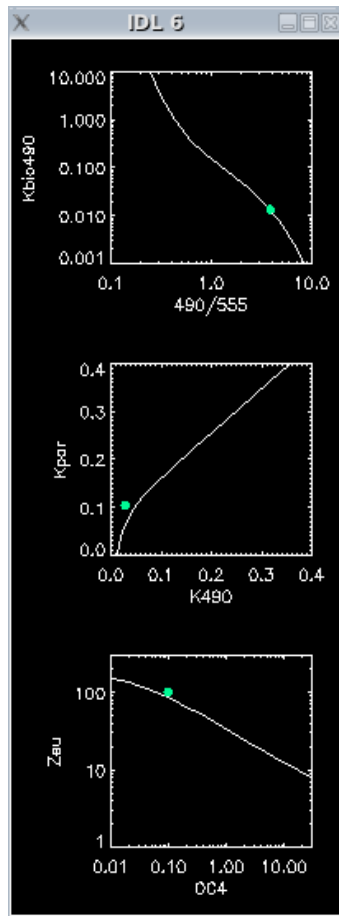
processing notes, extrapolation intervals, & statistics logged
output written to SeaBASS-style file (usually 1 file per cruise)

~30% ($\pm 20\%$) data files fail various exclusion criteria [TBD]

Visual SeaBASS (VSB): main window



Visual SeaBASS (VSB): features

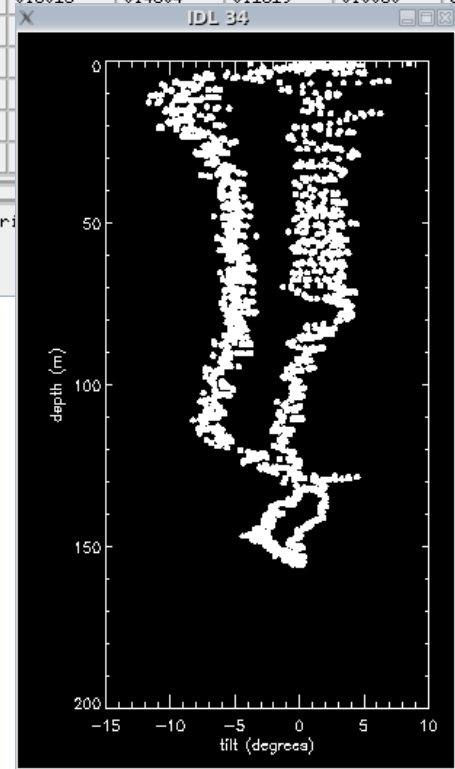
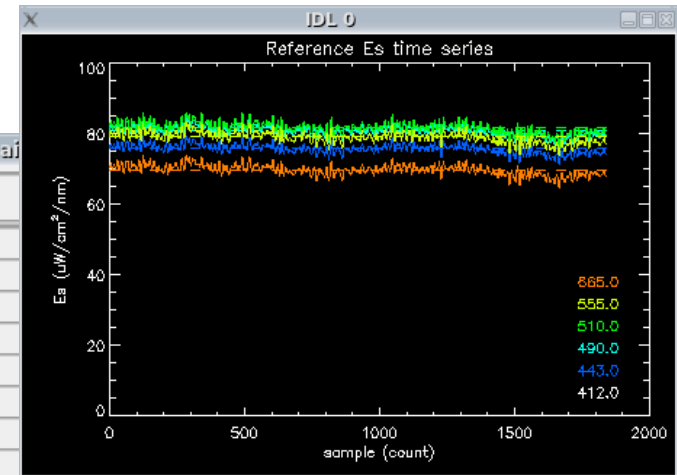


VSB Reduced Data <@seabass.domai

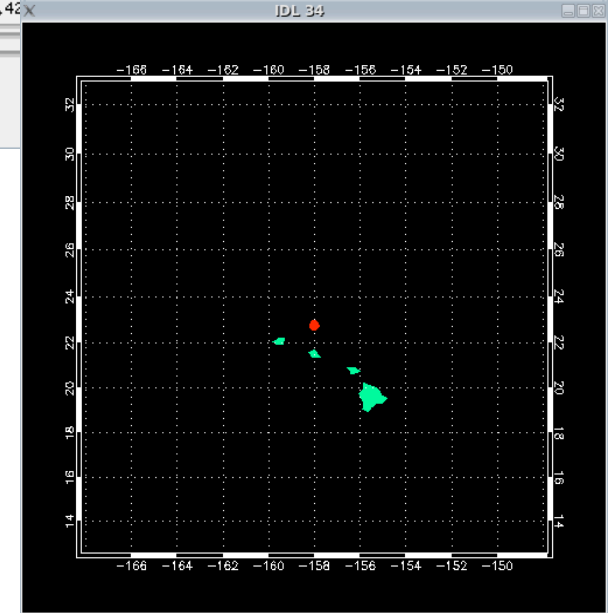
	LU412	LU443	LU490	LU510	LU555	LU665
0.745219	1.3365	1.1616	0.8936	0.5544	0.2298	0.0171
0.632569	1.3151	1.1428	0.8865	0.5478	0.2209	0.0149
0.557470	1.2998	1.1286	0.8794	0.5348	0.2120	0.0132
0.795286	1.2540	1.0955	0.8510	0.5174	0.2036	0.0136
1.10821	1.2510	1.0861	0.8439	0.5109	0.2015	0.0128
1.37107	1.2510	1.0908	0.8463	0.5196	0.2070	0.0113
1.58386	1.2571	1.0908	0.8486	0.5196	0.2072	0.0110
1.82170	1.2418	1.0813	0.8392	0.5152	0.2055	0.0107
1.99695	1.2083	1.0530	0.8179	0.4935	0.1910	0.0085
2.37249	1.1777	1.0246	0.8013	0.4804	0.1819	0.0080
2.83568	1.1869	1.0388				
3.24880	1.2083	1.0530				
3.54926	1.2113	1.0624				
3.92485	1.2235	1.0719				
4.05005	1.2083	1.0577				

The table does not reflect over-wr...

EXIT



58,9137	65,9184	66,8468	65,2200
62,8665	68,1575	70,3891	70,5435
65,7673	101,0723	101,1965	95,2822
73,6784	83,3834	89,8182	87,1404
77,0499	87,0779	92,0724	88,9149
77,7474	86,8540	90,7843	85,3659



known limitations:

our primary assumptions

reliance on outside (pre-)processors

difficult to verify calibration / offsets / corrections

cannot “un-bin” the depth-averaged values

little calculation of uncertainties

statistics & uncertainties not cleanly reported

processing flags could be expanded (bin levels, etc.)

hyperspectral data display

P.J. Werdell and S.W. Bailey, "The SeaWiFS Bio-optical Archive and Storage System (SeaBASS): Current architecture and implementation," NASA/TM-2002-211617, 45 pp (2002).

Cat herding: Lessons learned from maintaining SeaBASS and building NOMAD

Jeremy Werdell

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questions to be addressed in this presentation:

how does the OBPG use my AOP data?

are all AOP data used the same way?

data uses (collected to address different scientific questions):

targeted research

water quality monitoring

global data assimilation

satellite data product validation

algorithm development

satellite calibration

requirements for each satisfied differently

SeaBASS

$AOP(\lambda, z)$, $IOP(\lambda, z)$, & $C_a/CTD/bottle(z)$

format provided by PI

minimal exclusion

$L_U(\lambda, z) \rightarrow L_W(\lambda)$

VDS (Validation Data Set)

$AOP(\lambda, o^+)$, $IOP(\lambda, o^+)$, & $C_a/CTD/bottle(o^+)$

no restrictions on coincidence

exclusion criteria applied (x2) / data reduction

calibration quality with protocol adherence

NOMAD

$AOP(\lambda, o^+) + IOP(\lambda, o^+) + C_a/CTD/bottle(o^+)$

coincidence requirement

YOYO: replicate cast reduction software

eabass.dorr

b01_biome.env.all

Window: 3600

Define stations

Stations: 1

Plot station

Compare Es

View locations

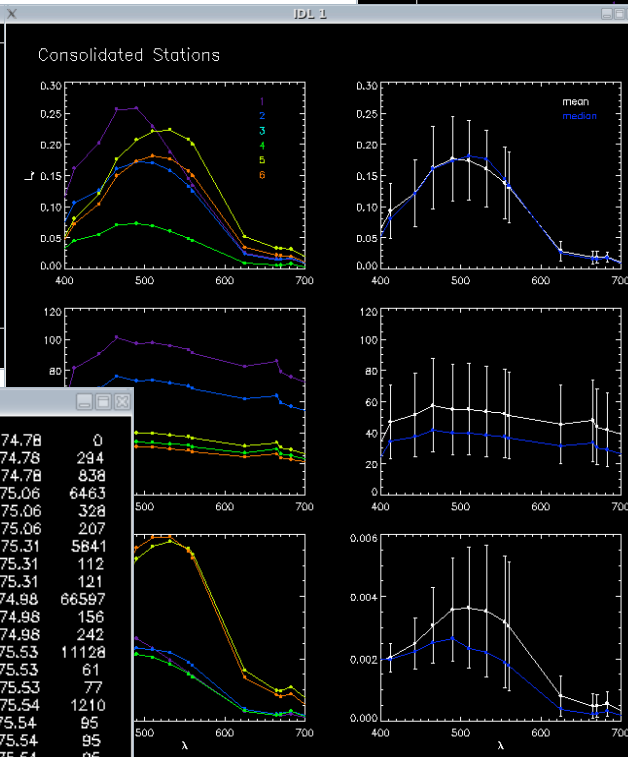
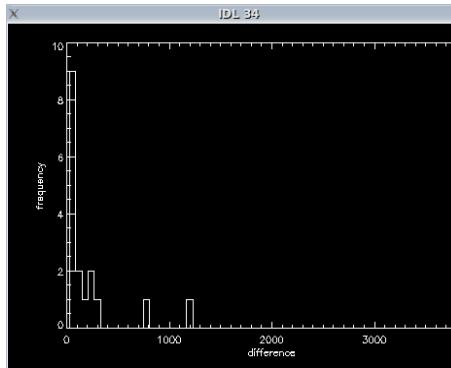
Map locations

Plot all data

Es Es

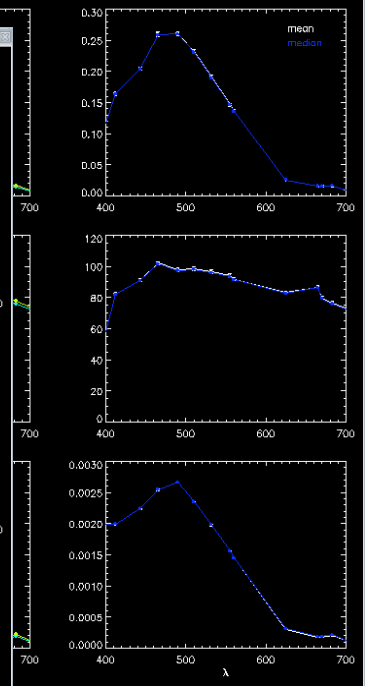
Consolidate

QUIT



IDL 33

1	2005	3	31	15	58	19	36.85	-74.78	0
1	2005	3	31	16	3	13	36.85	-74.78	294
1	2005	3	31	16	17	11	36.85	-74.78	838
2	2005	3	31	18	4	54	36.93	-75.06	6463
2	2005	3	31	18	10	22	36.93	-75.06	328
2	2005	3	31	18	13	49	36.93	-75.06	207
3	2005	3	31	19	51	10	36.99	-75.31	5841
3	2005	3	31	19	53	2	36.99	-75.31	112
3	2005	3	31	19	55	3	36.99	-75.31	121
4	2005	4	1	14	25	0	37.35	-74.98	66597
4	2005	4	1	14	27	36	37.35	-74.98	156
4	2005	4	1	14	31	38	37.35	-74.98	242
5	2005	4	1	17	37	6	37.47	-75.53	11128
5	2005	4	1	17	38	7	37.47	-75.53	61
5	2005	4	1	17	39	24	37.47	-75.53	77
5	2005	4	1	17	59	34	37.47	-75.54	1210
5	2005	4	1	18	1	9	37.47	-75.54	95
5	2005	4	1	18	2	44	37.47	-75.54	95
5	2005	4	1	18	4	19	37.47	-75.54	95
6	2005	4	1	20	55	15	37.78	-75.27	10258
6	2005	4	1	20	56	50	37.78	-75.27	95
6	2005	4	1	20	58	34	37.78	-75.27	104
6	2005	4	1	21	0	0	37.78	-75.27	86



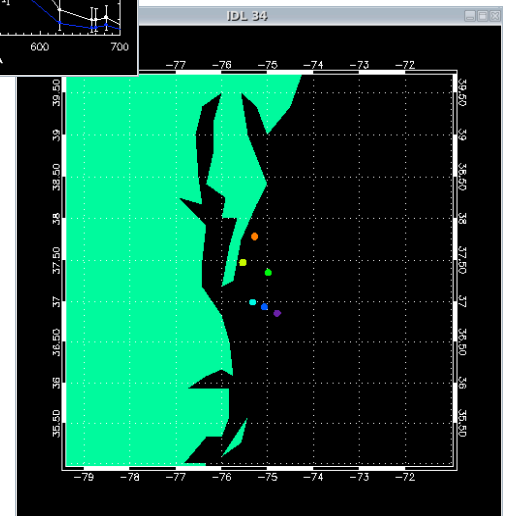
YOYO <@seabass.domain.sdps> <2>

Consolidate stations

1 (3): 1 3 (3): NA 5 (7): 5 6 (4): median

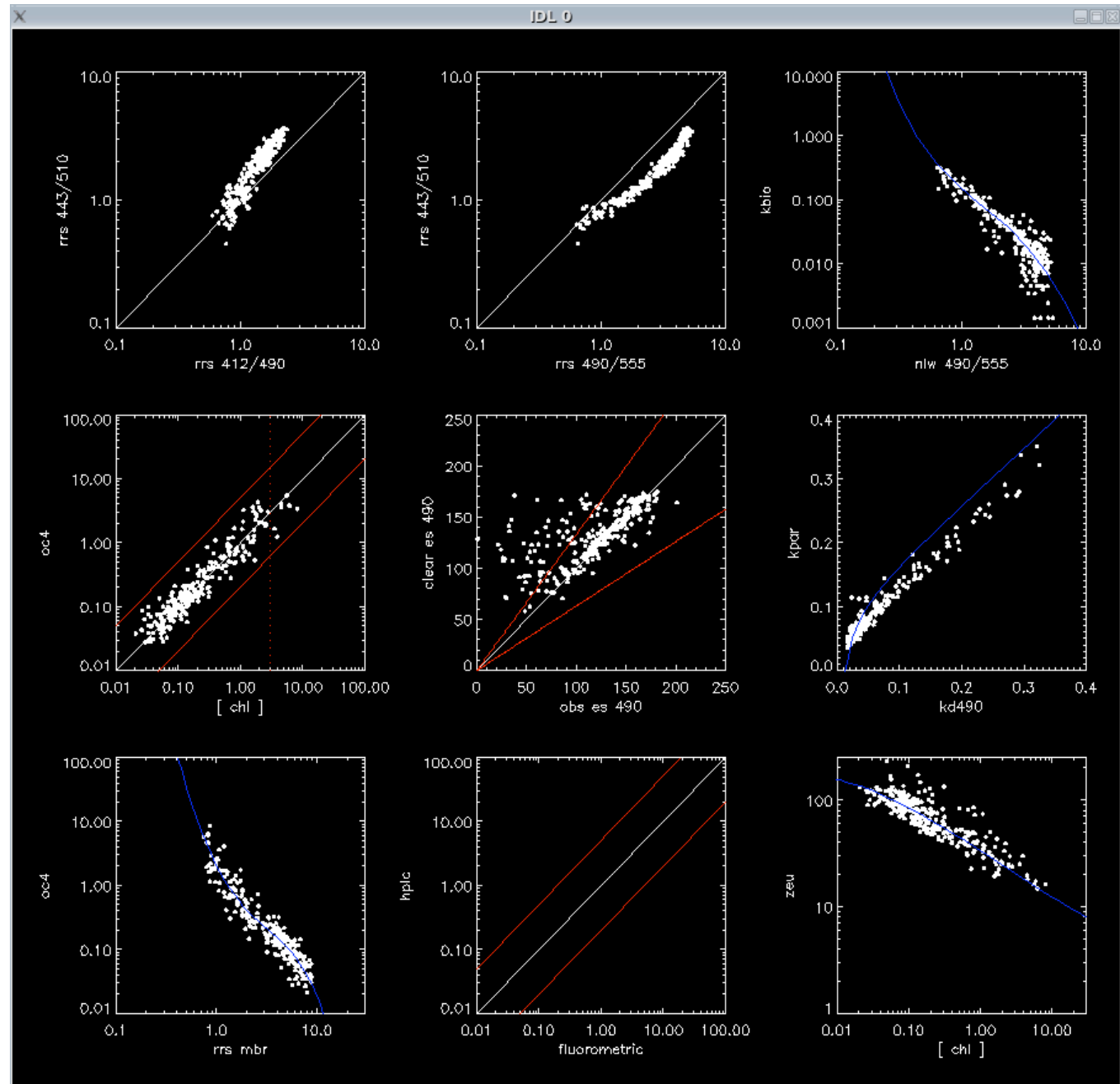
2 (3): 2 4 (3): mean

CANCEL PLOT REVERT ACCEPT



evaluation at
the cruise level:

AMT 1 - 8



SeaBASS

$AOP(\lambda, z)$, $IOP(\lambda, z)$, & $C_a/CTD/bottle(z)$

format provided by PI

minimal exclusion

50-90% data
retention

VDS (Validation Data Set)

$AOP(\lambda, o^+)$, $IOP(\lambda, o^+)$, & $C_a/CTD/bottle(o^+)$

no restrictions on coincidence

exclusion criteria applied (x2) / data reduction

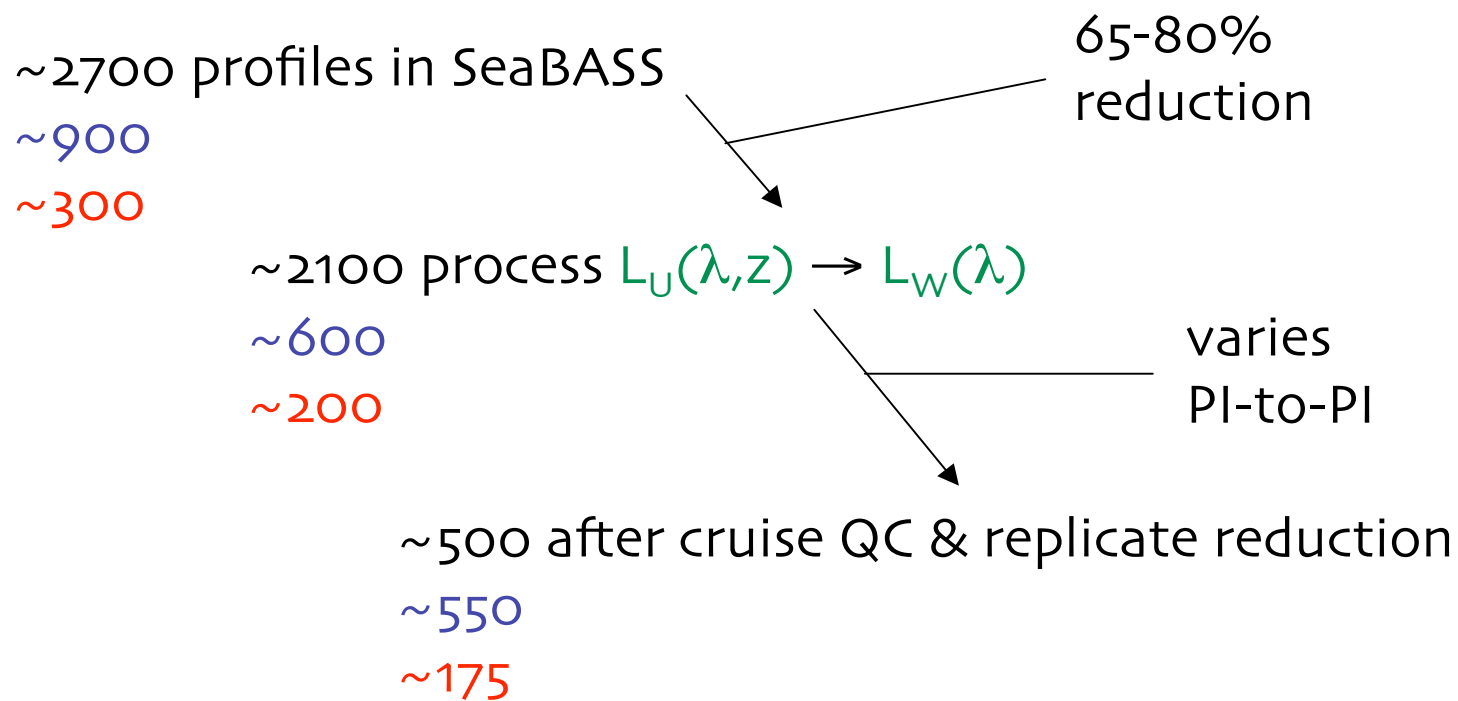
calibration quality with protocol adherence

NOMAD

$AOP(\lambda, o^+) + IOP(\lambda, o^+) + C_a/CTD/bottle(o^+)$

coincidence requirement

case study in data reduction via processing:

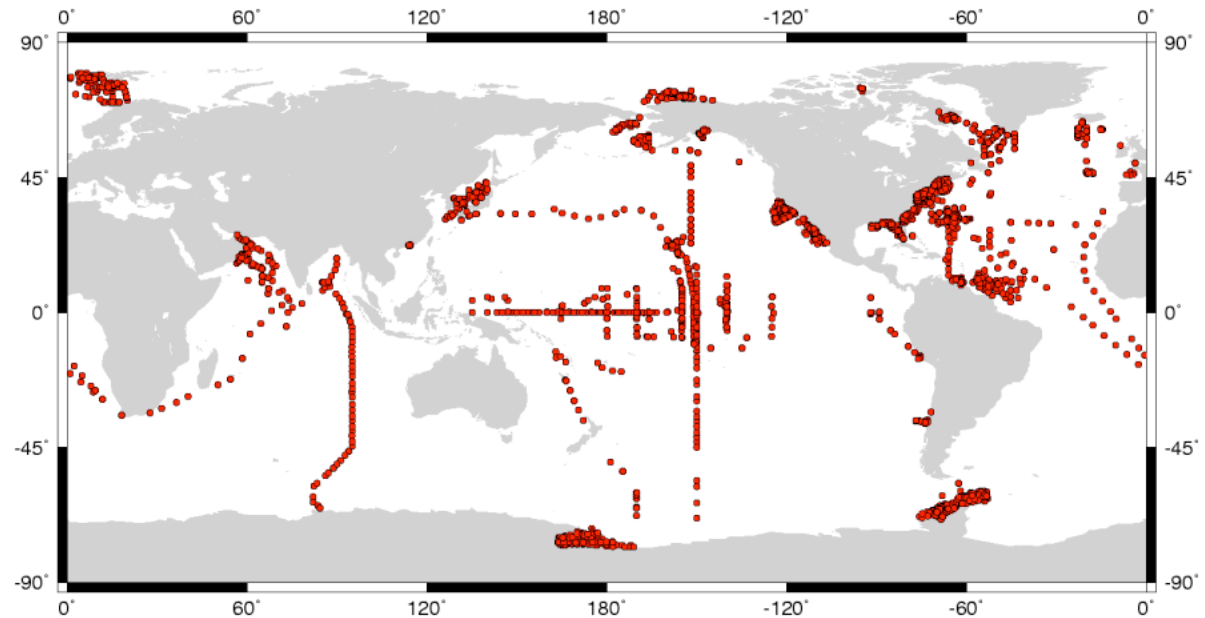


all monthly time-series
~1-4 observations / month

SeaBASS includes ~12,000 AOP depth profiles ...

... collected on ~840 field campaigns ...

... by ~30 different PIs & a variety of instruments



despite best efforts, impossible for all data to be equivalent

things that limit confidence:

no surface (deck / reference) $E_S(\lambda)$

averaging over depth intervals (binning)

modeled parameters outside reasonable range

inconsistent (or, lack of) replicate casts

inconsistent “up” vs. “down” casts

possible reasons for exclusion:

crazy $E_S(\lambda)$ time-series, irregular sky conditions

wavy $L_U(\lambda, z)$ or $E_D(\lambda, z)$, significant tilt / roll

no near-surface $L_U(\lambda, z)$ or $E_D(\lambda, z)$

poor extrapolation reconciliation / statistics

this does not mean that we (collectively) don't use these data
acknowledge that differences exist & use the data appropriately

perfect adherence to protocols vs. spatiotemporal representation

what can be accomplished depends on combinations of:

- location, season, water mass & water type

- instrumentation (technological / deployment hurdles)

- adherence to deployment protocols

- other available resources

- the research questions to be answered

SeaBASS

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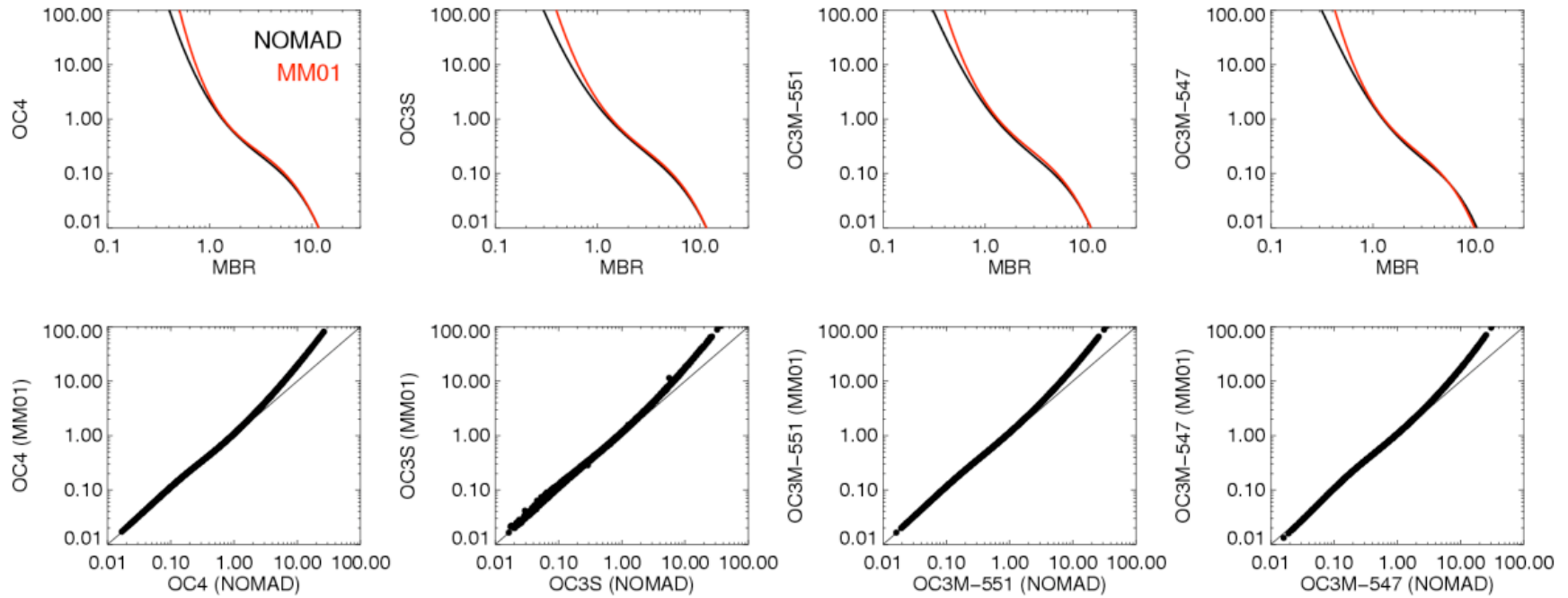
calibration quality with protocol adherence

NOMAD

$AOP(\lambda, o^+) + IOP(\lambda, o^+) + C_a/CTD/bottle(o^+)$

coincidence requirement

some personal thought on “impacts” ...



OBPG data requirements from a Web-based processor:

SeaBASS:

calibrated, depth-registered $L_U(\lambda, z)$, $E_D(\lambda, z)$, $E_S(\lambda)$, $anc(z)$

VDS / NOMAD:

$L_W(\lambda)$, $E_S(\lambda)$, $K_{D,PAR}(\lambda)$, other derived products

All:

uncertainties

P.J. Werdell and S.W. Bailey, "An improved in-situ bio-optical data set for ocean color algorithm development and satellite data product validation," *Rem. Sens. Environ.* 98, 122-140 (2005).

questions?