Execution Plans for a semi-automated system for Calibration and Validation of VIIRS ocean products.

Rehearsal 22 July 2011 (conclusion and results)

C. Trees, A. Alvarez, G. Pennucci.

Results: Hawaii-MOBY

MODIS satellite acquisitions (1 Km at nadir of ground resolution) have been provided (11 July 2011) by NRL (Adam Lawson) via ftp in hdf format.

MODIS
(2005, 2006 and 2007)

Network
(ftp, http)

MOBY Data
http://data.moby.mlml.calstate.edu/

Download,
Process (cloud fr
and archiv
all ima
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More details at the end of the rehearsals

Statistical Analysis
0.5~ day for each month
6 days!

Merging
1-2 day for all 2007 available data

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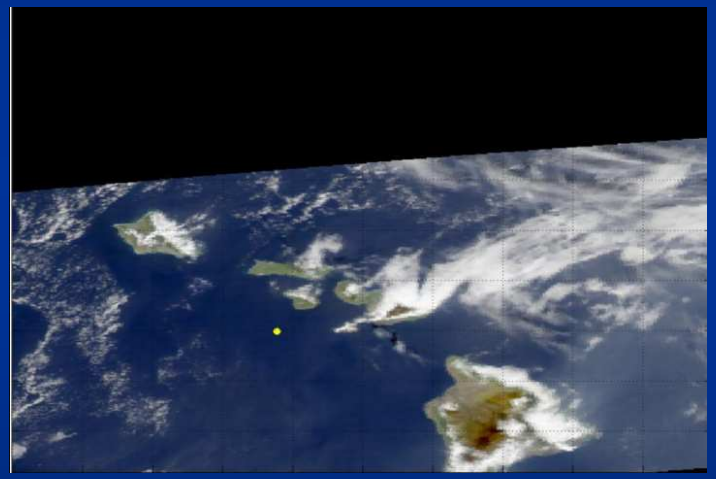
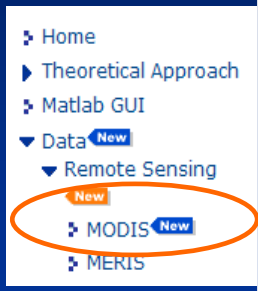
Phase 1: MODIS & MOBY data download, Pre-processing and archiving *Completed!*

MODIS data

MODIS imagery (from Jan 2005 to Dec 2007) have been download from NRL,for a total of **1325 images**.

All the “clear” images (**233 images**) have been processed and archived



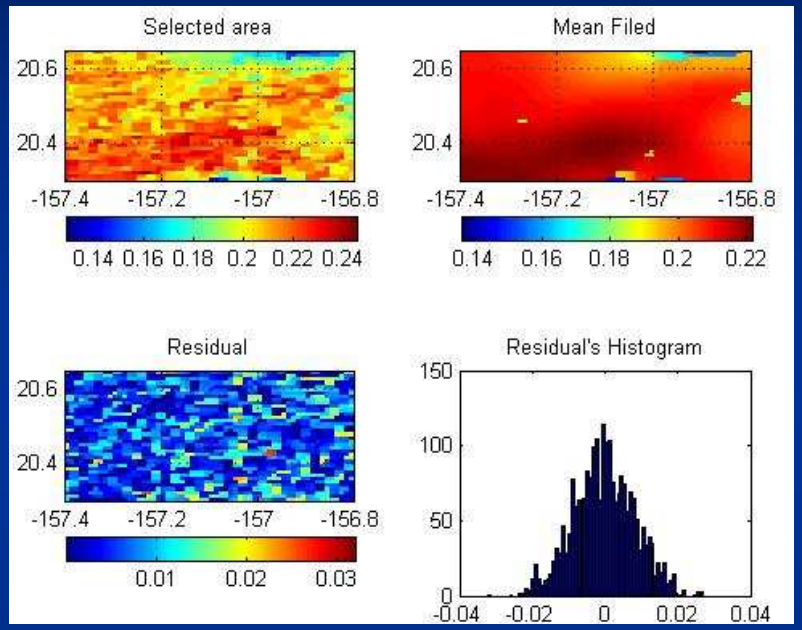


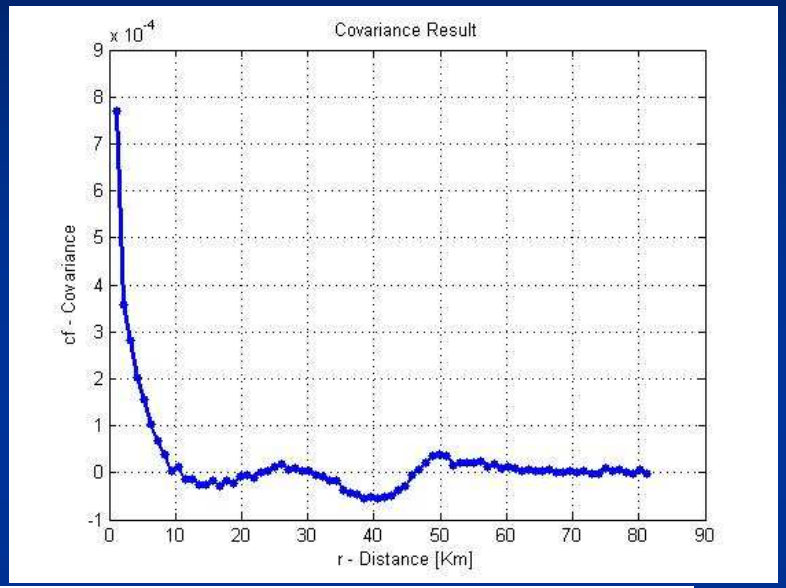
MOBY data

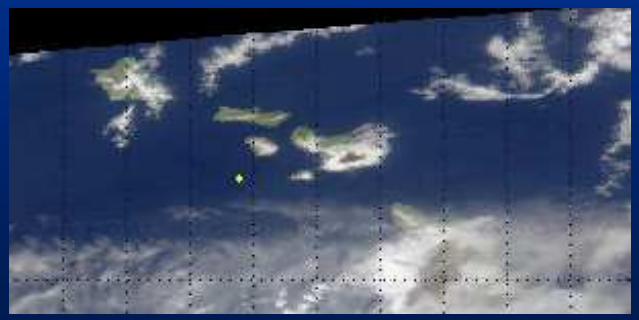
MOBY data (2007) have been downloaded from the web (http://data.moby.mlml.calstate.edu)

Phase 2: Spatial Analysis
Covariance and merging
Completed!

5 April 2007 nLw 547: MODIS: h 00.19 & MOBI h 00.09







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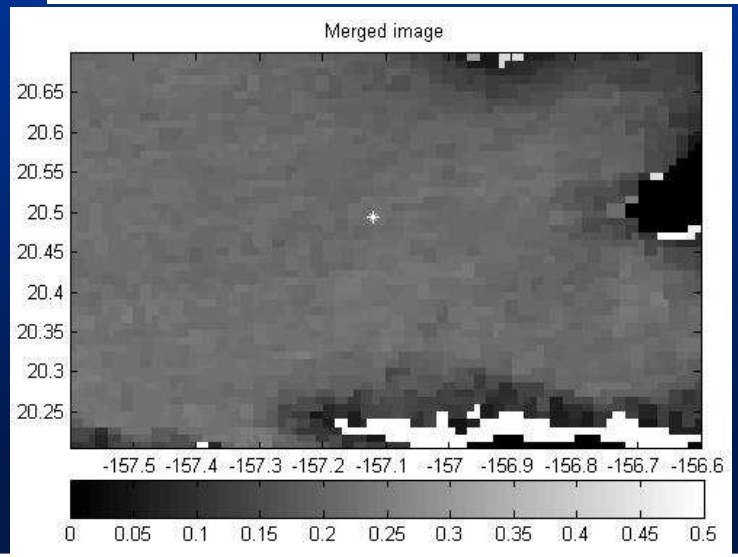

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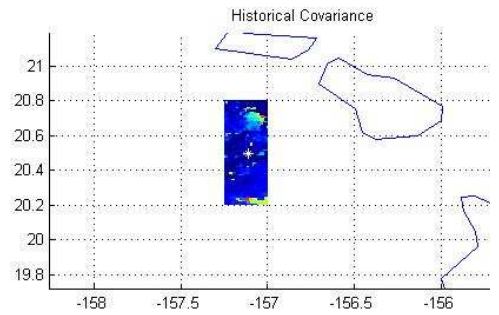
Phase 3: Spatial-Temporal Analysis
Covariance and UI Maps
Completed!

The covariance matrix have been evaluated using the available monthly time-series MODIS acquisitions from 2005 to 2007:

Month	2005	2006	2007	MODIS ORIGINAL IMAGES	Sub-area selection (cloud-free area around Moby station)
Jan	36 images	39 images	45 images	120 images	20 frames
Feb	36 images	34 images	36 images	106 images	23 frames
Mar	38 images	37 images	42 images	117 images	15 frames
Apr	38 images	36 images	42 images	116 images	14 frames
May	39 images	39 images	43 images	121 images	20 frames
Jun	36 images	37 images	42 images	115 images	18 frames
Jul	35 images	No data	42 images	77 images	12 frames
Aug	36 images	35 images	40 images	111 images	27 frames
Sep	34 images	34 images	40 images	108 images	11 frames
Oct	37 images	35 images	42 images	114 images	18 frames
Nov	34 images	33 images	41 images	108 images	22 frames
Dec	35 images	34 images	43 images	112 images	33 frames

For each month:

+ Uncertainly map (32 by 40 Km) (historical covariance)

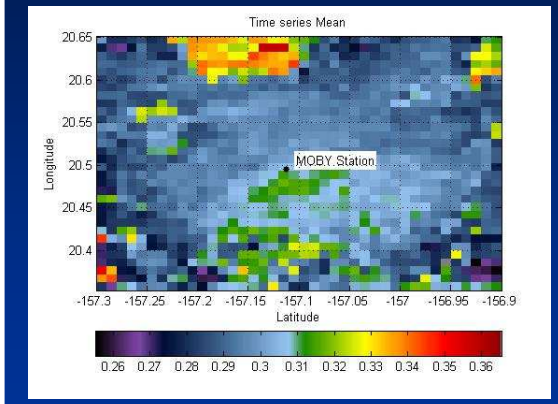


+ Mean of the time series.

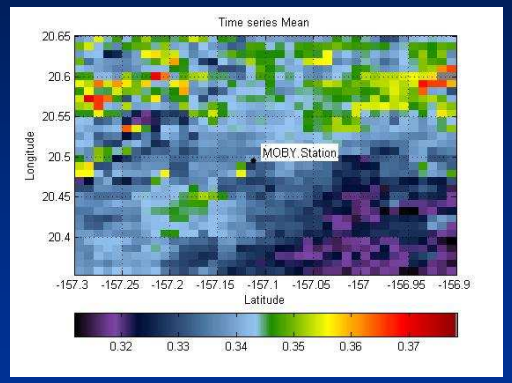
The historical covariance map (C_{HIST}) represents the pixels standard deviation of considered time-series. C_{HIST} , the covariance (C) and the mean of the time-series well represent the monthly statistic analysis.

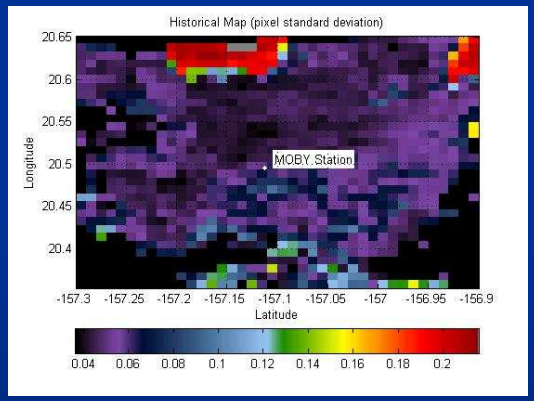
Phase 3: Spatial-Temporal Analysis
Covariance and UI Maps
Completed!

MARCH | **AUGUST**

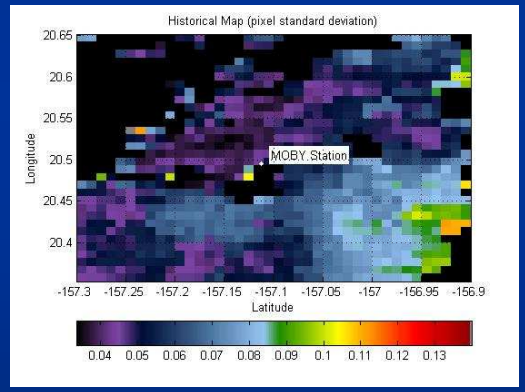


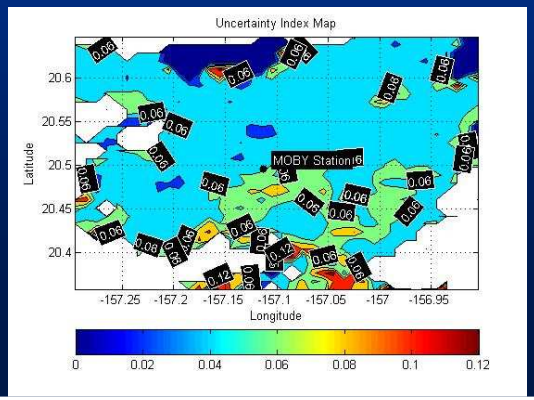
Time series mean
(Normalized Water Leaving radiance at 547 nm)



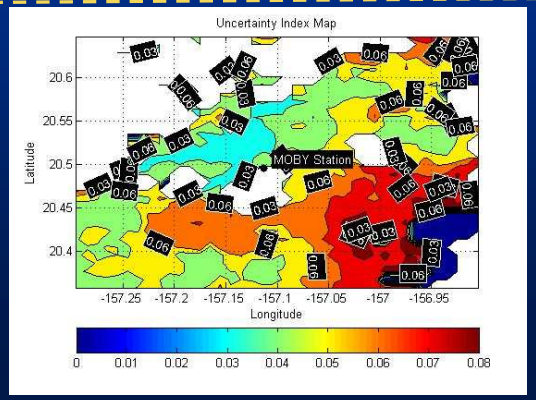


Historical Map
(pixel standard deviation)





Uncertainty Index Map
(where it's better to place an *in situ*?)



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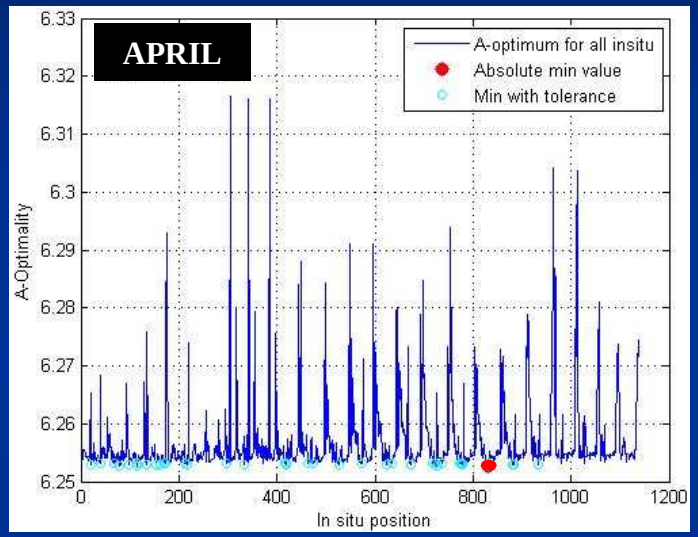
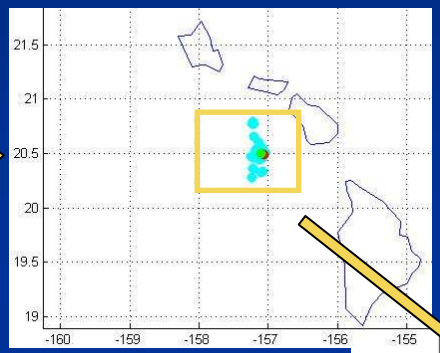
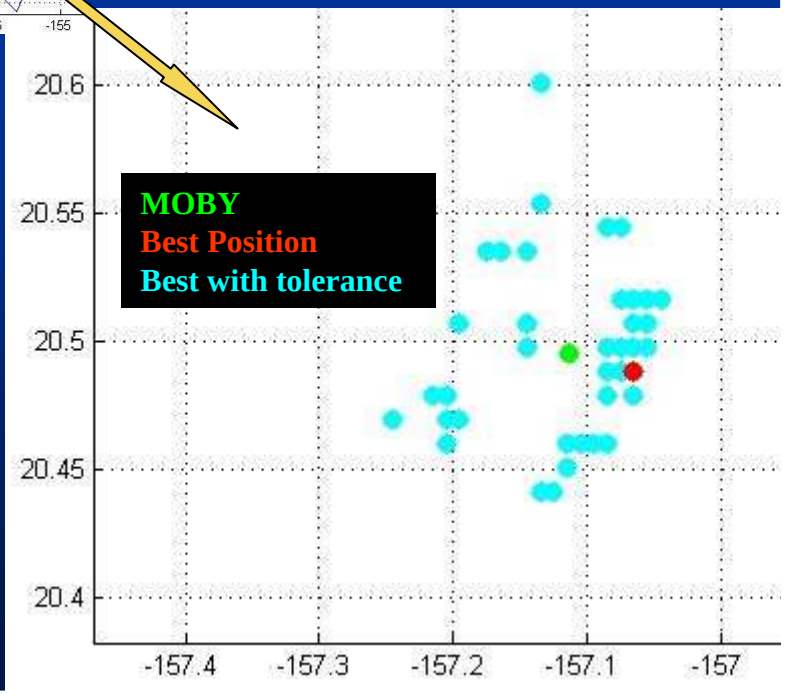
Phase 4: Spatial-Temporal Analysis
Optimum design
Completed!

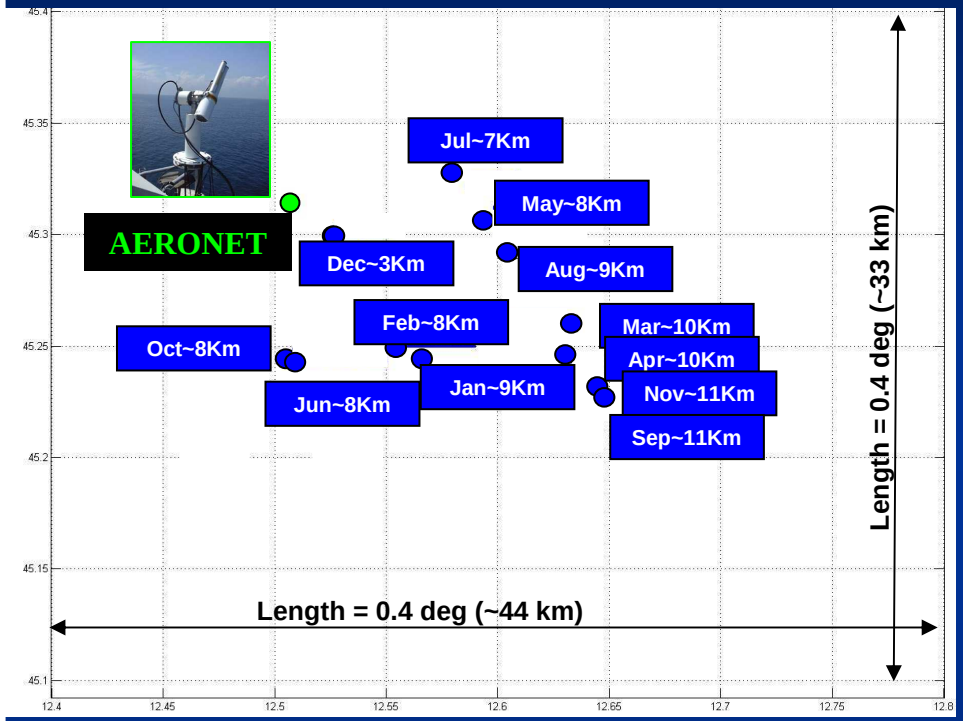
As we did for AERONET, we have applied the A-optimum design procedure to identify the “best” MOBY *in situ* position in terms of “lower variance error”.

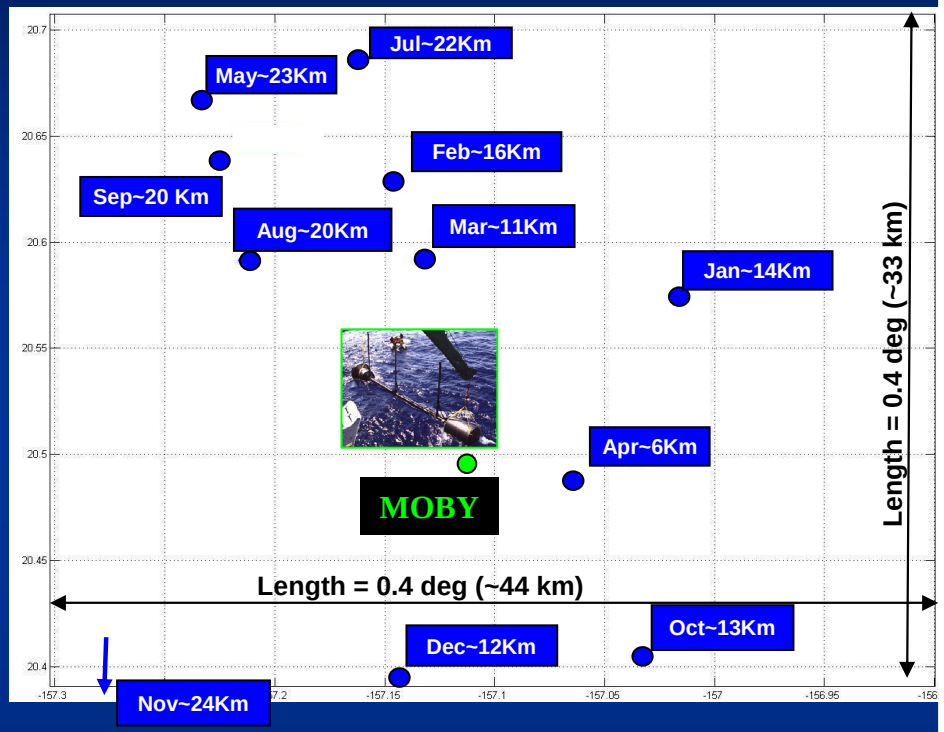






Comparison between AERONET and MOBY historical results
(which station is the best placed for Cal/Val support?)





To compare the results of the two Golden Regions analyzed we have displayed the A-optimum retrieved for each month.

The AERONET "best" locations are ~8.5 Km far to the actual position and are placed at SW of AERONET, while MOBY "best" results more far (15 Km) to the actual MOBY position but are well spaced (around the station).

Conclusion

We have presented how NURC will contribute to the execution plans for a semi-automated system for daily calibration and validation procedures for Visible Infrared Imager Radiometer System (VIIRS) ocean products.
We have demonstrated our operability in the process and deliver of products that can support that project. In particular:

✓ The data processing chain that will guarantee our operability during the project have been tested with success;
✓ The historical characterization of two golden regions (Venice and Hawaii) that will be used to support VIIRS Cal/Val procedures (post processing ~ 2 weeks of delay) have been completed;
✓ The spatial procedures (covariance and merging) that will be used to support in real-time VIIRS Cal/Val procedures have been tested and completed.

Lesson learned and work in progress

Waiting the VIIRS launch we will continue our studying focusing the attention on:
performing:

• New Golden regions (such as Aeronet-MVCO, Boussole and Gyres) WHEN DATA WILL BE AVAILABLE

• New uncertainty indices that can be used as support of Cal/Val procedures. In Particular we are working on a new index that relates the goodness of the measurement in a particular location (user defined) *to respect* (normalized) the Moby/Aeronet/Boussole/Gyre official sites.
It will be represented with a complex number that will take into account of two important parameters:

$$\text{Index} = A + B\,j$$

A takes into account of the "goodness" to respect the reference site. For example if A=2 performance of the new position is lower of a factor 2.

B takes into account of "area of influence" of the selected site.