UI index, a New definition

We have define an index that relates the goodness of the measurement in an user defined location *to respect* (normalized) the Moby (or Aeronet, or Boussole or Gyre) official sites. The idea is to define a parameter that is independent on the size of the study area in order to provide an absolute value that can be used for several areas.

The new UI is represented with a complex number that I take into account of two important parameters: the goodness of the measurement to respect the reference site and the area of influence of the retrieved result.

$$UI = A + j\ B$$

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.

UI index, the reference

In order to have an absolute reference to relate the goodness of the study measurement, a *reference in situ* have to be defined.
On the basis of our covariance-performance analysis we have decided to use MOBY as reference (that is the more used and tested station).
The idea is to use MOBY to normalize the UI index as follow:

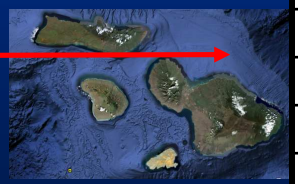
$$UI = \frac{Cov_{INSITU}}{Cov_{MOBY}} + j\frac{Area_{INSITU}}{Area_{MOBY}}$$

This ratio is retrieved from the evaluation of the area [km] (number of pixel x size of one pixel) with a bigger correlation. This area is identified using a threshold that depends on the correlation of the pixel of interest: $threshold = \frac{C(i,i)}{2}$

This ratio is retrieved using the covariance matrix of the *in situ* of interest (for example AERONET) and the covariance matrix of the reference *in situ* (MOBY). The value of the matrix is an index that represents the correlation of the i-pixels with the other pixels in the area. The ratio provide a value that takes into account of the "goodness" to respect the reference site.
If $\frac{Cov(i,i)}{Cov_{MOBY}} = 2$, the performance of the considered *in situ* two times lower to the MOBY performance.

MOBY reference table

MOBY	Cov	Area [km]
Jan	0.9532	1321
Feb	0.9668	1040
Mar	0.9771	914
Apr	0.9144	1426
May	0.9787	480
Jun	0.7215	782
Jul	0.7862	701
Aug	0.9450	1180
Sep	0.9951	1222
Oct	0.988	631
Nov	0.9270	751
Dec	0.9453	382



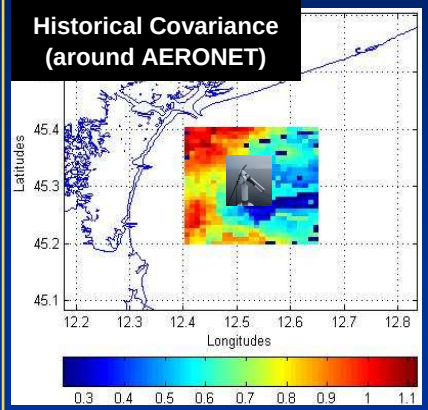
UI index, an example of implementation

Historical Water Leaving radiance (547 nm) analysis in the month of February

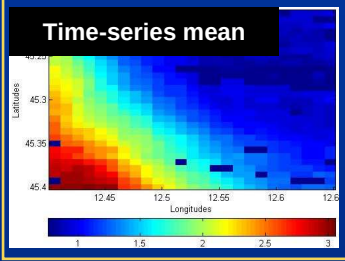
MODIS time-series
(Feb 2008-2009)

STATISTICAL RESULTS:

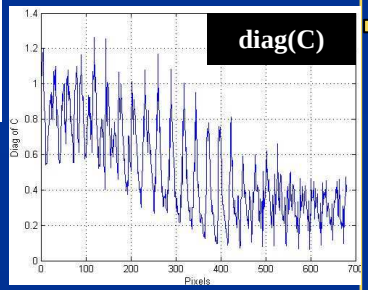
Historical Covariance (around AERONET)



Time-series mean



diag(C)



UI AERONET ANALYSIS:

$$Cov_{AERONET} = 0.9418$$

$$Area_{AERONET} = 451[\text{km}]$$

$$UI = \frac{0.9742}{Cov_{MOBY}} + j\frac{451}{Area_{MOBY}}$$

$$UI_{February} = 0.9742 + j0.4338$$

MOBY	Cov	Area [km]
Jan	0.9532	1321
Feb	**0.9668**	**1040**
Mar	0.9771	914
Apr	0.9144	1426
May	0.9787	480
Jun	0.7215	782
Jul	0.7862	701
Aug	0.9450	1180
Sep	0.9951	1222
Oct	0.988	631
Nov	0.9270	751
Dec	0.9453	382

$$UI = \frac{Cov_{INSITU}}{0.9668} + j\frac{Area_{INSITU}}{1040}$$

UI index, Venice-AERONET results

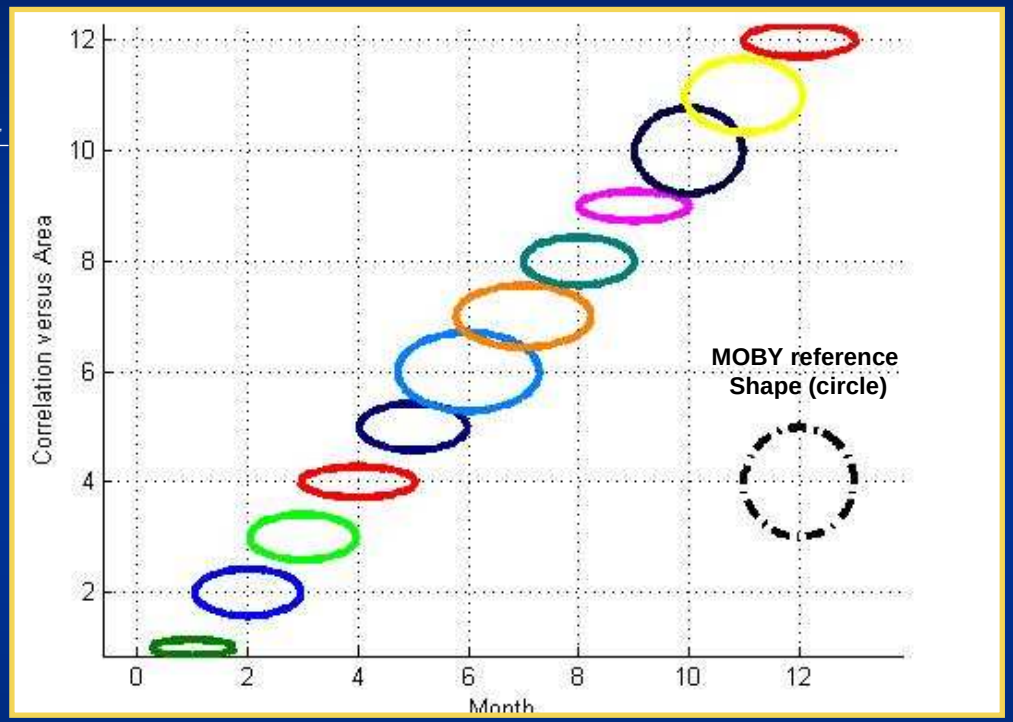
Ellipse definition:

$$\text{semimajor axis}_a = \frac{C_{AERONET}}{C_{MOBY}}$$

$$\text{semimajor axis}_b = \frac{Area_{AERONET}}{Area_{MOBY}}$$

$$\text{inclination} = 0^\circ$$

$$\text{center} = (\text{Month}_x, \text{Month}_y)$$



AERONET	UI index
Jan	0.7576 + j0.1528
Feb	0.9742 + j0.4338
Mar	0.98 + j0.42
Apr	1.0539 + j0.2824
May	0.9877 + j0.4333
Jun	1.2895 + j0.72
Jul	1.2388 + j0.5669
Aug	1.0172 + j0.4414
Sep	1.01 + j0.27
Oct	0.9786 + j0.7862
Nov	1.0673 + j0.6794
Dec	1.0247 + j0.2907

On the basis of the above results, it's possible to classify the performance of each month and To build a "top-list":

1.	October	7.	July
2.	November	8.	August
3.	May	9.	December
4.	February	10.	April
5.	June	11.	September
6.	March	12.	January