

# In situ data for algorithm calibration and validation

Vanda Brotas,  
Carolina Sá, Elisabete Mota



CENTRO DE OCEANOGRAFIA



**LIST OF ALL PARAMETERS USEFUL FOR THE ALGORITHMS REGIONAL ADAPTION AND VALIDATION ACTIVITIES**

based on RD list, NASA and REVAMP protocols

**MERIS bands (412.5; 442.5; 490; 510; 560; 620; 665; 661.25; 709)**

**RADIOMETRIC QUANTITIES**

Downwelled Irradiance  
 Upwelled Radiance  
 Water Surface Radiance in air  
 Incident Irradiance in air  
 Normal Solar Irradiance  
 Sky Radiance  
 Diffuse Sky Irradiance  
 Direct Sun Irradiance  
 Water-Leaving Radiance  
 Remote Sensing Reflectance  
 Attenuation Coefficient  
 Ocean Bidirectional Reflectance Distribution function  
 Aerosol Optical Depth  
 Aerosol Phase Function

**ANCILLARY DATA AND METADATA**

Latitude and Longitude  
 Date and Time (UTC)  
 Wave Height  
 Whitecap Conditions  
 Wind Speed, and Direction  
 Cloud Cover  
 Secchi Depth  
 Water Depth  
 Conductivity and Temperature over Depth (CTD)

**INHERENT OPTICAL PROPERTIES**

Beam Attenuation Coefficient  
 Absorption Coefficient  
 Backscattering coefficient  
 Scattering Coefficient  
 Volume Scattering Function  
 Particle Absorption Coefficient  
 Dissolved Material (CDOM) Absorption Coefficient  
 Non-Pigmented Particle Absorption Coefficient  
 Phytoplankton Absorption Coefficient

**BIOGEOCHEMICAL and BIO-OPTICAL QUANTITIES**

Phytoplankton Pigment Composition  
 Chlorophyll a and Phaeopigments Conc.  
 Fluorescence Intensity  
 Phycobiliprotein Concentrations  
 Coccolith Concentrations  
 Phytoplankton groups abundance  
 Total Suspended Particulate Material  
 Particle Size Distribution  
 PI parameters for PP  
 Phytoplankton biomass conversion factors  
 Turbidity conversion factors



# Algorithm REQUIREMENTS

These parameters are needed for basic water algorithms (for **training of neural networks**)

The adaptation of the NN algorithm to local conditions can be performed on different levels.

The most comprehensive one is the full bio-optical model, which is used for the simulation of the training data set.

If the full suite is not available, any of the above listed variables is helpful including information about the range of IOPs and / or concentrations.

## Quality assurance

- Data processing: building up templates
- Verifying protocols
- Applying basic statistics for each parameter, average, max and minimum. Filter, sort ascending, etc
- Visual inspection: checking for internal consistence between each database
- Checking for consistence between different databases
- Comparison with published literature

# Data sets were introduced into common templates

The screenshot shows a Microsoft Excel spreadsheet with the following data:

	A	B	C	D	E	F	G	H	I	J	W
2	1	User	Id	File_id	File	Cruise	yyyymmdd	hh:mm:ss	Lat	Lon	
649	1	PML		4_330	Coastcolour_Pigment_&_Particulate_absorption.xls		2009-07-27	11:00:00	50,25	4,217	
650	1	PML		4_331	Coastcolour_Pigment_&_Particulate_absorption.xls		2009-08-11	11:00:00	50,25	4,217	
651	1	PML		4_332	Coastcolour_Pigment_&_Particulate_absorption.xls		2009-08-17	11:00:00	50,25	4,217	
652	1	PML		4_333	Coastcolour_Pigment_&_Particulate_absorption.xls		2009-08-24	11:00:00	50,25	4,217	
653	1	PML		4_334	Coastcolour_Pigment_&_Particulate_absorption.xls		2009-09-01	11:00:00	50,25	4,217	
654	1	PML		4_335	Coastcolour_Pigment_&_Particulate_absorption.xls		2009-09-07	11:00:00	50,25	4,217	
655	1	PML		4_336	Coastcolour_Pigment_&_Particulate_absorption.xls		2009-09-14	11:00:00	50,25	4,217	
656	1	PML		4_337	Coastcolour_Pigment_&_Particulate_absorption.xls		2009-09-22	11:00:00	50,25	4,217	
657	1	PML		4_338	Coastcolour_Pigment_&_Particulate_absorption.xls		2009-09-28	11:00:00	50,25	4,217	
658	1	PML		4_339	Coastcolour_Pigment_&_Particulate_absorption.xls		2009-10-07	11:00:00	50,25	4,217	
659	1	PML		4_340	Coastcolour_Pigment_&_Particulate_absorption.xls		2009-10-12	11:00:00	50,25	4,217	
660	1	PML		4_341	Coastcolour_Pigment_&_Particulate_absorption.xls		2009-10-19	11:00:00	50,25	4,217	
661	1	PML		4_342	Coastcolour_Pigment_&_Particulate_absorption.xls		2009-10-26	11:00:00	50,25	4,217	
662	1	UNICAN	A-AC01	5_1	REDCAI_data.xls (Redcal 05)		07-08-2005				
663	1	UNICAN	A-AC01	5_2	REDCAI_data.xls (Redcal 05)		07-08-2005				
664	1	UNICAN	A-AC01	5_3	REDCAI_data.xls (Redcal 05)		07-08-2005				
665	1	UNICAN	A-AC01	5_4	REDCAI_data.xls (Redcal 05)		07-08-2005				
666	1	UNICAN	A-AC01	5_5	REDCAI_data.xls (Redcal 05)		07-08-2005				
667	1	UNICAN	A-AC01	5_6	REDCAI_data.xls (Redcal 05)		07-08-2005				
668	1	UNICAN	A-AC01	5_7	REDCAI_data.xls (Redcal 05)		07-08-2005				
669	1	UNICAN	A-AC01	5_8	REDCAI_data.xls (Redcal 05)		07-08-2005				
670	1	UNICAN	A-AC01	5_9	REDCAI_data.xls (Redcal 05)		07-08-2005				
671	1	UNICAN	A-AC01	5_10	REDCAI_data.xls (Redcal 05)		07-08-2005				
672	1	UNICAN	A-AC01	5_11	REDCAI_data.xls (Redcal 05)		07-08-2005				
673	1	UNICAN	A-AC01	5_12	REDCAI_data.xls (Redcal 05)		07-08-2005				
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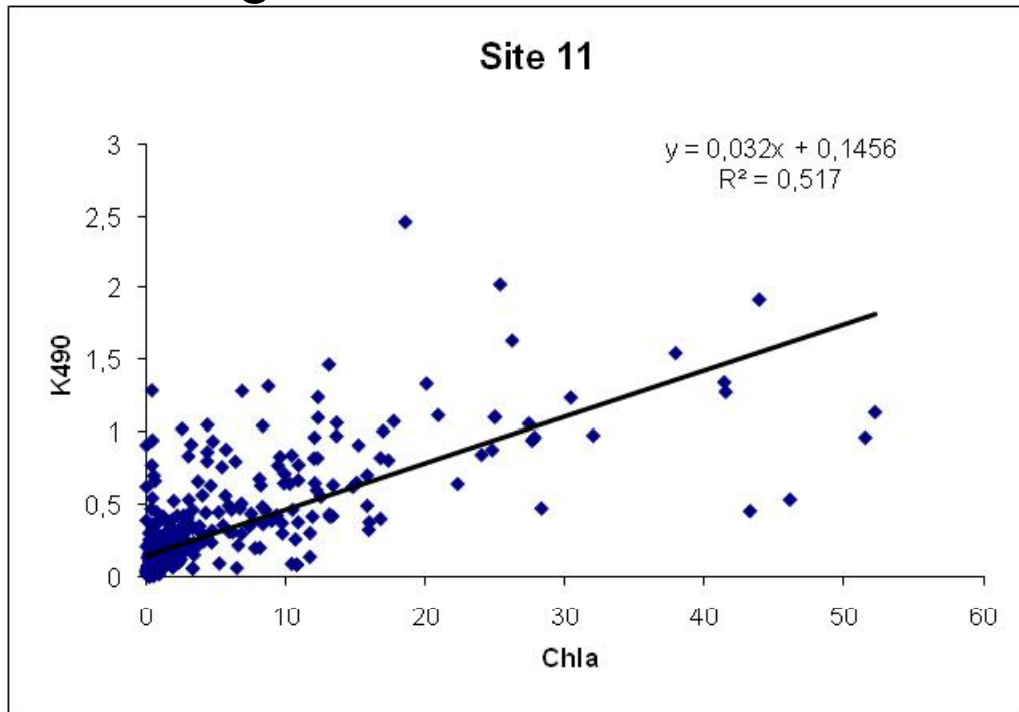
CoastColour UCM1 \* ESRIN \* 16-  
17.11.2010

# Frequent problems/doubts/hesitations

- Lack of information or contradictory information regarding sampling time
- Different format of coordinates. Or lack of coordinates.
- Errors in dates? Various parameters registered on 1 day, and then 1 parameter in a different day
- Difficult to decide if it is an error or not
- Doubts to be clarified during the meeting



# Checking for internal consistence, through correlation plots

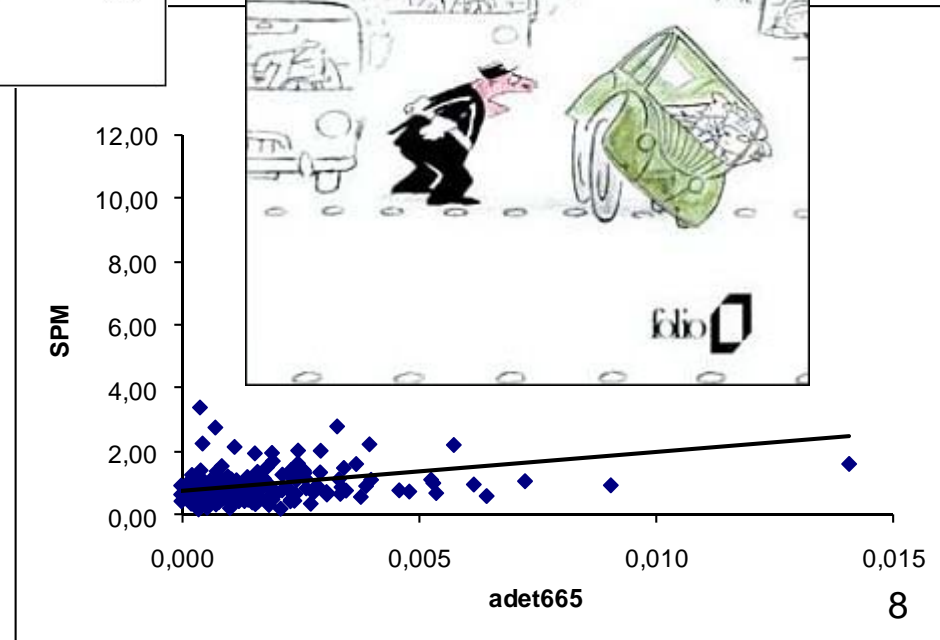


Diffuse attenuation coefficient and Chla

## Spotting outliers

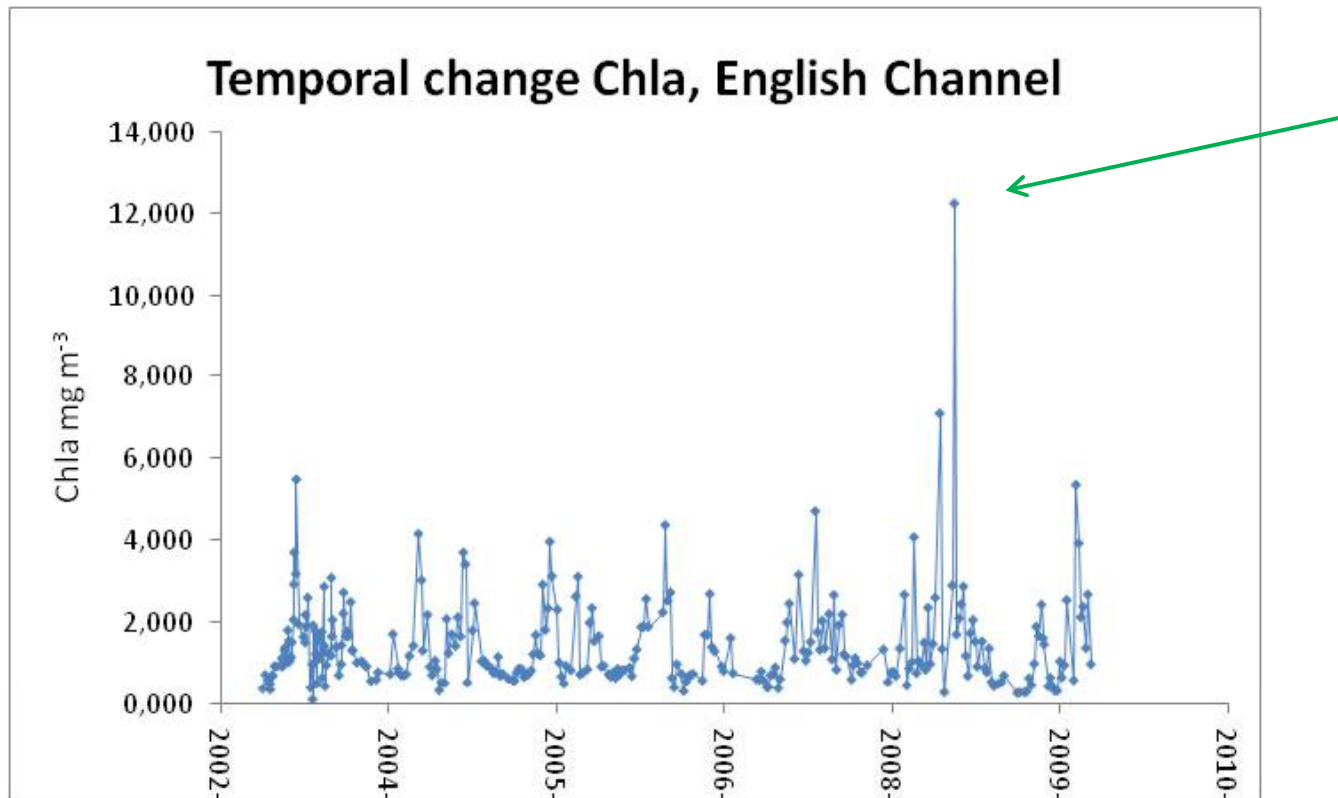


Even without correlation  
we can spot outliers

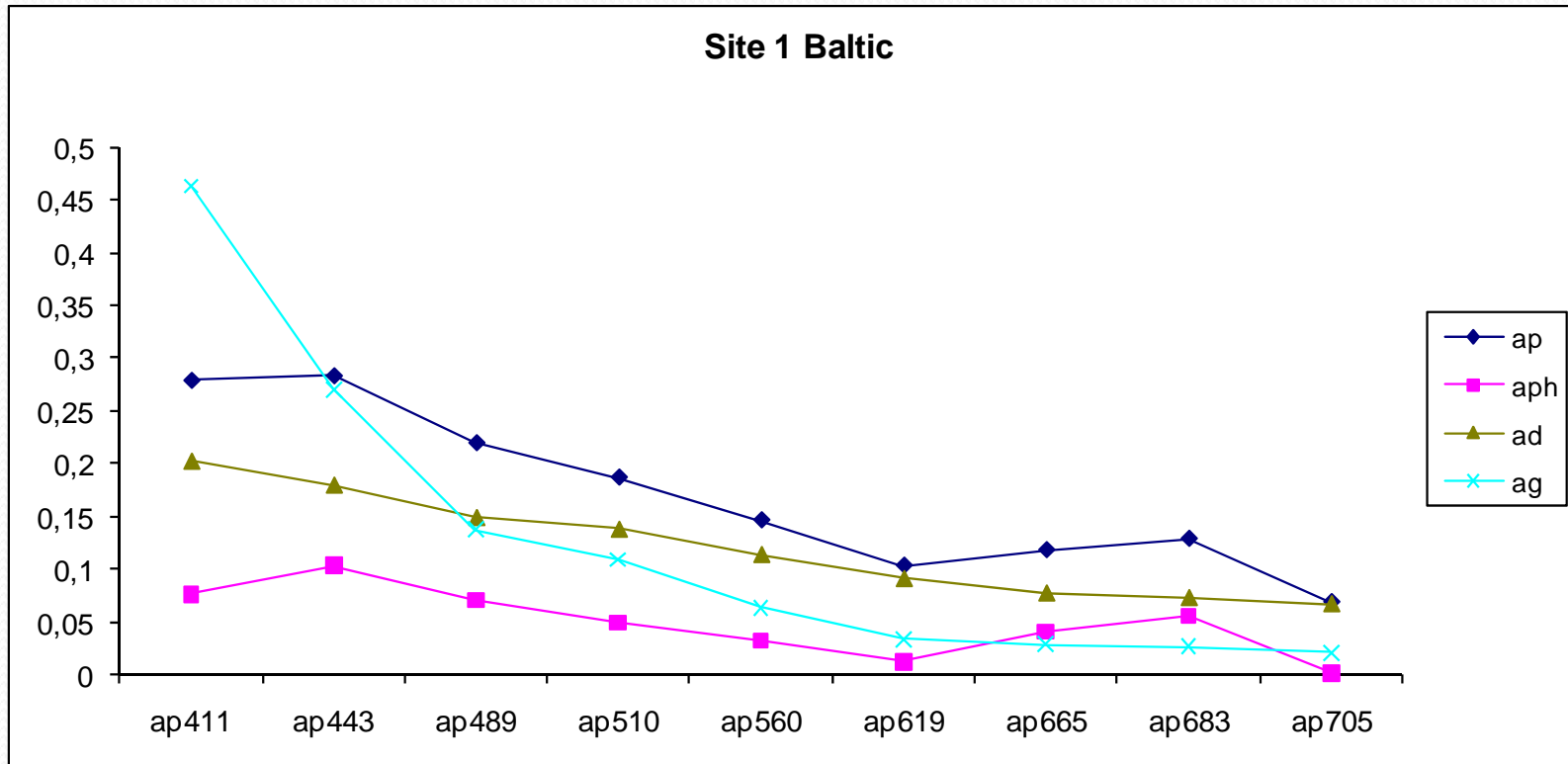




# Internal consistency – temporal trends



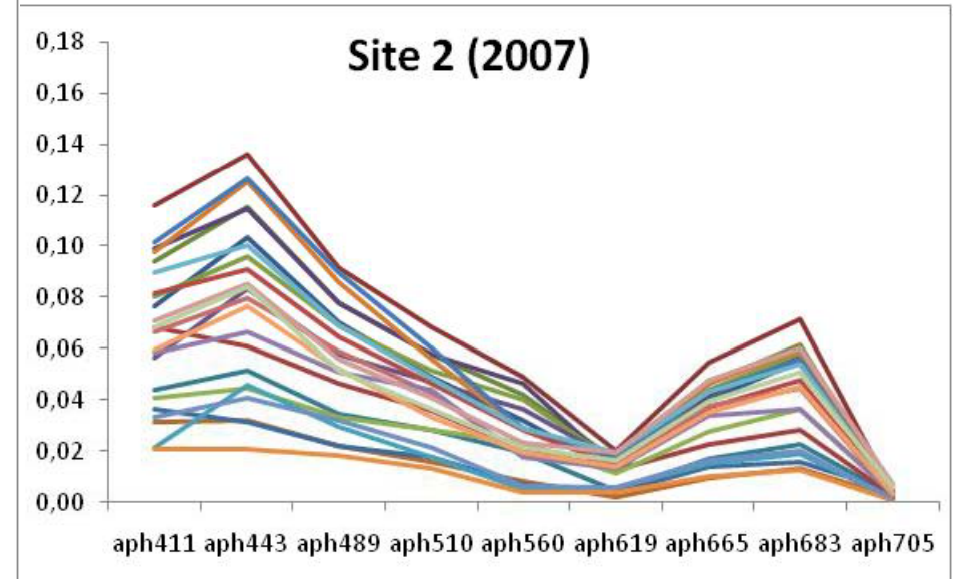
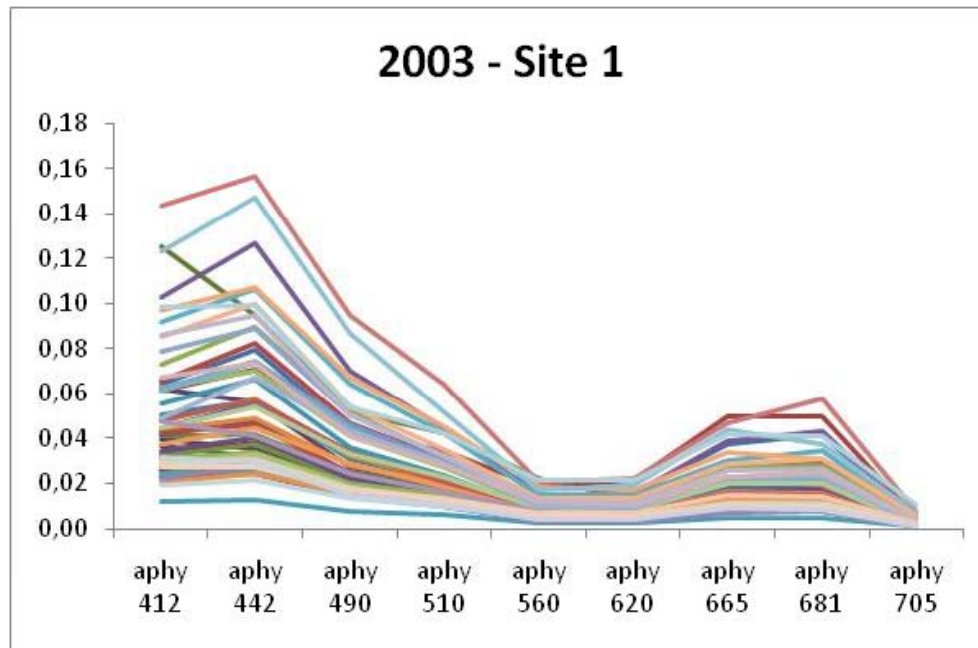
# IOPs



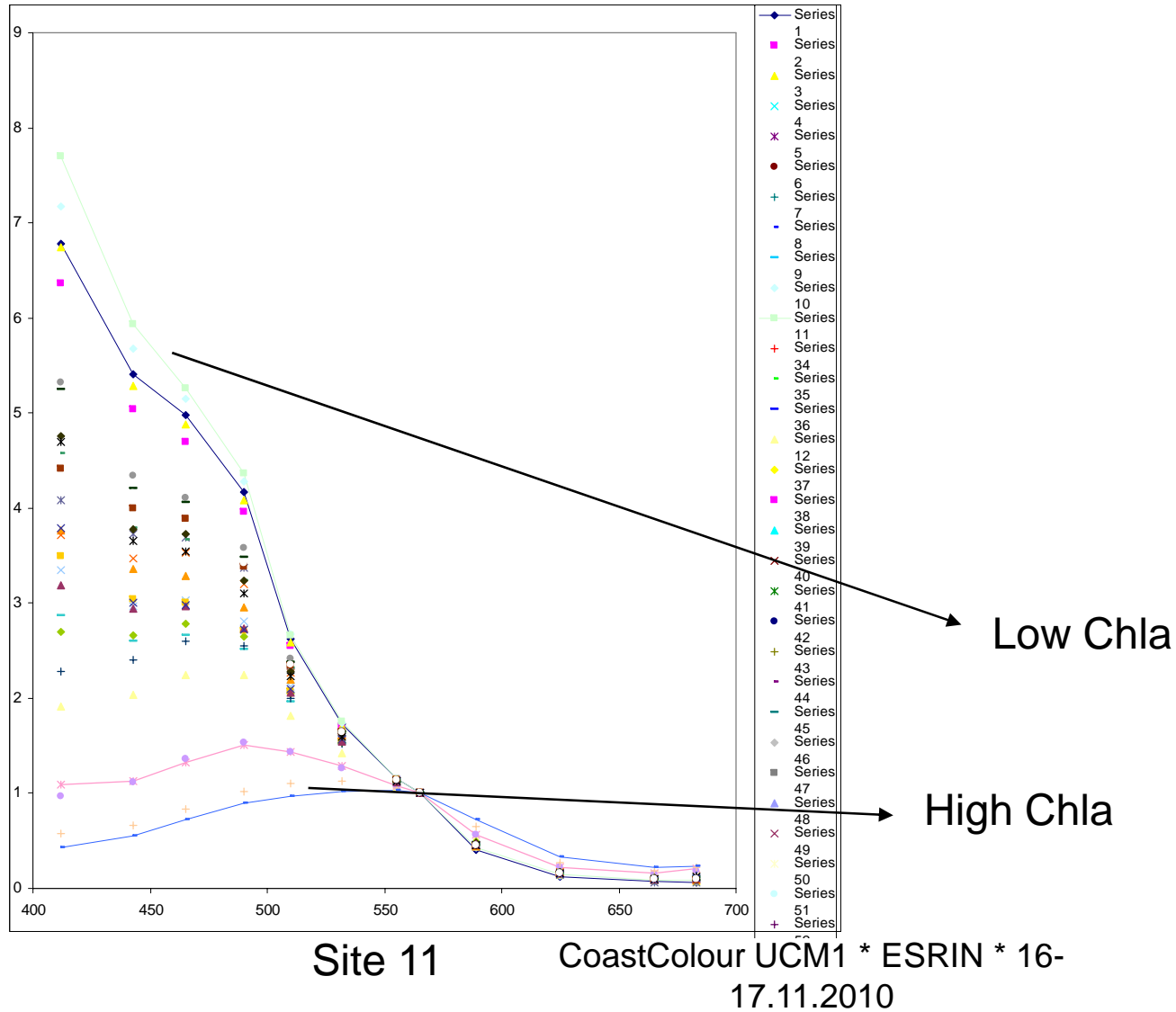
Particle absorption	ap
Phytoplankton absorption	aph
Non-pigmented particle	ad
Dissolved Material	ag

# Visual inspection /QC

Phytoplankton absorption coefficient

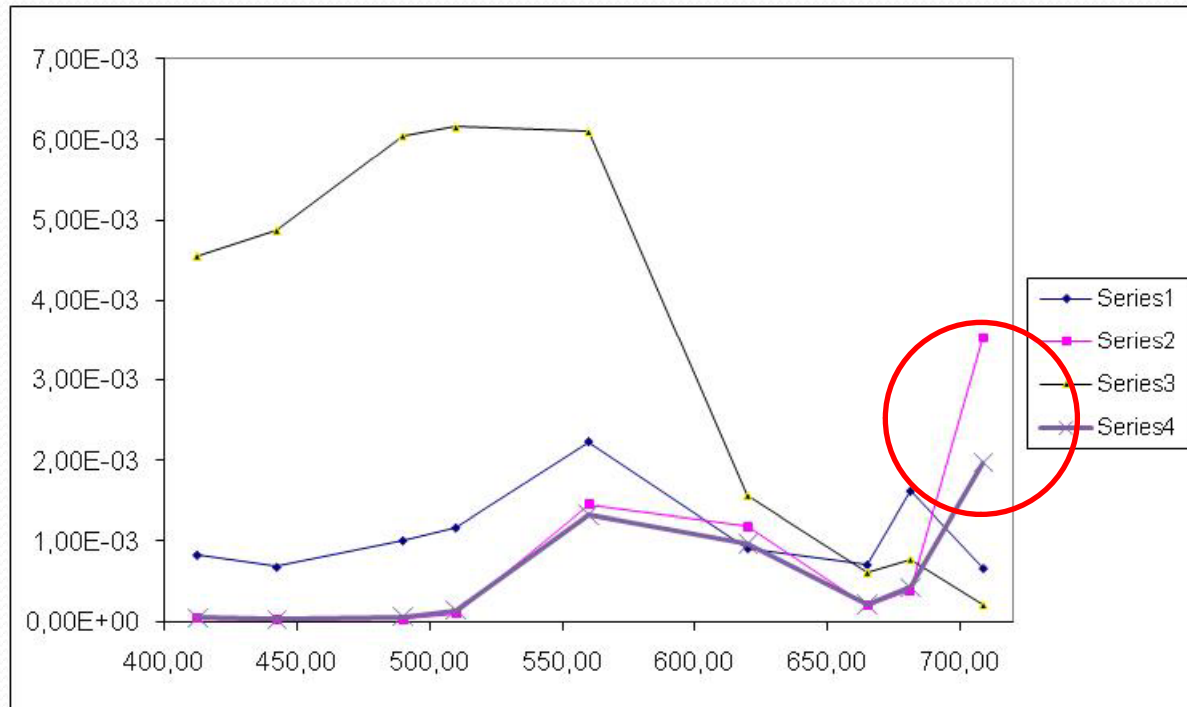


# Visual inspection: Reflectance spectra were normalized in relation to 560nm



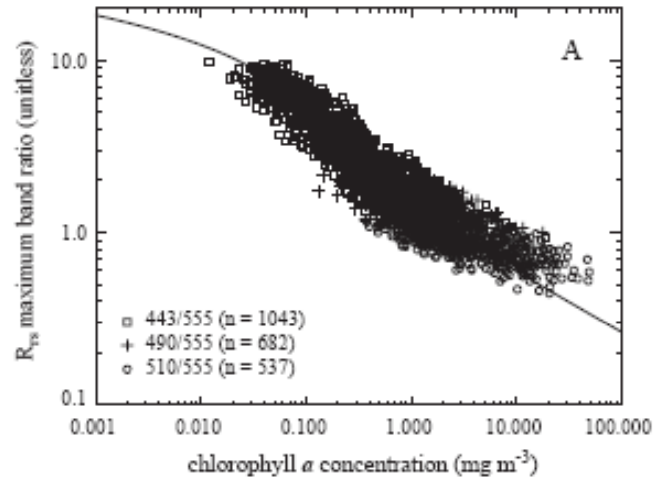
# Reflectance data

Extreme value in 708 !?

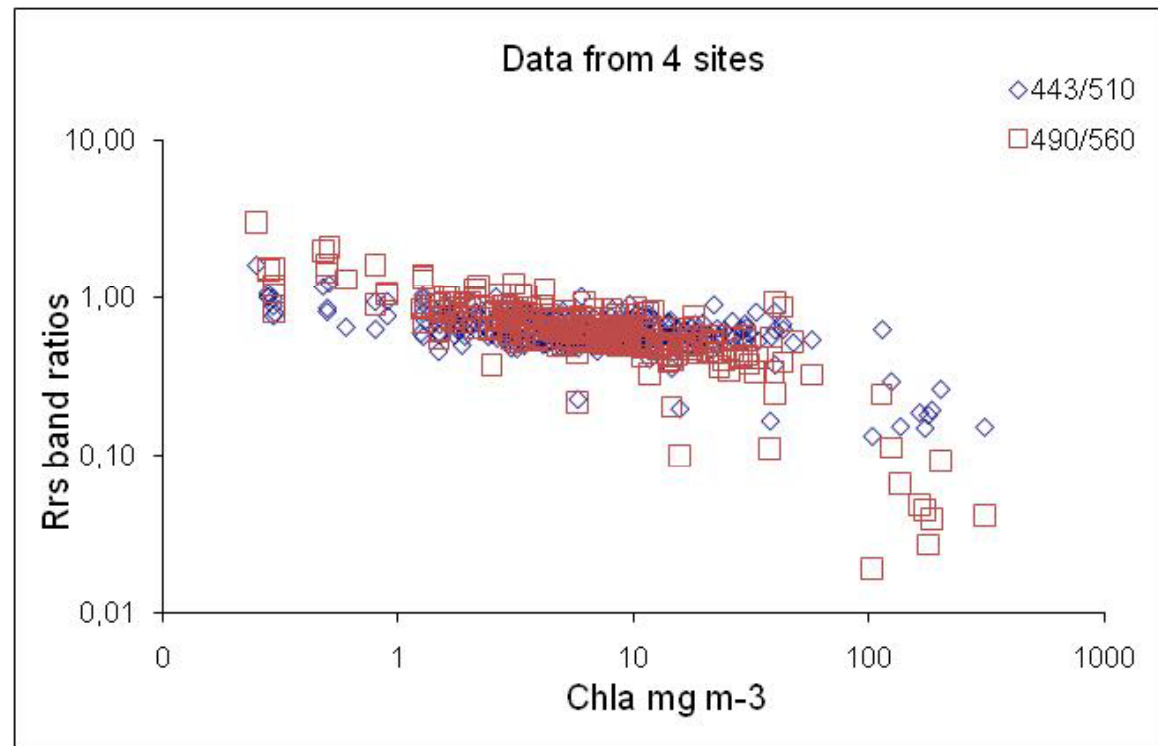


↓  
Chla > 100 mg m<sup>-3</sup>

# Quality control: Reflectance data

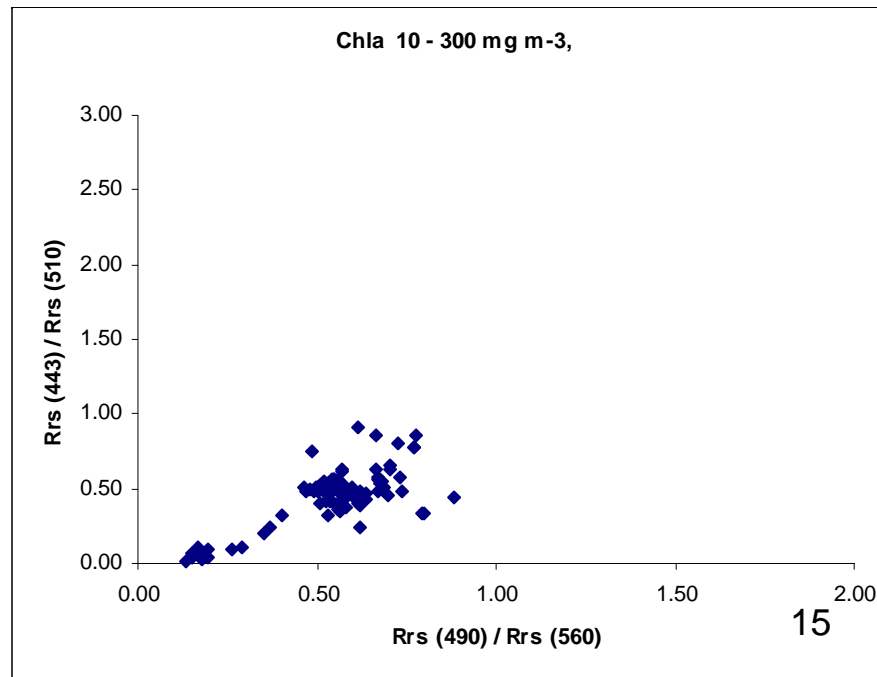
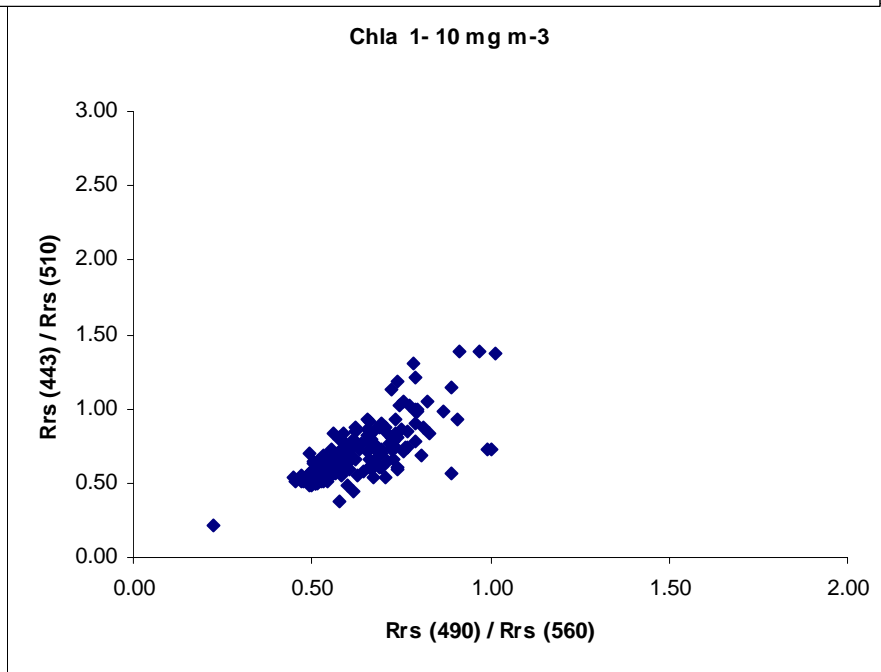
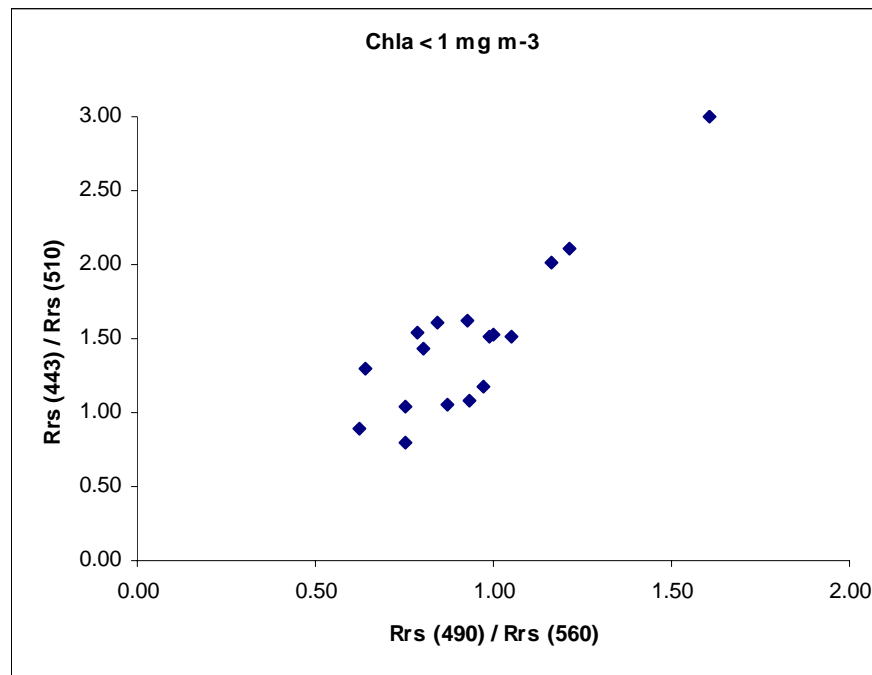
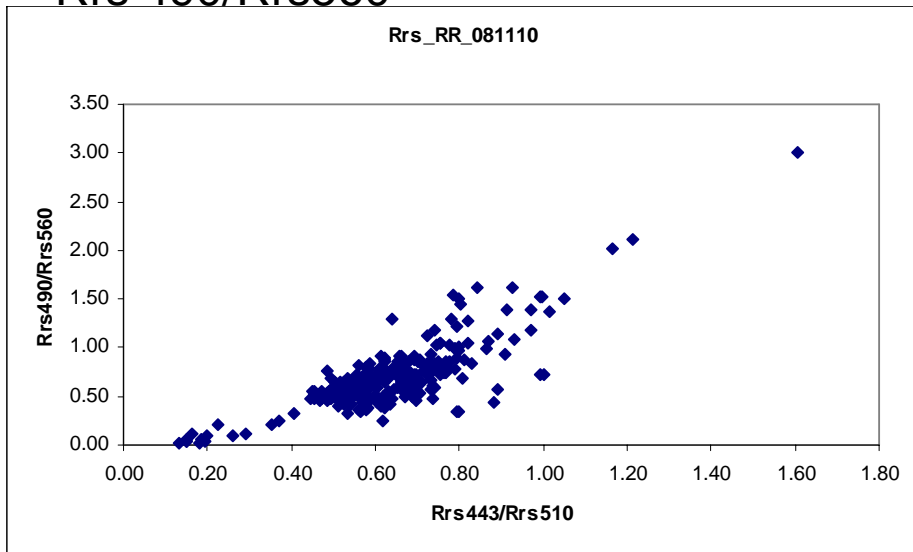


Werdell & Bailey 2005

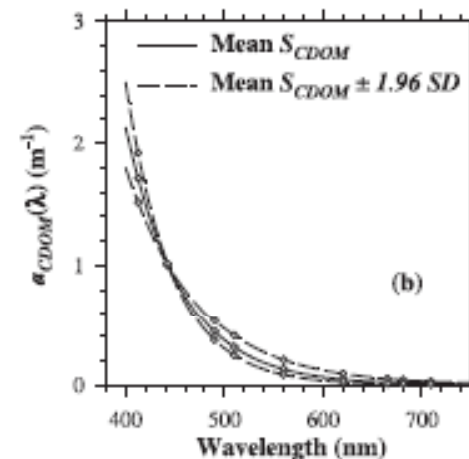
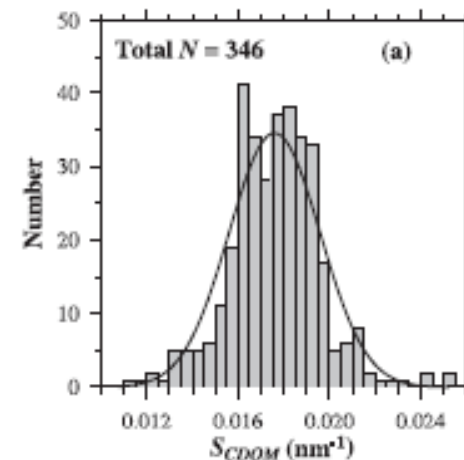
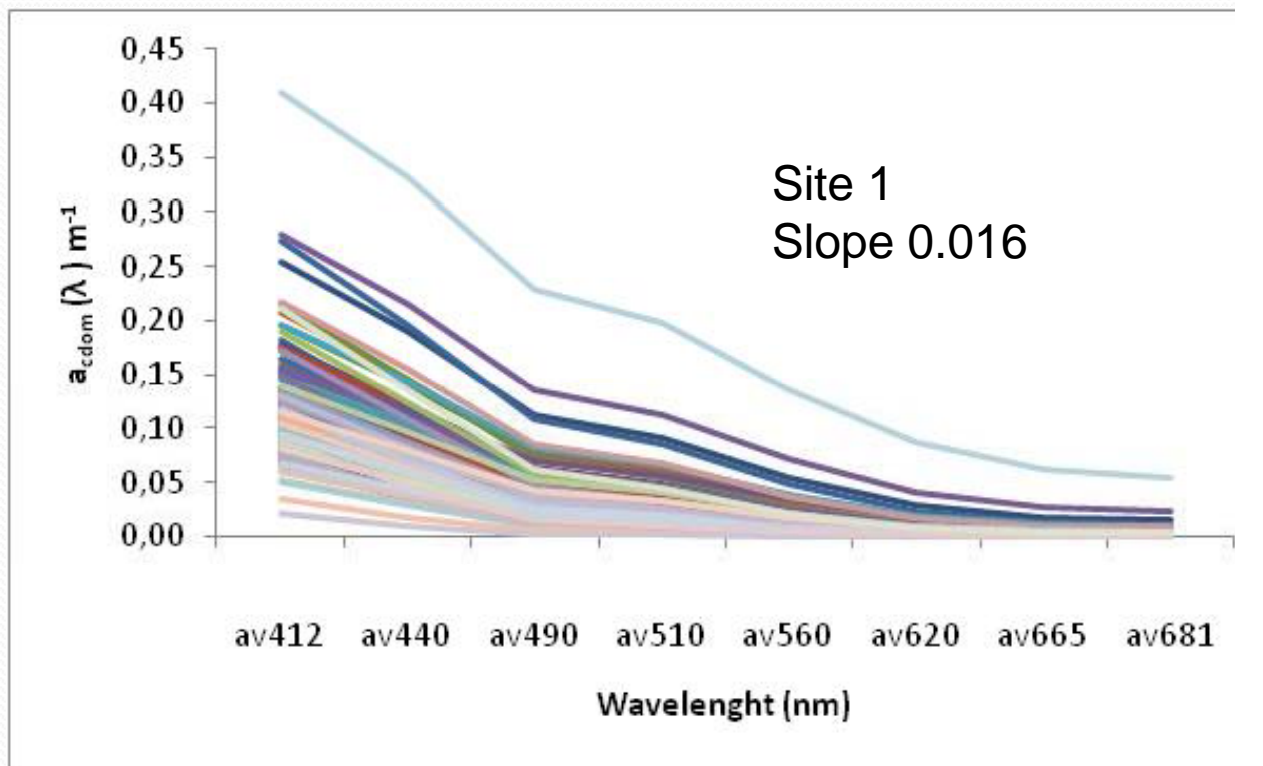




# Band ratios Rrs 443/ Rrs 510 versus Rrs 490/Rrs560



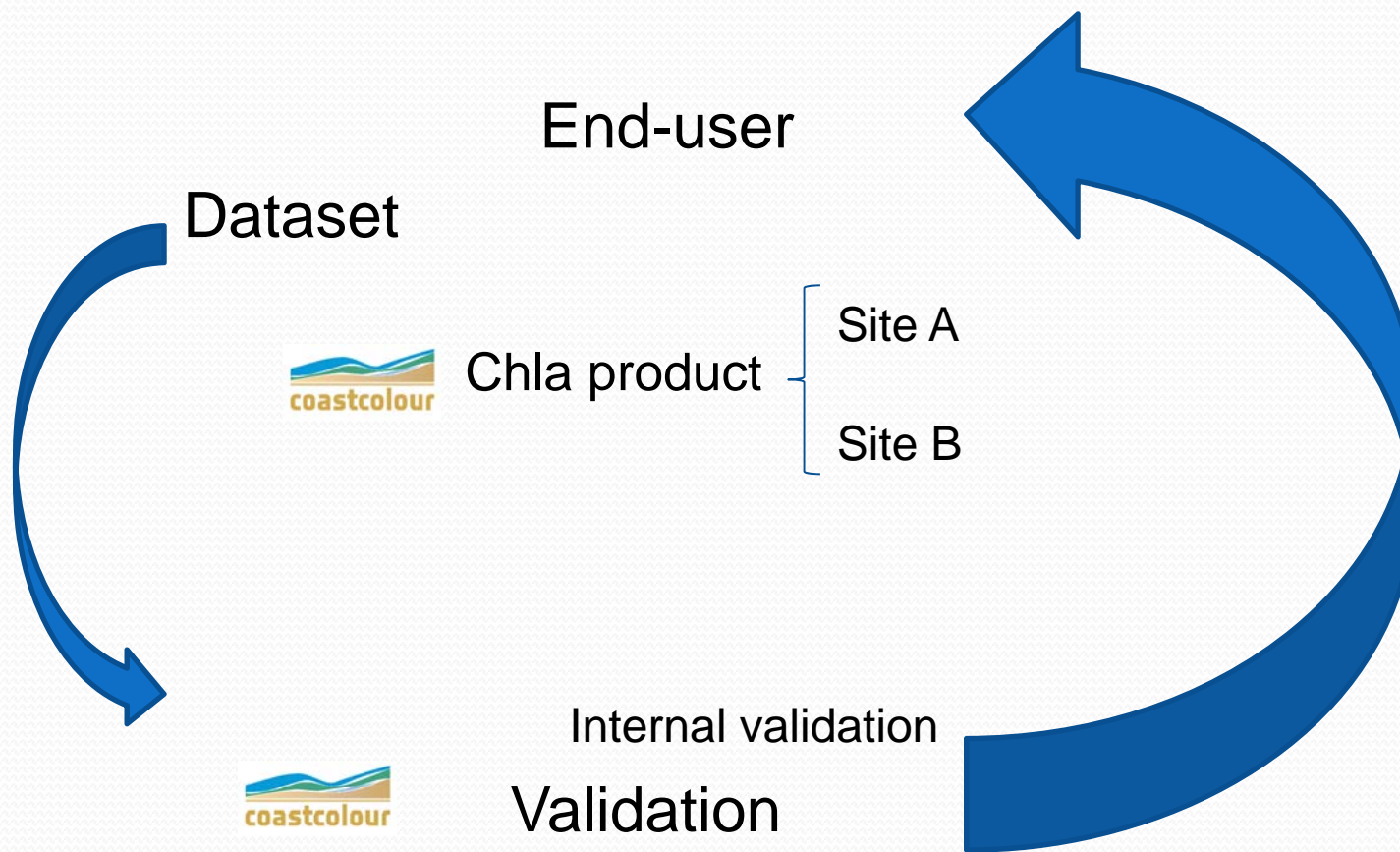
# Exponential slope of CDOM absorption spectrum



Babin et al, 2003

## Further statistics

- central tendency: average, trimmed average, median, min, max, quartiles, 10<sup>0</sup>% and 90<sup>0</sup>%ile;
- - dispersion: standard deviation, range, interquartile range, outliers, variance, coefficient of variation, real average range (95<sup>0</sup>%confidence);
- \* probability distributions
- \* Time Series Analysis



February – Test products delivered to endusers  
April – Feedback from by Endusers (Validation made by those who want)  
June – Level 2 products will be provided to end-users

See you in Lisbon,

UCM2

19-21 October 2011

Thank you