mvt@frascati - March 2012

Bio-optical Algorithms for European Seas: Performance and Applicability of Neural-Net Inversion Schemes

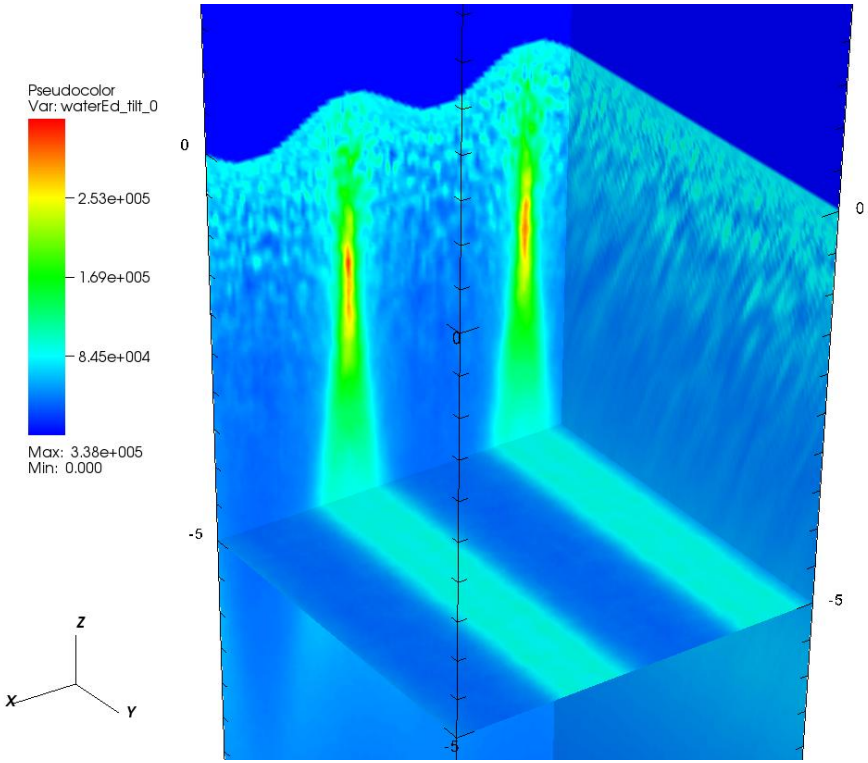
Davide D'Alimonte, Tamito Kajiyama ,Carolina Sá
Giuseppe Zibordi, Jean-François Berthon, and Elisabetta Canuti

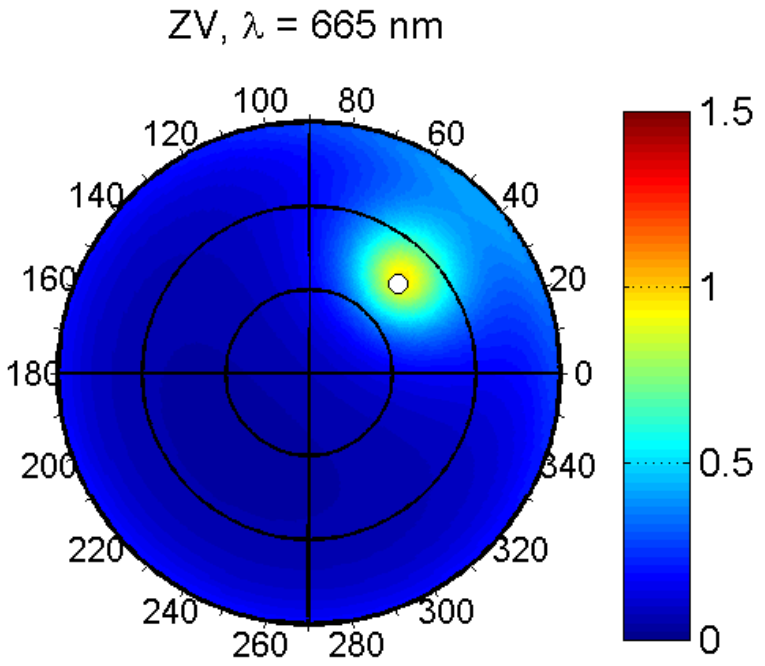
Outline

- Radiative transfer modeling
  - MOX
- OCPortugal
  - Regional MLP
- WESTOC
  - How to use
  - A case study

MOX

- New MOX functionalities under development
  - 3D simulations
  - Accurate sky-radiance modeling

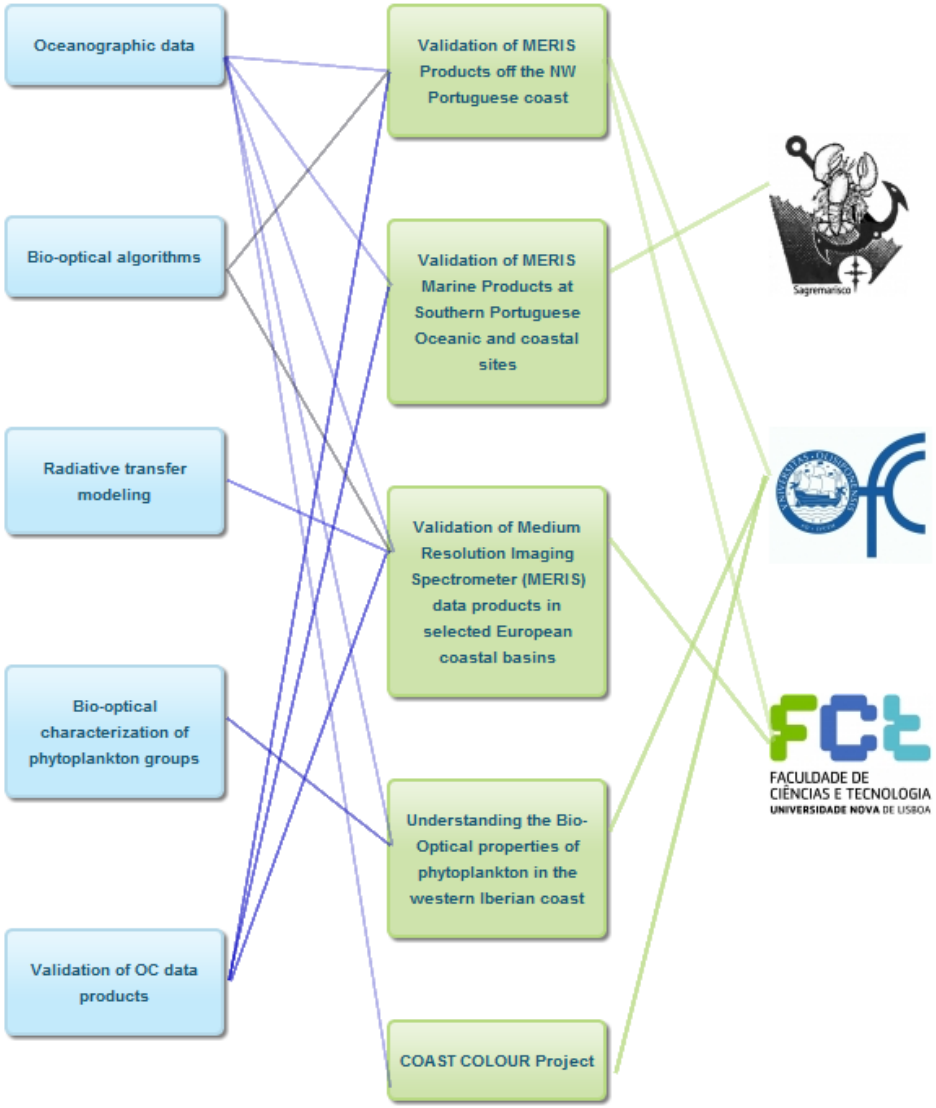




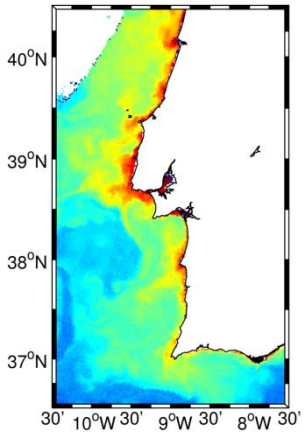
OCPortugal
OCEAN COLOUR PORTUGAL

http://ocportugal.org

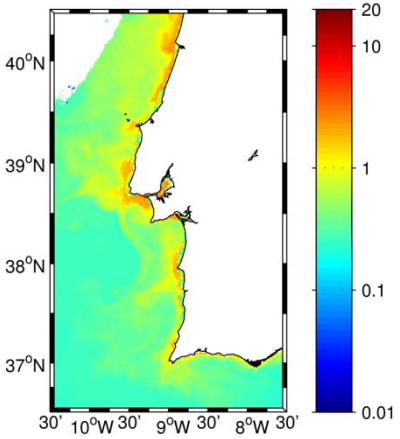
OCPortugal is a coordinated set of actions undertaken by different ocean color research groups of Portugal.



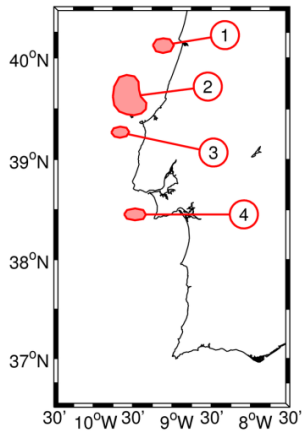
Regional MLPs Atlantic off Portugal



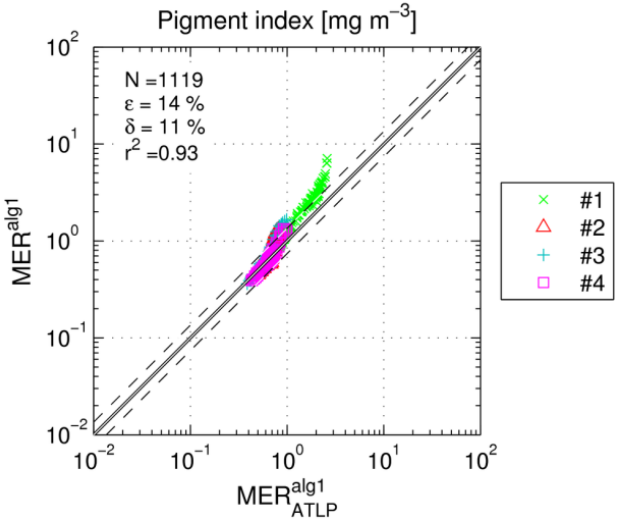
MER^{alg1}

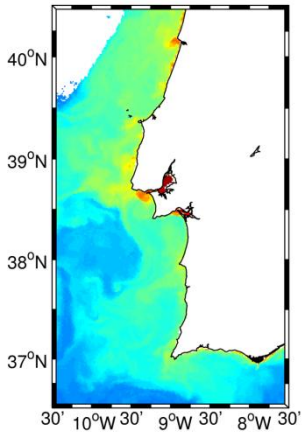


MLP^{alg1}_{ATLP} (R_{RS} 443 - 560)

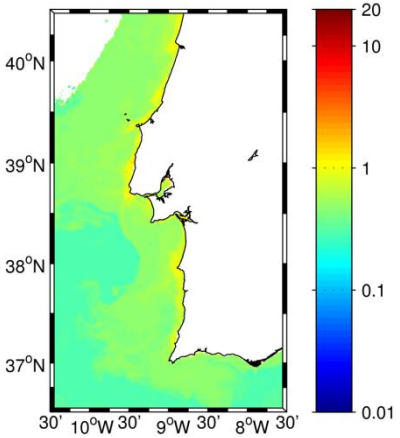


ROIs

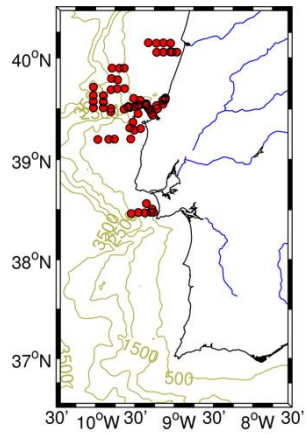




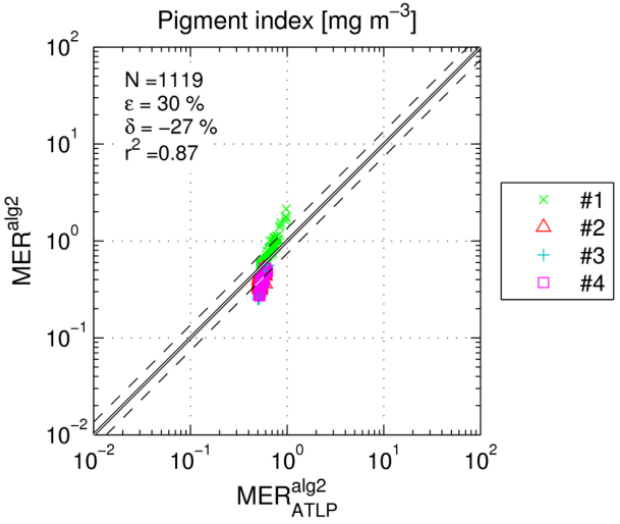
MER^{alg2}



MLP^{alg2}_{ATLP} (R_{RS} 443 - 560)



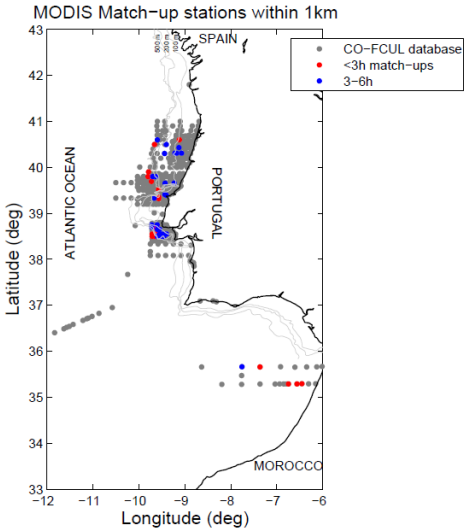
Optical stations

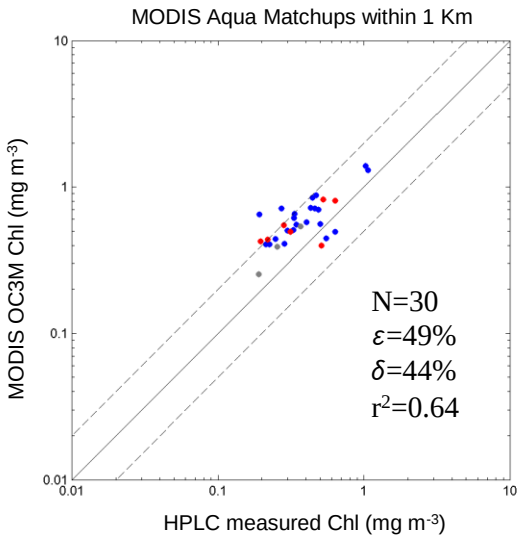


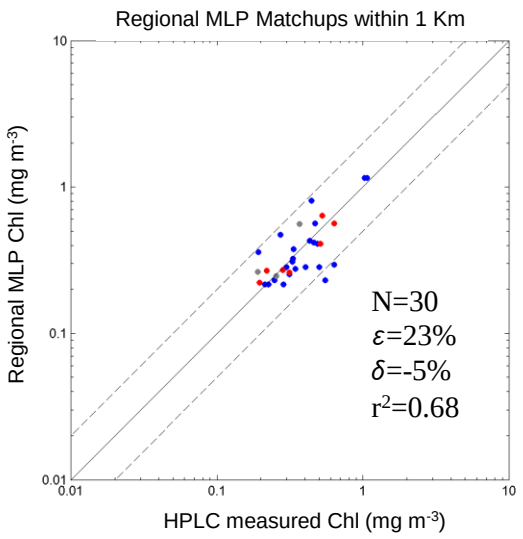
Source :MER_RR__2PRACR20100825_103551_000026292092_00223_44365_0000.N1 (3rd reproc.)

Regional MLPs Atlantic off Portugal

For MODIS images with match-up stations within 1km and 6h, Rrs at 488, 530, 555nm and Chl*a* OC3m product were extracted.



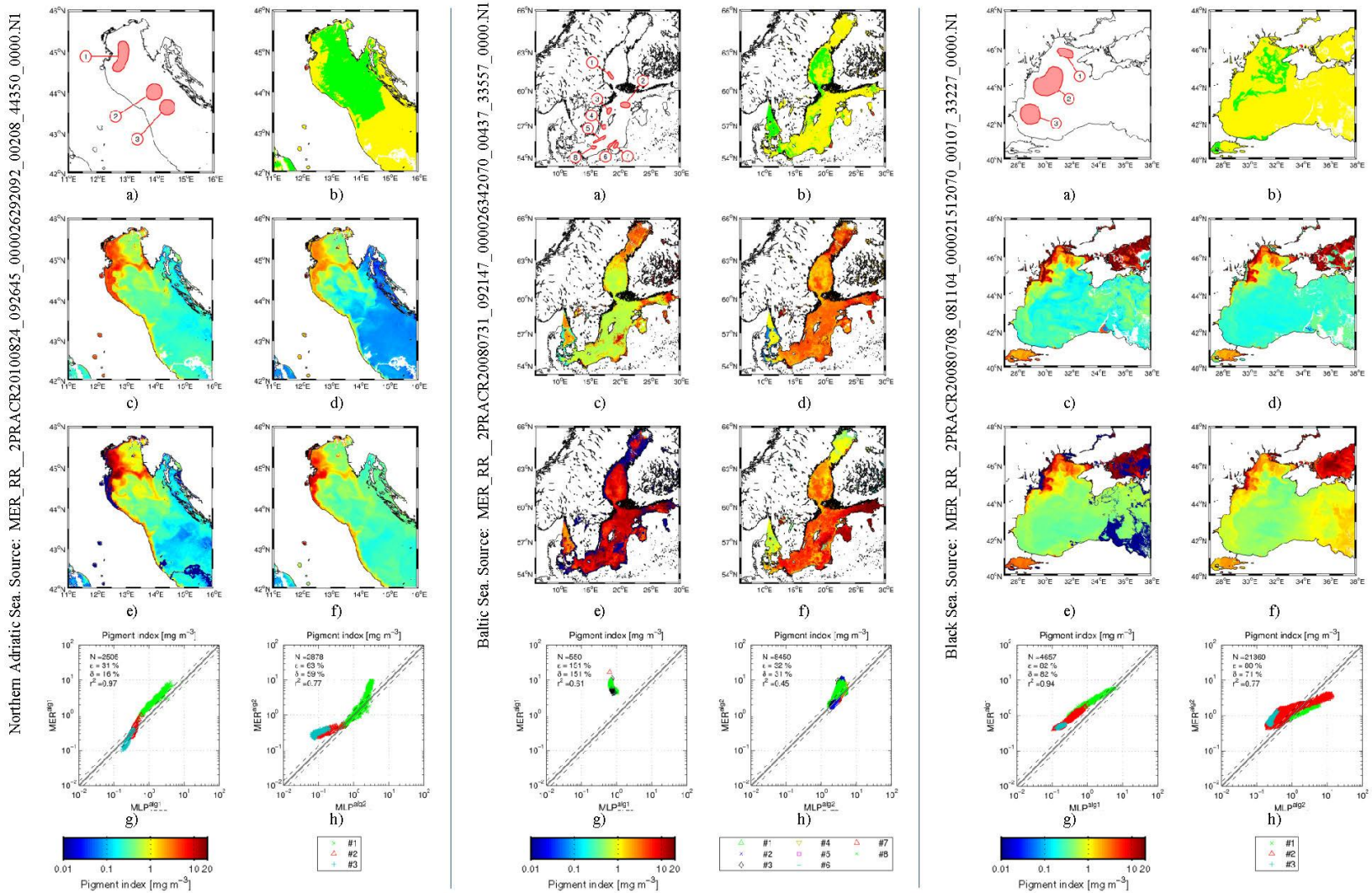




Analysis restricted to the [0.2,2] mg m^{-3} total chlorophyll concentration range

WESTOC

- The WEb Support To Ocean Color WESTOC is an interface to MLP bio-optical algorithms: http://westoc.di.fct.unl.pt/interface/
- Case studies:
  - MLP performance with respect to independent data;
  - accuracy of data products for different R_{RS} center-bands; and
  - assessment of band-shift for correcting difference between in-situ and space-born center-bands.



In each figure, Panel (a) identifies ROI boundaries. Panel (b) shows regions of validity of both algal-1 and algal-2. Green (red) pixels indicate where both algal-1 and algal-2 are valid (invalid). Yellow pixels highlight where only algal-2 is valid. Panels (c) and (d) show $MLP^{alg1}_{\{basin\}}$ and $MLP^{alg2}_{\{basin\}}$ products, respectively, regardless of the validity flags. Panels (e) and (f) display MER^{alg1} and MER^{alg2} maps, respectively. Panel (g) shows a scatter plot of MER^{alg1} versus $MLP^{alg1}_{\{basin\}}$ values for the valid pixels of ROIs highlighted in Panel (a). Comparison results are evaluated through the scattering and the bias expressed in terms of absolute ε and signed δ unbiased percent differences, respectively $\varepsilon = \frac{200}{N}\sum_{i=1}^{N}\frac{\left|\left[MER^{alg1}\right]_i - \left[MLP^{alg1}_{\{basin\}}\right]_i\right|}{\left[MER^{alg1}\right]_i + \left[MLP^{alg1}_{\{basin\}}\right]_i}$; $\delta = \frac{200}{N}\sum_{i=1}^{N}\frac{\left[MER^{alg1}\right]_i - \left[MLP^{alg1}_{\{basin\}}\right]_i}{\left[MER^{alg1}\right]_i + \left[MLP^{alg1}_{\{basin\}}\right]_i}$, where N is the total number of samples, and *i* is the sample index. Panel (h) is the same as Panel (g), but for algal-2.

Acknowledgments

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Related publications 2011-2012

- Kajiyama, T.; D'Alimonte, D. & Cunha, J. C. A high-performance computing framework for large-scale ocean color Monte Carlo *simulations Concurrency Computat.: Pract. Exper.*, **2012** [under revision]
- D'Alimonte, D.; Zibordi, G.; Berthon, J.-F.; Canuti, E. & Kajiyama, T. Performance and Applicability of Bio-optical Algorithms in Different European Seas Remote *Sens. Environ.,* **2012** [under revision]
- Kajiyama, T.; D'Alimonte, D. & Zibordi, G. Regional algorithms for European seas: a case study based on MERIS data *IEEE Geosci. Remote Sens. Lett.,* **2012** [under revision]
- D'Alimonte, D.; Zibordi, G.; Berthon, J.-J.-F.; Canuti, E. & Kajiyama, T. Bio-optical Algorithms for European Seas: Performance and Applicability of Neural-Net Inversion Schemes *JRC-IES Scientific and Technical Reports,* **2011**
- Kajiyama, T.; D'Alimonte, D. & Cunha, J. C. Performance prediction of ocean color Monte Carlo simulations using multi-layer perceptron neural networks *Procedia Computer Science,* **2011***, 4*, 2186-2195
- Mélin, F.; Vantrepotte, V.; Clerici, M.; D'Alimonte, D.; Zibordi, G.; Berthon, J. F. & Canuti, E. Multi-sensor satellite time series of optical properties and chlorophyll-a concentration in the Adriatic Sea *Progress in Oceanography,* **2011***, 91*, 229-244
- Zibordi, G.; Berthon, J.-F.; Mélin, F. & D'Alimonte, D. Cross-site consistent in situ measurements for satellite ocean color applications: the BiOMaP radiometric dataset *Remote Sens. Environ.,* **2011***, 115*, 2104-211