

# Manuela Balzarolo, Ph.D.

## Curriculum Vitae

### PROFESSIONAL EXPERIENCE

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01/01/2024, present

#### Senior scientist

*CMCC Foundation, Vitebo, Italy*

- Senior scientist in the Institute for Climate Resilience –ICR, IAFES Division.
- Scientific coordinator of Horizon EU SDGs-EYES ‘Sustainable Development Goals - Enhanced monitoring through the family of copErnicus Services (SDGs-EYES)’ project
- Scientific leader of the INTERREG MED ‘Germ of Life’ project

15/06/2023, present

#### Scientist

*CMCC Foundation, Vitebo, Italy*

- Scientist in the Impacts on Agriculture, Forests and Ecosystem Services IAFES Division.
- Scientific leader of the Service Value Chain (SVC) SE-S04-13 ‘Erosion Risk Assessment’ in the frame of the SVC IRIDE SERVICE SEGMENT – LOT 3 of Italian National Recovery and Resilience Plan (PNRR) in collaboration with the European Space Agency (ESA)
- Scientific contribution to the Service Value Chain (SVC) SE-S04-09 ‘Fire Damage Assessment’ for the production of the ‘GHG emissions from forest fires’ map in the frame of the SVC IRIDE SERVICE SEGMENT – LOT 3 of Italian National Recovery and Resilience Plan (PNRR) in collaboration with the European Space Agency (ESA)
- Participation in the EO4EU project
- Reporting to Planetek, e-geos and ESA; writing project reports; publishing peer-review papers.

01/01/2021, present

#### Senior scientist (part-time)

*Faculty of Biology, University of Antwerp, Belgium*

- Scientist in the Plants and Ecosystems group of Prof. Ivan Janssens.
- Member of Climate Research Group of the ESA Climate Change Initiatives CCI+ “Vegetation parameters” project (PIs: VITO & University of Twente). Focus on the development a new fAPAR product for modelling agro-ecosystem productivity and the effect of climate extremes on phenology and ecosystem services.
- Working group leader of the validation of P model global productivity estimates with in situ data in the framework of the ESA ‘Terra-P: Estimation of GPP and NPP from Sentinel-3 data’ and Terra-P CCN projects (PI: Dr. Roel Van Hoolst, VITO, Belgium).
- Reporting to ESA and Belspo; writing project reports; publishing peer-review papers.

05/2017, 08/2019

#### Marie Curie Post-doctoral research fellowship

*Centre for Ecological Research and Forestry Applications (CREAF), Universitat Autònoma de Barcelona, Spain*

- Scientist in the Global Ecology Unit of Josep Peñuelas.
- PI and project leader of the “INDRO: Remote sensing INDicators for DRought monitoring” project. Funded by MSCA-IF-2015-EF –Marie Skłodowska-Curie Individual Fellowships. Proposal No: 702717.
- Global assessment of productivity of biomes by integrating in situ and satellite observations and determination of agro-meteorological and ecological drivers of ecosystem radiation use efficiency.
- Reporting to EU; writing project reports; publishing peer-review papers.

06/2013 - 04/2017

#### Post-doctoral researcher

*Faculty of Biology, University of Antwerp, Belgium*

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- Scientist in the Research Centre of Excellence Plant and Vegetation Ecology of Prof. Reinhart Ceulemans
- PI and project leader of the “ECOPROPHET: Improved Ecosystem Productivity Modeling by Innovative Algorithms and Remotely Sensed Phenology Indicators”. Funded by Belgian Science Policy Office – Research programme for Earth observation (STEREO III). Contract number: SR/00/334.
- PI and project leader of the HYPI “Assessment of Isoprene emission by HYPerspectral data” project, in the framework of Belgian Science Policy Office – Research programme for Earth observation (STEREO III). Contract number: SR/00/322.
- Integration of remote sensing data into the global productivity database developed by University of Antwerp development of new remote sensing based indicator based to detect the drought effect on ecosystem functioning;
- Reporting to Belspo; writing project reports; publishing peer-review papers.

04/2013 – 06/2013

#### **Short Terms Scientific Mission grant**

*Flemish Institute of Technology-VITO, Belgium*

- Research fellow in the Remote Sensing Unit-TAP, supervised by Prof. Frank Veroustraete.

01/2013 – 05/2013

#### **Research collaboration**

*Faculty of Agriculture, University of Viterbo, Italy*

- Global validation of carbon and water fluxes predicted by Land Surface models (ORCHIDEE, C-TESSEL, ISBA) against eddy covariance data.
- Scientific paper writing.

12/2007 – 11/2012

#### **Post-doctoral researcher**

*Faculty of Agriculture, University of Viterbo, Italy*

- Post-Doctoral Researcher in the Airborne Remote Sensing Laboratory of Prof. Dario Papale.
- Coordination of the task on the validation of carbon and water fluxes predicted by several land surface models against eddy covariance data in the framework of Land Carbon Core Information Service (LC-CIS) of geoland2 EU-project.
- Reporting; writing project reports; publishing peer-review papers.

12/2003 – 11/2007

#### **Research fellowship**

*Faculty of Agriculture, University of Viterbo, Italy*

- Researcher and PhD student in the Forest Ecology Laboratory of Prof. Riccardo Valentini.
- Analysis of mass and energy fluxes of agro-ecosystems by eddy covariance and remote sensing techniques.
- Modeling carbon fluxes and productivity of agroecosystems in Lombardia (Italy).
- Reporting; writing project reports; publishing peer-review papers.

04/2003 – 11/2003

#### **Young scientist**

*Carlo Gavazzi Spae Spa, Milan, Italy*

- Scientist funded in the framework of the project "Giovani Scienziati in azienda" of Lombardy Region, Italy
- Coordination of an international team for ESA/DUP project proposal in the context of earth observation applications in the Alps.
- Organization of hyperspectral in situ campaign and data processing for mapping crops and burnt areas.
- Landsat ETM+ satellite data processing and satellite image classification and validation.

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## **EDUCATION**

04/2008

#### **Ph.D. in Forest Ecology**

*Faculty of Agriculture, University of Viterbo, Italy*

- Researcher in the Forestry Ecology Laboratory of Prof. Riccardo Valentini.
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- Principal subjects: agro-ecosystem ecology, agro-ecosystem productivity, ecological modelling, remote sensing, carbon and water estimation by eddy covariance.

04/2003

**Master degree in Environmental Science with specialization in agriculture**

*Faculty of Agriculture, University of Milan, Italy*

- Dissertation title: Estimating the productivity of a mountainous pasture by in situ remote sensing measurements.
- Principal subjects: in situ hyperspectral data collection and analysis, deriving vegetation indices from reflectance, Landsat images processing, and methods for sampling biomass and leaf area index.

**COURSE AND TRAINING**

2007

**Summer school on eco-hydrology**

*University of Amsterdam, The Netherlands*

2006

**Course ArcGIS on spatial and 3D analyst**

*University of Rome, Italy*

2004

**Course on analysis of agro-meteorological data and programming**

*Italian Association of Agro-Meteorology (AIAM), Italy*

**PERSONAL SKILLS**

**Mother tongue** Italian

**Other language(s)**

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	B1: Independent user	B2: Independent user	B2: Independent user	B2: Independent user	B2: Independent user
French	B2: Independent user	B2: Independent user	B2: Independent user	B2: Independent user	B2: Independent user
Spanish	A1: Basic user	A1: Basic user	A1: Basic user	A1: Basic user	A1: Basic user
Levels: A1/2: Basic user - B1/2: Independent user - C1/2 Proficient user Common European Framework of Reference for Languages					

**Computer skills**

Very good knowledge of following software packages and programming languages:

- for remote sensing data processing: ENVI, OrthoPCI, R and Matlab;
- data-processing packages: Matlab and R (Basic knowledge of IDL and Python);
- statistical analysis: SAS, SigmaPlot, SPSS and R;
- cloud computing: Google Earth Engine for remote sensing data processing and time-series analysis.

**Writing skills**

Grant proposals

- Marie Skłodowska-Curie Actions Individual Fellowships
  - Belgian Science Policy Office (BELSPO): Support To Exploitation and Research in Earth Observation - STEREO programme
  - European Space Agency (ESA)
- Publications in peer-reviewed scientific journals
- 30 original research papers
- Project reports
- ESA, BELSPO, EU-Horizon, EU-FP7, EU Cost Action

**Communication skills** Academic (including public outreach)  
- Oral and poster presentations at (inter)national scientific meetings, conferences and workshops  
- Regular presentations in group and project meetings  
- Participation to steering committee (EU Cost Action)

**Organisational / managerial skills** Skill to coordinate European and international projects (HYPI, ECOPROPHET and INDRO projects). Skill to interact with different communities working on Earth observations: i.e. eddy covariance, remote sensing and modelling communities. These skills were gained working as a working group leader for geoland2 EU-project, and EUROSPEC ES0903 Cost Action, as a project manager in HYPI and ECOPROPHET project.

Driving licence B

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## ADDITIONAL INFORMATION

### Editor activity

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#### Review editor

Frontiers in Forests and Global Change, session Forests and the Atmosphere (ISSN: 2624-893). From 13-03-2018 ongoing.

#### Guest editor

Special Issue "Remote Sensing and Its Applications in the Bio-Geosciences". *Sensors* (IF (2017) 2.475; ISSN 1424-8220). From 01-05-2018 to 20-12-2018

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### Review activity

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In ISI journals: Remote sensing, Biogeosciences

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## MEMBERSHIP IN STEERING AND/OR PROGRAMME COMMITTEE

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### Member of the Management Committee of ESSEM COST Action ES1309

ESSEM COST Action CA22136 "Pan-European Network of Green Deal Agriculture and Forestry Earth Observation Science (PANGEOS)". Period: from 06-11-2023 to 05-11-2027. Official representative for Belgium.

### Convener of the EGU session BG9.1

"Remote Sensing applications for the biosphere", European Geosciences Union General Assembly, Vienna (Austria), 26 April 2023.

### Convener of the EGU session BG9.3

"Remote Sensing applications for the biosphere", European Geosciences Union General Assembly, Vienna (Austria), 3-8 April 2022.

### Chair of session at 2021 IEEE International Geoscience and Remote Sensing Symposium

"Advances in observing and modelling carbon cycle and phenology", 2021 IEEE International Geoscience and Remote Sensing Symposium, Virtual, Brussels (Belgium), 12 July 2021.

### Convener of Agorá section at ESA Living Planet Symposium 2019

Session: "Global Primary Production with Sentinel-3 - way forward" in the frame of ESA Living Planet Symposium 2019, Milan (Italy), May 13-17, 2019.

### Volunteer member

Center of Excellence Plant and Vegetation Ecology (PLECO), Department of Biology, University of Antwerp. From 01-05-2017 to 31-12-2020.

### Convener of the EGU session BG1.24/GI2.19

Session: BG1.24/BG2.19 "Remote sensing and its applications in the biogeosciences with the COST OPTIMISE action and MDPI journal *Sensors*" in the frame of EGU-European Geosciences Union General Assembly, Vienna (Austria), April 10, 2018.

### PhD promotor

Maral Maleki. Title: "Assessing ecosystem productivity by using new Earth Observation products from different satellite platforms". Research Centre of Excellence on Global Change Ecology, Department of Biology, University of Antwerp. Period: November 2017 - December 2021.

### International conference organizer and member of the scientific committee

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*"New perspectives in modeling and measurement of biogenic volatile organic compounds emissions by remote sensing"*, Antwerp (Belgium), June 15-16, 2017.

#### Convener of the EGU session BG1.8

Session: BG1.8 *"Remote sensing and data assimilation in the biogeosciences (co-sponsored by iLEAPS)"* in the frame of EGU-European Geosciences Union General Assembly, Vienna (Austria), April 28, 2017.

#### Scientific coordinator of the Working Groups

Working group 3 "New GPP products"; and Working group 4 "Valorization and dissemination" in the frame of the ECOPROPHET project. Period: 2016-2021.

#### Member of the scientific meeting committee

*"First HYPI project Steering Committee meeting"*, Antwerp (Belgium), April 28, 2016.

#### Scientific coordinator of the Working Groups

Working group 3 "Leaf level measurements"; Working group 2 "Canopy level measurements"; and Working group 4 "Dissemination" in the frame of the HYPI project. Period: 2015-2017.

#### Master Project assessor in the Master Project Biology defences

Department of Biology. Faculty of Sciences. University of Antwerp. 22 September 2016, Antwerp (Belgium).

#### Judge for the Outstanding Student Poster and PICO (OSPP) Award contest

EGU-European Geosciences Union General Assembly, Vienna (Austria), April 21, 2016.

#### Convener of the EGU session BG2.6

Session: BG2.6 *"Remote Sensing and data assimilation in the biogeosciences (co-sponsored by iLEAPS)"* in the frame of EGU-European Geosciences Union General Assembly, Vienna (Austria), April 21, 2016.

#### Member of the Management Committee of ESSEM COST Action ES1309

ESSEM COST Action ES1309 *"Innovative optical Tools for proximal sensing of ecophysiological processes (OPTIMIZE)"*. Period: from 25-04-2014 to 24-04-2018. Official representative for Belgium.

#### Scientific co-coordinator of the Working Group

Working group 1 *"Network: state of the art of the optical sampling networks, protocol definition"* in the frame of the ESSEM COST Action ES0903. Period: from 23-11-2009 to 22-11-2013. Official representative for Italy.

#### Member of the Management Committee of ESSEM COST Action ES0903

ESSEM COST Action ES0903 *"Spectral sampling tools for vegetation Biophysical Parameters and Flux measurements in Europe (EUROSPEC)"*. Period: 2008-2013.

#### Co-chair of an international conference

*COST Action ES0903 "EUROSPEC" Final Conference*, 6-8 November 2013, Trento (Italy).

#### Scientific Coordinator of an experts meeting

*"EUROSPEC Joint Working Group meeting"*, Palermo (Italy), July 12-13, 2013.

#### Co-chair of an international meeting and member of the scientific organizing committee

*"EUROSPEC-SPECNET meeting: International Network cooperating to link spectral data and flux measurements around the world"*, Madrid (Spain), June 27-29, 2012.

#### Member of the European Geophysical Union (EGU)

January 2011 – December 2013.

#### Co-chair of the Scientific an International Conference

*"Enlarging and connecting European spectral network"*, Hyytiälä (Finland), January 18-20, 2011.

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## LIST OF PUBLICATIONS

Google Scholar: about 2124 citation, with an H-index of 19 and I-10 index of 27 (source googlescholar).

### Peer-reviewed papers

1. Prentice, I. C., Balzarolo, M., Bloomfield, K. J., Chen, J. M., Dechant, B., Ghent, D., Janssens, I., Luo, X., Morfopoulos, C., Ryu, Y., Vicca, S., and van Hoolst, R. (202x). Principles for satellite monitoring of vegetation carbon uptake. *Nature Review Earth and Environment (in review)*.

2. De Pue, J., Wieneke, S., Bastos, A., Barrios, J. M., Liu, L., Ciais, P., Arboleda, A., Hamdi, R., Maleki, M., Maignan, F., Gellens-Meulenberghs, F., **Balzarolo, M.** (2023). Temporal variability of observed and simulated gross primary productivity, modulated by vegetation state and hydrometeorological driver. *Biogeosciences*, 20, 4795–4818, 2023. <https://doi.org/10.5194/bg-20-4795-2023>.
3. Filella, I., Descals, A., **Balzarolo, M.**, Yin, G., Verger, A., Fang, H., Peñuelas, J. (2023). Photosynthetically Active Radiation and Foliage Clumping Improve Satellite-Based NIRv Estimates of Gross Primary Production. *Remote Sensing*: 15, 2207. <https://doi.org/10.3390/rs15082207>.
4. Bloomfield, K.J., van Hoolst, R., **Balzarolo, M.**, Janssens, I.A., Vicca, S., Ghent, D., Prentice, I.C. (2023). Towards a General Monitoring System for Terrestrial Primary Production: A Test Spanning the European Drought of 2018. *Remote Sensing*: 15, 1693. <https://doi.org/10.3390/rs15061693>.
5. Maleki M., Arriga N., Roland M., Wieneke S., Barrios J.M., Van Hoolst R., Janssens I.A., **Balzarolo M.** (2022). Soil water depletion induces discrepancies between in situ measured vegetation indices and photosynthesis in a temperate zone heathland. *Agricultural and Forest Meteorology*: 324, 109110.
6. De Pue J., Barrios J. M., Liu L., Ciais P., Arboleda A., Hamdi R., **Balzarolo M.**, Maignan M., Gellens-Meulenberghs F.. Local scale evaluation of the simulated interactions between energy, water and vegetation in land surface models. *Biogeosciences*: 19, 4361–4386, <https://doi.org/10.5194/bg-19-4361-2022>, 2022.
7. Tasser E., Seeber J., Rubatscher D., Loacker I., Lavorel S., Robson M., **Balzarolo M.**, Altimir N., Droesler M., Gamper S., Barančok P., Wohlfahrt G., Tappeiner U., Cernusca A., Sebastia M.-T., Vescovo L., Bahn, M. (2022). Effect of land use on carbon and nitrogen pool partitioning in European mountain grasslands. *Science of the Total Environment*: 822, 153380.
8. Wieneke S., **Balzarolo M.**, Asard H., Abd Elgawad H., Peñuelas J., Rascher U., Ven A., Verlinden M.S., Janssens I.A., Vicca S. (202x). Fluorescence ratio and photochemical reflectance index as a proxy for photosynthetic quantum efficiency of photosystem II along a phosphorus gradient. *Agricultural and Forest Meteorology*: 322, 109019.
9. Maleki M., Arriga N., Barrios J.M., Wieneke S., Liu Q., Peñuelas J., Janssens I.A., **Balzarolo M.** (2020). Estimation of Gross Primary Productivity (GPP) Phenology of a Short-Rotation Plantation Using Remotely Sensed Indices Derived from Sentinel-2 Images. *Remote Sensing*: 12(13), 2104; [doi.org/10.3390/rs12132104](https://doi.org/10.3390/rs12132104).
10. **Balzarolo M.**, Valdameri N., Fu Y.H., Schepers L., Janssens I.A., Campioli M. (2019). Different determinants of radiation use efficiency in cold and temperate forests. *Global Ecology and Biogeography*: 28:1649–1667; [doi.org/10.1111/geb.12985](https://doi.org/10.1111/geb.12985).
11. **Balzarolo M.**, Peñuelas J., Veroustraete F. (2019). Influence of landscape heterogeneity and spatial resolution in multi-temporal in situ and MODIS NDVI data proxies for seasonal GPP dynamics. *Remote Sensing*, 11, 1656; [doi:10.3390/rs11141656](https://doi.org/10.3390/rs11141656).
12. Marien B., **Balzarolo M.**, Dox I., Leys S., Marchand J. L., Geron C., Portillo-Estrada M., AbdElgawad H., Asard H., Campioli M. (2019). Detecting the onset of autumn leaf senescence in deciduous forest trees of the temperate zone. *New Phytologist*; [doi: 10.1111/nph.15991](https://doi.org/10.1111/nph.15991).
13. Fernández-Martínez M., Yu R., Gamon J., Hmimina G., Filella I., **Balzarolo M.**, Stocker B., Peñuelas J. (2019). Monitoring spatial and temporal variabilities of gross primary production using MAIAC MODIS data. *Remote Sensing*: 11(7), 874; [doi.org/10.3390/rs11070874](https://doi.org/10.3390/rs11070874).
14. **Balzarolo M.**, Peñuelas J., Filella I., Portillo-Estrada M., Ceulemans R. (2018). Assessing ecosystem isoprene emissions by hyperspectral remote sensing. *Remote Sensing*: 10(7), 1086; [doi: 10.3390/rs10071086](https://doi.org/10.3390/rs10071086).
15. Filella I., Zhang C., Seco R., Potosnak M., Guenther A., Karl T., Gamon J., Pallardy S., Gu L., Kim S., **Balzarolo M.**, Fernandez-Martinez M., Penuelas J. (2018). A MODIS photochemical reflectance index (PRI) as an estimator of isoprene emissions in a temperate deciduous forest. *Remote Sensing*: 10(4), 557; [doi: 10.3390/rs10040557](https://doi.org/10.3390/rs10040557).
16. Peñuelas J., Sardans J., Filella I., Estiarte M., Llusà J., Ogaya R., Carnicer J., Bartrons M., Rivas-Ubach A., Grau O., Peguero G., Margalef O., Pla-Rabés S., Stefanescu C., Asensio D., Preece C., Liu L., Verger A., Barbeta A., Achotegui-Castells A., Gargallo-Garriga A., Sperlich D., Farré-Armengol G., Fernández-Martínez M., Liu D., Zhang C., Urbina I., Camino-Serrano M., Vives-Inglá M., Stocker B.D., **Balzarolo M.**, Guerrieri R., Peaucelle M., Marañón-Jiménez S., Bórnez-Mejías K., Mu Z., Descals A., Castellanos A., Terradas J. (2017). Impacts of global change on Mediterranean forests and their services. *Forests*: 8(12), 463; [doi: 10.3390/f8120463](https://doi.org/10.3390/f8120463).
17. Driessens T., Baeckens S., **Balzarolo M.**, Vanhooydonck B., Huyghe K., Van Damme R. (2017). Climate-related environmental variation in a visual signalling device: the male and female dewlap in *Anolis sagrei* lizards. *Journal of Evolutionary Biology*: 30, 1846–1861; [doi: 10.1111/jeb.13144](https://doi.org/10.1111/jeb.13144).
18. Vicca S., **Balzarolo M.**, Filella I., Granier A., Herbst M., Knohl A., Longdoz B., Mund M., Nagy Z., Pintér K., Rambal S., Verbesselt J., Verger A., Zeileis A., Zhang C., Peñuelas J. (2016). Remotely-sensed detection of effects of extreme droughts on gross primary production. *Nature Scientific Reports*: 6: 28269; [doi: 10.1038/srep28269](https://doi.org/10.1038/srep28269).
19. Vanbeverem S.P.P., Bloemen J., **Balzarolo M.**, Broeckx L. S., Sarzi-Falchi I., Verlinden M.S., Ceulemans R. (2016). A comparative study of four approaches to assess phenology of *Populus* in a short-rotation coppice culture. *iForest*: 9, 682–689; [doi: 10.3832/ifor1800-009](https://doi.org/10.3832/ifor1800-009).

20. **Balzarolo M.**, Vicca S., Nguy-Robertson A. L., Bonal D., Elbers J. A., Fu Y. H., Grünwald T., Horemans J. A., Papale D., Peñuelas J., Suyker A., Veroustraete F. (2016). Matching the phenology of Net Ecosystem Exchange and vegetation indices estimated with MODIS and FLUXNET in-situ observations. *Remote Sensing of Environment*: 174, 290–300.
21. Porcar-Castell A., Mac Arthur A., Rossini M., Eklundh L., Pacheco-Labrador J., Anderson K., **Balzarolo M.**, Martín M. P., Jin H., Tomelleri E., Cerasoli S., Sakowska K., Hueni A., Julitta T., Nichol C.J., Vescovo, L. (2015). EUROSPEC: at the interface between remote sensing and ecosystem CO<sub>2</sub> flux measurements in Europe. *Biogeosciences*: 12, 6103-6124.
22. Wingate L., Ogee J., Cremonese E., Filippa G., Mizunuma T., Migliavacca M., Moisy C., Wilkinson M., Moureaux C., Wohlfahrt G., Hammerle A., Hoertnagl L., Gimeno C., Porcar-Castell A., Galvagno M., Nakaji T., Morison J., Kolle O., Knohl A., Kutsch W., Kolari P., Nikinmaa E., Ibrom A., Gielen B., Eugster W., **Balzarolo M.**, Papale D., Klumpp K., Koestner B., Gruenwald T., Joffre R., Ourcival J.-M., Hellstrom M., Lindroth A., Charles G., Longdoz B., Genty B., Levula J., Heinesch B., Sprintsin M., Yakir D., Manise T., Guyon D., Ahrends H., Plaza-Aguilar A., Guan J.H., Grace J. (2015). Interpreting canopy development and physiology using the EUROPhen camera network at flux sites. *Biogeosciences*: 10, 11857-11897.
23. **Balzarolo M.**, Vescovo L., Hammerle A., Gianelle D., Papale D., Wohlfahrt G. (2015). On the relationship between ecosystem-scale hyperspectral reflectance and CO<sub>2</sub> exchange in European mountain grasslands. *Biogeosciences*: 10, 11857-11897.
24. Berninger F., Susiluoto S., Damiano G., Bahn M., Wohlfahrt G., Campbell C., Anderson M., Sutton M., Christensen T., Garcia- Pausas J., Gimeno C., Sanz M.J., Dore S., Rogiers N., Furger M., Eugster W., **Balzarolo M.**, Sebastià M.T., Tenhunen J., Staszewski T. and Cernusca A. (2015). Management and site effects on carbon balances of European mountain pastures and meadows. *Boreal Environment Research*: 20, 748-760.
25. **Balzarolo M.**, Boussetta S., Balsamo G., Beljaars A., Maignan F., Calvet J.-C., Lafont S., Barbu A., Poulter B., Chevallier F., Szczypta C., Papale D. (2014). Evaluating the potential of large scale simulations to predict carbon fluxes of terrestrial ecosystems over a European Eddy Covariance network. *Biogeosciences*: 11, 2661–2678; doi:10.5194/bg-11-2661-2014.
26. Boussetta S., Balsamo G., Beljaars A., Agusti-Panareda A., Calvet J-C, Jacobs Cor, van den Hurk B., Viterbo P., Lafont S., Dutra E., Jarlan L., **Balzarolo M.**, Papale D., van der Werf G.. Natural land carbon dioxide exchanges in the ECMWF integrated forecasting system: Implementation and offline validation (2013). *Journal of Geophysical Research–Atmospheres*: 118, 5923–5946, doi: 10.1002/jgrd.50488.
27. Anderson K., Rossini M., Pacheco-Labrador J., **Balzarolo M.**, MacArthur A., Fava F., Julitta T., Vescovo L. (2013). Inter-comparison of hemispherical conical reflectance factors (HCRF) measured with four fibre-based spectrometers. *Optics Express*: 21(1), 605–617.
28. **Balzarolo M.**, Anderson K., Nichol C., Rossini M., Vescovo L., Arriga N., Wohlfahrt G., Calvet J-C, Carrara A., Cerasoli S., Cogliati S., Daumard F., Eklundh L., Elbers J.A., Evrendilek F., Handcock R.N., Kaduk J., Klumpp K., Longdoz B., Matteucci G., Meroni M., Montagnani L., Ourcival J-M., Sánchez-Cañete E.P., Pontailier J-Y., Juszczak R., Scholes B., Martín M.P. (2011). Ground-based optical measurements at European flux sites: a review of methods, instruments and current controversies. *Sensors*: 11, 7954–7981.
29. Vescovo L., Wohlfahrt G., **Balzarolo M.**, Pilloni S., Sottocornola M., Rodeghiero M., Gianelle D. (2012). New spectral vegetation indices based on the near-infrared shoulder wavelengths for remote detection of grassland phytomass. *International Journal of Remote Sensing*: 33(7), 2178–2195.
30. Bahn M., Rodeghiero M., Anderson M., Dore S., Gimeno S., Drösler M., Williams M., Ammann C., Berninger F., Flechard C., Jones S., **Balzarolo M.**, Kumar S., Newesely C., Priwitzer T., Raschi A., Siegwolf R., Susiluoto S., Tenhunen J., Wohlfahrt G., Cernusca A. (2008). Soil respiration in European grasslands in relation to climate and assimilate supply. *Ecosystems*: 11(8), 1352–1367.
31. Wohlfahrt G., Anderson-Dunn M., Bahn M., **Balzarolo M.**, Berninger F., Campbell C., Carrara A., Cescatti A., Christensen T., Dore S., Eugster W., Friborg T., Furger M., Gianelle D., Gimeno C., Hargreaves K., Hari P., Haslwanter A., Johansson T., Marcolla B., Milford C., Nagy Z., Nemitz E., Rogiers N., Sanz M.J., Siegwolf R.T.W., Susiluoto S., Sutton M., Tuba Z., Ugolini F., Valentini R., Zorer R., Cernusca A. (2008). Biotic, abiotic and anthropogenic controls on the net ecosystem CO<sub>2</sub> exchange of European mountain grasslands. *Ecosystems*: 11(8), 1338–1351.
32. Gilmanov T.G., Soussana J-F, Aires L., Allard V., Ammann C., **Balzarolo M.**, Barcza Z., Bernhofer C., Campbell C.L., Cernusca A., Cescatti A., Clifton-Brown J., Dirks B.O.M., Dore S., Eugster W., Fuhrer J., Gimeno C., Gruenwald T., Haszpra L., Hensen A., Ibrom A., Jacobs A.F.G., Jones M.B., Lanigan G., Laurila T., Lohila A., Manca G., Marcolla B., Nagy Z., Pilegaard K., Pinter K., Pio C., Raschi A., Rogiers N., Sanz M.J., Stefani P., Sutton M., Tuba Z., Valentini R., Williams M.L., Wohlfahrt G. (2007). Partitioning European grassland net ecosystem CO<sub>2</sub> exchange into gross primary productivity and ecosystem respiration using light response function analysis. *Agriculture, Ecosystems and Environment*: 121, 93–120.

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## [PARTECIPATION IN NATIONAL AND INTERNATIONAL PROJECTS](#)

### [ESA CCI+ Vegetation: - Climate Change Initiative Phase 2 New EVCS: Vegetation parameters.](#)

PI: Prof. Christiaan Van der Tol, University of Twente, The Netherlands. Funded by ESA; contract: ESA-EOP-SC-CA-2021-7, issue 1, Revision 2, dated 26/05/2021. Period: 01/03/2022 -31/03/2026. I contribute to (i) the assessment of the usefulness of the FAPAR and LAI products in relation to other ECVs developed in other CCI projects and (ii) to the development to new algorithms for the estimation of plant isoprene emissions using remote sensing data.

### [ESA TerrA-P CCN: Extention of the project TerrA-P 'Estimation of GPP and NPP from Sentinel-3 data starting from first principles'](#)

PI: Dr. Roel Van Hoolst, Flemish Institute of Technology-VITO, Belgium. Period: 01/10/2020 -31/01/2022. I contributed to: (i) analysis of the ecophysiological response of main biomes to climate extreme, focus on summer drought in 2018; (ii) development of the methodology to scale the ratio of ABP to GPP using remote sensing products; (iii) P model validation using multiple databases (flux and meteorological data obtained from eddy covariance; biomass and plants traits (plant height, diameter, age, forest management, etc.) derived from global databases).

### [LEAF-FALL: What makes leaves fall in autumn? A new process description for the timing of leaf senescence in temperate and boreal trees.](#)

PI: Prof. Matteo Campioli, PLECO (Center of Excellence Plant and Vegetation Ecology, Department of Biology, University of Antwerp). ERC grants. Period: 01/02/2017 -31/01/2022. Activities: understand the timing of leaf senescence in temperate deciduous trees by integrating remote sensing and in situ observations; contribution to experimental research design for in situ surveys; definition of the protocol for leaf pigments sampling; processing of Sentinel-2 satellite data and calculation of remotely vegetation indices; interpretation of the relationship between senescence derived from in situ data and changes in vegetation indices. Contribution as second author to [12] (see publication list here below).

### [TerrA-P: Estimation of GPP and NPP from Sentinel-3 data starting from first principles.](#)

Coordinators: Dr. Else Swinnen and Dr. Roel Van Hoolst, Flemish Institute of Technology-VITO, Belgium. Activities: analysis of spatial and temporal variability of gross primary production and above biomass productivity predicted by ecological models and measured at ground level; analysis of the ecophysiological response of main biomes to climate extreme (e.g. drought); analysis of environmental controls on biomes productivity; integration of multiple databases (flux and meteorological data obtained from eddy covariance; biomass and plants traits (plant height, diameter,



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age, forest management, etc.) derived from global databases).

#### **Imbalance-P: Effects of phosphorus limitations on Life, Earth system and Society.**

PI: Josep Peñuelas. Centre for Ecological Research and Forestry Applications, Global Ecology Unit, University of Barcelona (Spain). Activity: assessment of plant traits and physiological status of different biomes by integrating in situ and satellite observations; simulation of global ecosystem productivity based on satellite passive fluorescence (OCO-2, GOME), PRI (MODIS) and conventional vegetation indices derived from different platforms (Proba-V, MODIS).

#### **TRACK-C: Tracking carbon allocation beyond the plant in a nutrient addition experiment with *Zea Mays*.**

PI: Dr. Sara Vicca, PLECO (Center of Excellence Plant and Vegetation Ecology, Department of Biology, University of Antwerp). Period: 01/06/2015 - 31/05/2019. Activity: test the hypothesis that passive fluorescence and PRI are able to track changes in electron transfer rate (ETR) induced by P-limitation in TRACK-C manipulation experiment; design of experimental set-up for gas exchange, active and passive fluorescence, chlorophyll-, carotenoids- and xanthophyll pigments and reflectance data; leading data collection and processing.

#### **Global assessment of terrestrial biomass production and of its determinants.**

PI: Prof. Ivan Janssens. Period: 01/10/2015 - 30/09/2018. Activities: estimation of radiation use efficiency (RUE) for all major terrestrial biomes (e.g. forests, grasslands, croplands, wetlands, tundra, deserts) and for the entire Earth's land, and definition of the key global drivers of RUE (e.g. plant traits, climate, site fertility, soil water content, N deposition and CO<sub>2</sub> fertilization).

#### **Geoland-2: Towards an operational GMES Land Monitoring Core Service.**

Supervisor: Dr. Dario Papale. Forest Ecology Laboratory, DiBAF, Faculty of Agriculture, University of Viterbo. Period: 01/01/2009 - 31/12/2012. Role: researcher payed on the project budget. Activities: improvement of carbon dioxide and atmospheric modules over several biomes and meteorological conditions; validation of carbon and water model simulations by in situ data.

#### **CARBOITALY: The Italian net for measuring forest and agriculture carbon sinks and developing a system to predict the absorption of greenhouse gases by terrestrial ecosystems.**

PI: Prof. Riccardo Valentini. Forest Ecology Laboratory, DiBAF, Faculty of Agriculture, University of Viterbo. Period: 01/10/2009 - 31/12/2012. Role: researcher payed on the project budget. Activities: assessment of carbon, water and energy fluxes of Mediterranean forest and grassland ecosystems by integrating eddy covariance and remote sensing (both proximal and satellite) data. Contribution to: Papale D et al. Carbon, water and energy fluxes of terrestrial ecosystems in Italy. Chapter in: The Greenhouse Gas Balance of Italy. An Insight on Managed and Natural Terrestrial Ecosystems. ISBN 978-3-642-32423-9. Valentini, R., and Miglietta, F. (Eds.). (2014), Springer. dal 01-12-2007 al 30-11-2008.

#### **Progetto KYOTO Lombardia.**

Supervisor: Prof. Riccardo Valentini. Forest Ecology Laboratory, DiBAF, Faculty of Agriculture, University of Viterbo, Italy. Funded by Fondazione Lombardia per l'Ambiente. Role: researcher payed on the project budget. Activities: modeling carbon cycle and productivity of agro-forest ecosystems in Lombardy (Italy). Obtained results contributed to the project report "Progetto Kyoto" (2008), ISBN/ISSN 978-88-8134-067-5.

#### **CarboEurope-IP: Assessment of the European terrestrial carbon balance**

Supervisor: Prof. Riccardo Valentini. Forest Ecology Laboratory, DiBAF, Faculty of Agriculture, University of Viterbo, Italy. Activities: modeling ecosystem productivity; participation in the definition of the protocol for radiation measurements at canopy and ecosystem scale. Period: 01-01-2004 al 30-11-2008.

#### **CARBOMONT: Effects of land-use changes on sources, sinks and fluxes of carbon in European mountain areas.**

Supervisor: Prof. Riccardo Valentini. Forest Ecology Laboratory, DiBAF, Faculty of Agriculture, University of Viterbo, Italy. Period: 01-12-2003 al 30-11-2005. Role: researcher payed on the project budget. Activities: coordination of scientific activities and supervision of fieldworks at Amplero eddy covariance site (hyperspectral field campaigns, soil respiration and LAI measurements and biomass samplings). Reference person for eddy covariance measurements and data elaboration. Obtained results contributed to peer-review publications (see publication list here below).

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Ispra, 16/02/2024

*I authorize to use my personal data in accordance to decree 196/2003.*