

CONTACT DETAILS

Department of Agricultural and Food Sciences

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EDUCATION

- 2007 **Ph.D. in Agricultural Engineering**, University of Milan (Italy). Final dissertation: Study of the water fluxes and the water balance at field scale: measurements and evaluation of hydrological models of different complexity (in Italian).
- 2004 **Diploma in Environmental Sciences**, University of Milan (Italy). Final grade 110/110. Final dissertation: Sustainable development and EMAS Environmental certification: analysis and application to a Consortium for forest management (Italy) (in Italian).

ACADEMIC CAREER and RESEARCH EXPERIENCES

- 2019-present **Associate professor** at Department of Agricultural and Food Sciences, Alma Mater Studiorum Università di Bologna (Italy).
- 2018-2019 **Postdoctoral research position** at Institute of Earth and Environmental Science, Potsdam University (Germany)
- 2014-2017 **Postdoctoral research position** at Helmholtz Centre for Environmental Research – UFZ and guest Lecturer at University of Potsdam (Germany)
- 2010-2014 **Postdoctoral research position and Lecturer** at the Institute of Earth and Environmental Science, Water and Matter Transport in Landscapes group, Potsdam University (Germany). Main activities: to test and apply Cosmic ray neutron sensing for soil moisture measurements at intermediate scale; to develop sensitivity analysis tools for error decomposition of model output;
- 2007-2010 **Research fellow** at the Department of Agricultural Engineering, University of Milan (Italy). Main activities: developing of hydrological models for agricultural water managements, transfer technology project for the assessment of the irrigation water requirements, supervising and teaching.
- 2006-2007 **Fellowship** at the Soil Physics, Ecohydrology and Groundwater Management Group of the Department of Environmental sciences of Wageningen University (Netherlands), supervisor Prof. J.C. van Dam.
- 2005 **Research collaboration** in the SEN2FLEX project of European Space Agency (ESA). Main activities: field activities for the analysis of the soil water content and hydrological characterization at different spatial scales.
- 2004-2007 **Research scientist** (PhD candidate) in the Institute of Agricultural Hydraulic, University of Milan (Italy). Main activities: monitoring water fluxes at field scale, comparing hydrological modelling of different complexity, teaching assistant.
- 2004 **Research assistant** in the Institute of Agricultural Hydraulic, University of Milan (Italy). Main activities: development, manage and process data of the Geographical

Information System for the study of water and groundwater resources in Province of Cremona (Italy).

PROFESSIONAL TRAINING

- 2017 Fall School on Terrestrial Modeling and High-Performance Scientific Computing, Bonn (Germany) 25-29 September 2017
- 2010 Summer School on Sensitivity Analysis of Model Output (SAMO) organized by the European Joint Research Center, Fiesole (Italy), 32 h.
- 2005 Advanced Course: Les methodes de la geostatistique, Centre de Geostatistique, Ecole des mines des Paris, Fontainebleau (France), 98 h.
- 2005 Advanced Course in Soil hydrology, University Federico II of Naples (Italy); 32 h.
- 2004 Postgraduate specialization: Geographical Information System, (Bergamo, Italy), 572 h.
- 2003 Multidisciplinary course in development education, UNICEF (Milan, Italy); 56 h.
- 2002 Course on International Cooperation, CIPSI (Rome, Italy), 70 h.

SCIENTIFIC SERVICES AND AFFILIATIONS

Reviewer for: Water Resources Research, Hydrology and Earth System Sciences, Journal of Hydrology, Hydrological processes, Vadoze Zone Journal, Environmental Modelling and software, Geophysical Research Letter, Sensor, Science of total environment, Environmental Earth Sciences, Hydrology, Water, Computers & Geosciences, Computers and Electronics in Agriculture, Journal of hydrological engineering, Global climate change, Resources, Conservation & Recycling

Affiliations: European Geosciences Union (<https://www.egu.eu/>); Proximal soil sensing working group (<http://wgpss.org/>); International Environmental Modelling and Software society (<http://www.iemss.org/society/>), Associazione Italiana Ingegneria Agriaria (<http://www.aiia.it/>); European Society of Agricultural Engineers (<http://www.eurageng.eu/>); International Commission of Agricultural Engineering (<https://cigr.org/>)

Conferences:

2020 co-convener for the special session Integrated Water Management for Agriculture (Part I): Sensing, Modeling, and Data Integration at the international workshop on Metrology for agriculture and forestry, Trento, Italy, 4-6 November 2020 (<https://www.metroagrifor.org/maf2020/>)

2021 co-convener for the special session Sensing hydrological processes at different spatial and temporal scales for sustainable use of water resources at the international workshop on Metrology for agriculture and forestry, Trento-Bolzano, Italy, 3-5 November 2021 (<http://www.metroagrifor.org/home>)

PROJECT FOUNDED

- 2019-2024 **FAO/IAEA** (Food and agricultural organization, International Atomic Energy Agency): Technical contract in the coordinate research program “Enhancing agricultural resilience and water security using Cosmic-Ray Neutron Technology.”

2018-2021 **DFG - Research Unit** (German research foundation) CosmicSense project (<https://www.uni-potsdam.de/en/cosmicsense.html>): the project focuses on enhancing soil moisture observation based on cosmic-ray neutrons sensing for the study of the water fluxes in small catchment (co-PI in three modules).

PUBLICATIONS

Google scholar (h-index 14, Citations 765)

Scopus (h-index 12, Citations 517)

WOS Publons (h-index 13, Citations 507)

Publicazioni ISI - Peer-reviewed

- [1] Barbosa, Luís Romero, Victor Hugo R. Coelho, Lena M. Scheiffele, **Gabriele Baroni**, Geraldo M. Ramos Filho, Suzana M. G. L. Montenegro, Cristiano das N. Almeida, and Sascha E. Oswald. “Dynamic Groundwater Recharge Simulations Based on Cosmic-Ray Neutron Sensing in a Tropical Wet Experimental Basin.” *Vadose Zone Journal* 20, no. 4 (2021): e20145. <https://doi.org/10.1002/vzj2.20145>.
- [2] Scheiffele, Lena M., **Gabriele Baroni**, Trenton E. Franz, Jannis Jakobi, and Sascha E. Oswald. “A Profile Shape Correction to Reduce the Vertical Sensitivity of Cosmic-Ray Neutron Sensing of Soil Moisture.” *Vadose Zone Journal* 19, no. 1 (2020): e20083. <https://doi.org/10.1002/vzj2.20083>.
- [3] **Baroni, Gabriele**, and Till Francke. “An Effective Strategy for Combining Variance- and Distribution-Based Global Sensitivity Analysis.” *Environmental Modelling & Software* 134 (December 1, 2020): 104851. <https://doi.org/10.1016/j.envsoft.2020.104851>.
- [4] Dobkowitz, Sophia, Ariane Walz, **Gabriele Baroni**, and Aldrin M. Pérez-Marín. “Cross-Scale Vulnerability Assessment for Smallholder Farming: A Case Study from the Northeast of Brazil.” *Sustainability* 12, no. 9 (2020): 3787. <https://doi.org/10.3390/su12093787>.
- [5] Fersch, B., Francke T., Heistermann M, Schrön M., Döpfer V., Jakobi J., **Baroni G.**, et al. “A Dense Network of Cosmic-Ray Neutron Sensors for Soil Moisture Observation in a Highly Instrumented Pre-Alpine Headwater Catchment in Germany.” *Earth System Science Data* 12, no. 3 (2020): 2289–2309. <https://doi.org/10.5194/essd-12-2289-2020>.
- [6] Pilz, Tobias, Till Francke, **Gabriele Baroni**, and Axel Bronstert. “How to Tailor My Process-Based Hydrological Model? Dynamic Identifiability Analysis of Flexible Model Structures.” *Water Resources Research* n/a, no. n/a (2020): e2020WR028042. <https://doi.org/10.1029/2020WR028042>.
- [7] Schattan, P., M. Köhli, M. Schrön, G. Baroni, and S.E. Oswald. “Sensing Area-average Snow Water Equivalent with Cosmic-ray Neutrons: The Influence of Fractional Snow Cover.” *Water Resources Research*, December 11, 2019, 2019WR025647. <https://doi.org/10.1029/2019WR025647>.
- [8] Stevanato, L., **Baroni, G.**, Cohen, Y., Cristiano Lino, F., Gatto, S., Lunardon, M., Marinello, F., Moretto, S., Morselli, L. A Novel Cosmic-Ray Neutron Sensor for Soil Moisture Estimation over Large Areas. *Agriculture* 2019, 9 (9), 202.
- [9] **Baroni, G.**, Schalge, B., Rakovec, O., Kumar, R., Schüler, L., Samaniego, L., Simmer, C., Attinger, S., 2019. A comprehensive distributed hydrological modelling inter-comparison to

- support processes representation and data collection strategies. *Water Resources Research*. <https://doi.org/10.1029/2018WR023941>
- [10] **Baroni, G.**, Drastig, K., Lichtenfeld, A., Jost, L., Claas, P., 2019. Assessment of Irrigation Scheduling Systems in Germany: Survey of the Users and Comparative Study. *Irrig. and Drain.* ird.2337. <https://doi.org/10.1002/ird.2337>
- [11] Erdal, D., **Baroni, G.**, Sánchez-León, E., Cirpka, O.A., 2019. The value of simplified models for spin up of complex models with an application to subsurface hydrology. *Computers & Geosciences*. <https://doi.org/10.1016/j.cageo.2019.01.014>
- [12] Kayatz, B., **Baroni, G.**, Hillier, J., Lüdtke, S., Heathcote, R., Malin, D., van Tonder, C., Kuster, B., Freese, D., Hüttl, R., Wattenbach, M., 2018. Cool farm tool water: A global on-line tool to assess water use in crop production. *Journal of Cleaner Production*. <https://doi.org/10.1016/j.jclepro.2018.09.160>
- [13] **Baroni, G.**, Scheffele, L.M., Schrön, M., Ingwersen, J., Oswald, S.E., 2018. Uncertainty, sensitivity and improvements in soil moisture estimation with cosmic-ray neutron sensing. *Journal of Hydrology* 564, 873–887. <https://doi.org/10.1016/j.jhydrol.2018.07.053>
- [14] Francke, T., **Baroni, G.**, Brosinsky, A., Foerster, S., López-Tarazón, J.A., Sommerer, E., Bronstert, A., 2018. What did really improve our meso-scale hydrological model? A multi-dimensional analysis based on real observations. *Water Resources Research*. <https://doi.org/10.1029/2018WR022813>
- [15] **Baroni, G.**, Zink, M., Kumar, R., Samaniego, L., Attinger, S., 2017. Effects of uncertainty in soil properties on simulated hydrological states and fluxes at different spatio-temporal scales. *Hydrol. Earth Syst. Sci.* 21, 2301–2320. <https://doi.org/10.5194/hess-21-2301-2017>
- [16] Schrön, M., Köhli, M., Scheffele, L., Iwema, J., Bogen, H.R., Lv, L., Martini, E., **Baroni, G.**, Rosolem, R., Weimar, J., Mai, J., Cuntz, M., Rebmann, C., Oswald, S.E., Dietrich, P., Schmidt, U., Zacharias, S., 2017. Improving calibration and validation of cosmic-ray neutron sensors in the light of spatial sensitivity. *Hydrol. Earth Syst. Sci.* 21, 5009–5030. <https://doi.org/10.5194/hess-21-5009-2017>
- [17] Schattan, P., **Baroni, G.**, Oswald, S.E., Schöber, J., Fey, C., Kormann, C., Huttenlau, M., Achleitner, S., 2017. Continuous monitoring of snowpack dynamics in alpine terrain by aboveground neutron sensing. *Water Resour. Res.* 53, 3615–3634. <https://doi.org/10.1002/2016WR020234>
- [18] Ghasemizade, M., **Baroni, G.**, Abbaspour, K., Schirmer, M., 2017. Combined analysis of time-varying sensitivity and identifiability indices to diagnose the response of a complex environmental model. *Environmental Modelling & Software* 88, 22–34. <https://doi.org/10.1016/j.envsoft.2016.10.011>
- [19] **Baroni, G.**, Oswald, S.E., 2015. A scaling approach for the assessment of biomass changes and rainfall interception using cosmic-ray neutron sensing. *Journal of Hydrology* 525, 264–276. <https://doi.org/10.1016/j.jhydrol.2015.03.053>
- [20] **Baroni, G.**, Tarantola, S., 2014. A General Probabilistic Framework for uncertainty and global sensitivity analysis of deterministic models: A hydrological case study. *Environmental Modelling & Software* 51, 26–34. <https://doi.org/10.1016/j.envsoft.2013.09.022>
- [21] Rivera Villarreyes, C.A., **Baroni, G.**, Oswald, S.E., 2014. Inverse modelling of cosmic-ray soil moisture for field-scale soil hydraulic parameters. *Eur J Soil Sci* 65, 876–886. <https://doi.org/10.1111/ejss.12162>

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- [22] **Baroni, G.**, Ortuani, B., Facchi, A., Gandolfi, C., 2013. The role of vegetation and soil properties on the spatio-temporal variability of the surface soil moisture in a maize-cropped field. *Journal of Hydrology*. <https://doi.org/10.1016/j.jhydrol.2013.03.007>
- [23] Rivera Villarreyes, C.A., **Baroni, G.**, Oswald, S.E., 2011. Integral quantification of seasonal soil moisture changes in farmland by cosmic-ray neutrons. *Hydrology and Earth System Sciences* 15, 3843–3859. <https://doi.org/10.5194/hess-15-3843-2011>
- [24] **Baroni, G.**, Facchi, A., Gandolfi, C., Ortuani, B., Horeschi, D., van Dam, J.C., 2010. Uncertainty in the determination of soil hydraulic parameters and its influence on the performance of two hydrological models of different complexity. *Hydrology and Earth System Sciences* 14, 251–270. <https://doi.org/10.5194/hess-14-251-2010>

Publicazioni Peer-reviewed Non-ISI (Conference proceeding)

- [1] Stevanato, L., M. Polo, M. Lunardon, F. Marinello, S. Moretto, and G. Baroni. “Towards the Optimization of a Scintillator-Based Neutron Detector for Large Non-Invasive Soil Moisture Estimation.” In *2020 IEEE International Workshop on Metrology for Agriculture and Forestry (MetroAgriFor)*, 196–200, 2020. <https://doi.org/10.1109/MetroAgriFor50201.2020.9277582>.
- [2] Ricchi, T., V. Alagna, G. Villani, F. Tomei, A. Toscano, and G. Baroni. “Sensitivity of the Agro-Hydrological Model CRITERIA-1D to the Leaf Area Index Parameter.” In *2020 IEEE International Workshop on Metrology for Agriculture and Forestry (MetroAgriFor)*, 247–51, 2020. <https://doi.org/10.1109/MetroAgriFor50201.2020.9277614>.
- [3] Schattan P., **G. Baroni**, S.E. Oswald, J. Schöber, C. Fey, T. Francke, M. Huttenlau, R. Kirnbauer, S. Achleitner, 2017. Combining an improved snow model with above-ground neutron sensing and remote sensing. *Proceedings of the 37th IAHR World Congress*, August 13 – 18, 2017, Kuala Lumpur, Malaysia.
- [4] **Baroni G.**, Rivera Villarreyes C.A. and Oswald S.E., 2013. Measurements of soil water storage at field scale via Cosmic Ray neutron Sensing. In: Gebbers, R.; Lück, E.; Rühlmann, J.(eds.): 3rd Global Workshop on Proximal Soil Sensing. Potsdam, (0947-7314), p. 34-38.
- [5] **Baroni, G.** and S.Tarantola, 2012. A general probabilistic framework for uncertainty and sensitivity analysis of deterministic models. *Proc. of the International Congress on Environmental Modelling and Software (iEMS): In Managing Resources of a Limited Planet*, Leipzig, Germany, pp. 1029-1036. Eds.: R. Seppelt, A.A. Voinov, S. Lange, D. Bankamp. (ISBN: 978-88-9035-742-8).
- [6] **Baroni, G.**, Oswald, S.E., Rivera Villarreyes, C.A., 2011. A global uncertainty and sensitivity procedure for the assessment of groundwater recharge distribution via hydrological models. *Proc. of ModelCare Conference*, IAHS-AISH Publication, 355-04.
- [7] Facchi, A., **Baroni, G.**, Boschetti, M., Gandolfi, C., 2010. Comparing optical and direct methods for leaf area index determination in a maize crop. *Journal of Agricultural Engineering* 1, 27–34.
- [8] **Baroni G.**, Facchi A., Gandolfi C., Ortuani B., Horeschi D., Van Dam J.C., 2009. Valutazione funzionale di diversi metodi per la stima dei parametri idraulici del suolo mediante l'utilizzo di due modelli idrologici. IX Conferenza dell'Associazione di Ingegneria Agraria - AIIA, Ischia (Italy). In *Ricerca e innovazione nell'ingegneria dei biosistemi agro-territoriali*. ISBN 978-88-89972-13-7.

- [9] **Baroni G.**, Facchi A., Gandolfi C., Ortuani B., 2008. Analysis of the performances of methods for the evaluation of soil hydraulic parameters and of their application in two hydrological models. In *Options Méditerranéennes, A 84. Irrigation in Mediterranean Agricultural: challenges and innovation for the next decades*, pp. 213-222.
- [10] Facchi A., **Baroni G.**, Gandolfi C., Montaldo N., Mancini M., Horeschi D., 2007. Osservazione sperimentale di grandezze idrologiche a scala puntuale e di appezzamento. In: *Ricerca ed innovazione nell'idraulica agraria e nelle sistemazioni idraulico-forestali*, G. B. Bischetti, M. L. Deangelis, C. Gandolfi. - Milano: Nuova Bios; pp. 199-202.

Oral and poster presentations (> 80, not listed)

TEACHING

University courses

2019-present Department of Agricultural and Food sciences, University of Bologna (Italy)

- Introduction to geostatistics and spatial analysis (7 hours). PhD training
- Sustainable water management (60 hours) in the Master program Precision and Sustainable agriculture
- Irrigation, drainage systems and soil protection (60 hours) in the Bachelor Ornamental plants and landscape protection
- Irrigation and drainage systems (40 hours) in the Bachelor Marketing and Economics of the agro-industrial system

2014 - 2019, Institute of Earth and Environmental Science, University of Potsdam (Germania)

- Agricultural hydrology and irrigation systems: Master course, 30 hours. Summer term
- Uncertainty and sensitivity analysis: Master course, 15 hours. Winter term

2010 - 2014, Institute of Earth and Environmental Science, University of Potsdam (Germania):

- Water and solute transport in porous media. Master course, 30 ore
- Agricultural hydrology and irrigation systems: Master course, 30 hours. Summer term
- Uncertainty and sensitivity analysis: Master course, 15 hours. Winter term
- Local climatology and field methods: Bachelor course, 40 hours. Summer term
- Geographical information system GIS. Bachelor course, 60 hours. Summer term

2006 - 2009, teaching assistant at Agricultural Faculty at the University of Milan (Italy)

- Water resources in agro-forest systems, Master degree
- Hydrology I, Bachelor degree

Seminars and invited talks

- Cosmic-Ray Neutron Sensing: a “new” geophysical approach for soil moisture estimation at field scale (20.12.2017). Seminar within the PhD program at the Department of agricultural and environmental science, University of Milan (Italy).

- Cosmic-Ray Neutron sensing: un metodo (geo)fisico rivisitato per una nuova prospettiva in idrologia e settori affini (23.11.2017). Seminar at the Department of Physics and Astronomy Galileo Galilei, University of Padova (Italy) (23.11.2017).
- A stochastic approach for hydrological models to bridge the gap between modelling and monitoring activities (17.05.2011). Seminar within the workshop Methods for uncertainty and sensitivity analysis of mathematical models at the Leibniz Centre for Agricultural Landscape Research – ZALF (Müncheberg, Germany).
- Training course for the technical staff of local administration (Province of Cremona - Italy) Soil water balance for irrigation water requirements: theory and models, 5 h., November 2009

ADVISOR

PhD and PhD candidate

- [1] Ricchi T., Assessment of agro-hydrological models and remote sensing methods for supporting agricultural water management. Department of agricultural and food sciences, University of Bologna (Italy), Advisors: A.Toscano, G.Baroni
- [2] Scheiffele, LM.: Applications of cosmic-ray neutron sensing for soil moisture measurements for land-surface hydrological observations. Institute of Environmental Science and geography, University of Potsdam, Germania. Advisors: S.E.Oswald, co-advisor: G.Baroni.
- [3] Rivera Villarreyes C.A.: Cosmic-ray neutron sensing for soil moisture measurements in cropped fields. Institute of Earth and Environmental Science, University of Potsdam, Germania (2014). Advisors: S.E.Oswald, co-advisor: G.Baroni.

Master thesis

- [1] Quarta R., Sensitivity of the agro-hydrological model AQUACROP to estimate irrigation water requirements in orchards. Department of agricultural and food sciences, University of Bologna, Italy. (2019).
- [2] Dobkowitz S., Cross-Scale Vulnerability Assessment for Smallholder Farming: A Case Study in the Northeast of Brazil. University of Potsdam, Germania (2018). Supervisor: A.Waltz. co-supervisor: G.Baroni.
- [3] Lichtenfeld A.U., Assessment of modelling tools for supporting irrigation scheduling in crop production in Germany. University of Potsdam, Germania (2017). Supervisor: K.Drastig. co-supervisor: G.Baroni.
- [4] Budack C., Identification of Drought Stress of Forest Trees using the Leaf Turgor Pressure. University of Potsdam, Germania (2016). Supervisor: J.Müller. co-supervisor: G.Baroni.
- [5] Scheiffele L.M., Assessment of soil moisture dynamics on an irrigated maize field using cosmic ray neutron sensing. University of Potsdam, Germania (2015). Supervisor: G.Baroni, co-supervisor: S.E.Oswald.

- [6] Mross K., Estimation of the soil water balance by the combination of Cosmic ray neutron sensing and Eddy Covariance technique in an irrigated citrus orchard in the Tensift-Haouz basin (Morocco). University of Potsdam, Germania (2014). Supervisor S.Er-Raki. co-supervisor G.Baroni
- [7] Schweipert C.M., Assessment of the irrigation practice in the Autlan valley (Jalisco, Mexico), University of Potsdam, Germania (2012). Supervisor A.Bronstert. co-supervisor G.Baroni.

Bachelor thesis

- [1] Arena I., I paradossi dell'efficienza idrica in agricoltura, Department of agricultural and food sciences, University of Bologna, Italy (2019) G.Baroni. co-supervisor: A.Castellini
- [2] Zacheo A., Indici vegetazionali per la caratterizzazione delle colture: confronti metodologici a diverse scale spaziali, Department of agricultural and food sciences, University of Bologna, Italy (2019) Supervisor: G.Baroni. co-supervisor: V.Alagna.
- [3] Ienco L., Misura del contenuto idrico del suolo in pieno campo ed in laboratorio: svolgimento di alcune campagne di monitoraggio ed analisi dei risultati. L. Ienco, Facoltà di Agraria, Milano, Italia (2009). Supervisor: C.Gandolfi. co-supervisor: G.Baroni.
- [4] Mulotto P., Metodi di misura della conducibilità idraulica satura del suolo. Facoltà di Agraria, Milano (2008). Supervisor: C.Gandolfi. co-supervisor: G.Baroni.
- [5] Seghezzi J., Sistemazioni fluviali in ambito naturalistico: il caso del torrente Quisa (Bergamo). Facoltà di Agraria, Milano (2005). Supervisor: G.Bischetti. co-supervisor: G.Baroni.

International exchange students

- [1] Jolley R.P., RMIT University (Melbourne, Australia). February – May 2014, Institute of Earth and Environmental Science, University of Potsdam (Germany)

Members in the commission for master thesis

- [1] Wietzke L.M., Modeling the impact of immobile water zones on subsurface transport processes in 2D-aquifers. University of Potsdam, Germania (2018). Supervisor C.Stumpp, co-supervisor S.Attinger.
- [2] Berghäuser L., Extreme Challenges for Livelihoods: Climate Change Impacts on Hydrological and Agricultural Extreme Events in the MENA & Sahel Regions. University of Potsdam, Germania (2018). Supervisor J.Schewe. co-supervisor A.Bronstert.
- [3] Murawski A., Risk assessment of agricultural crops regarding water shortage and yield deficits in selected example regions. University of Potsdam, Germania (2014). Supervisor J. Müller. co-supervisor A.Bronstert.