

Arnald Puy

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Updated: October 24, 2022

Current position

2022 Sep– **Associate Professor in Social and Environmental Uncertainties**
School of Geography, Earth and Environmental Sciences; College of Life and Environmental Sciences, University of Birmingham, UK

Previous positions

2019–2022 **Marie Skłodowska-Curie Fellow (GF)**
Dept. of Ecology and Evolutionary Biology, Princeton University, USA
Centre for the Study of the Sciences and the Humanities, University of Bergen, Norway

2018–2019 **Researcher**
Centre de Recherches en Archéologie et Patrimoine, Université Libre de Bruxelles, Belgium

2015–2017 **Marie Curie Fellow (IEF)**
Maritime Civilizations Department, University of Haifa, Israel

2014–2015 **Humboldt Research Fellow**
Institute of Geography, University of Cologne, Germany

2012–2014 **Postdoctoral Researcher**
Complexity and Social-Ecological Dynamics (CaSEs), Institució Milà i Fontanals, CSIC Barcelona. Spain

2008–2012 **Predocctoral Fellow (FPI)**
Dept. de Ciències de l'Antiguitat i l'Edat Mitjana, Facultat de Filosofia i Lletres, Universitat Autònoma de Barcelona, Spain

Education

2012 **PhD in Antiquity and Middle Ages**
Universitat Autònoma de Barcelona, Spain
DISSERTATION TITLE: Construction criteria of Andalusi irrigated fields. The case of Ricote (Murcia, Spain)
<https://www.tdx.cat/handle/10803/96879?locale-attribute=en>
GRADE: *Summa cum laude*

2009 **DEA in Medieval and Classical History and Archaeology**
Universitat Autònoma de Barcelona, Spain

2006 **BA in History**
Universitat Autònoma de Barcelona, Spain

Publications

Peer reviewed papers

1. Samuele Lo Piano, Razi Sheikholeslami, **Arnald Puy**, and Andrea Saltelli. “Unpacking the modelling process via sensitivity auditing”. *Futures* 144 (2022), p. 103041. DOI: [10.1016/j.futures.2022.103041](https://doi.org/10.1016/j.futures.2022.103041).
2. **Arnald Puy**, Pierfrancesco Beneventano, Simon A. Levin, Samuele Lo Piano, Tommaso Portaluri, and Andrea Saltelli. “Models with higher effective dimensions tend to produce more uncertain estimates”. *Science Advances* 8 (2022), eabn9450. DOI: [10.1126/sciadv.abn9450](https://doi.org/10.1126/sciadv.abn9450). [R code](#).
3. **Arnald Puy**, Razi Sheikholeslami, Hoshin V. Gupta, Jim W. Hall, Bruce Lankford, Samuele Lo Piano, Jonas Meier, Florian Pappenberger, Amilcare Porporato, Giulia Vico, and Andrea Saltelli. “The delusive accuracy of global irrigation water withdrawal estimates”. *Nature Communications* 13 (2022), p. 3183. DOI: [10.1038/s41467-022-30731-8](https://doi.org/10.1038/s41467-022-30731-8). [R code](#).
4. Samuele Lo Piano, Emanuele Borgonovo, **Arnald Puy**, Andrea Saltelli, John Walsh, and Daniele Vidoni. “Improving the reliability of cohesion policy databases”. *PLOS ONE* 17.4 (2022), e0266823. DOI: [10.1371/journal.pone.0266823](https://doi.org/10.1371/journal.pone.0266823).
5. **Arnald Puy**, Bruce Lankford, Jonas Meier, Saskia van der Kooij, and Andrea Saltelli. “Large variations in global irrigation withdrawals caused by uncertain irrigation efficiencies”. *Environmental Research Letters* 17.4 (2022), p. 044014. DOI: [10.1088/1748-9326/ac5768](https://doi.org/10.1088/1748-9326/ac5768). [R code](#).
6. **Arnald Puy**, Samuele Lo Piano, Andrea Saltelli, and Simon A. Levin. “sensobol: an R package to compute variance-based sensitivity indices”. *Journal of Statistical Software* 102.5 (2022), pp. 1–37. DOI: [10.18637/jss.v102.i05](https://doi.org/10.18637/jss.v102.i05).
7. **Arnald Puy**, William Becker, Samuele Lo Piano, and Andrea Saltelli. “A comprehensive comparison of total-order estimators for global sensitivity analysis”. *International Journal for Uncertainty Quantification* 12.2 (2022), pp. 1–18. DOI: [10.1615/Int.J.UncertaintyQuantification.2021038133](https://doi.org/10.1615/Int.J.UncertaintyQuantification.2021038133). [R code](#).
8. **Arnald Puy**, Emanuele Borgonovo, Samuele Lo Piano, Simon A. Levin, and Andrea Saltelli. “Irrigated areas drive irrigation water withdrawals”. *Nature Communications* 12.1 (2021), p. 4525. DOI: [10.1038/s41467-021-24508-8](https://doi.org/10.1038/s41467-021-24508-8). [R code](#).
9. **Arnald Puy**, Samuele Lo Piano, and Andrea Saltelli. “Is VARS more intuitive and efficient than Sobol’ indices?” *Environmental Modelling & Software* 137 (2021), p. 104960. DOI: [10.1016/j.envsoft.2021.104960](https://doi.org/10.1016/j.envsoft.2021.104960). [R code](#).
10. Saman Razavi, Anthony Jakeman, Andrea Saltelli, Clémentine Prieur, Bertrand Iooss, Emanuele Borgonovo, Elmar Plischke, Samuele Lo Piano, Takuya Iwanaga, William Becker, Stefano Tarantola, Joseph H.A. Guillaume, John Jakeman, Hoshin Gupta, Nicola Melillo, Giovanni Rabitti, Vincent Chabridon, Qingyun Duan, Xifu Sun, Stefán Smith, Razi Sheikholeslami, Nasim Hosseini, Masoud Asadzadeh, **Arnald Puy**, Sergei Kucherenko, and Holger R. Maier. “The future of sensitivity analysis: an essential discipline for systems modeling and policy support”. *Environmental Modelling & Software* 137 (2021), p. 104954. DOI: [10.1016/j.envsoft.2020.104954](https://doi.org/10.1016/j.envsoft.2020.104954).
11. Samuele Lo Piano, Federico Ferretti, **Arnald Puy**, Daniel Albrecht, and Andrea Saltelli. “Variance-based sensitivity analysis: The quest for better estimators and designs between explorativity and economy”. *Reliability Engineering & System Safety* 206 (2021), p. 107300. DOI: [10.1016/j.res.2020.107300](https://doi.org/10.1016/j.res.2020.107300).
12. Andrea Saltelli, Gabriele Bammer, Isabelle Bruno, Erica Charters, Monica Di Fiore, Emmanuel Didier, Wendy Nelson Espeland, John Kay, Samuele Lo Piano, Deborah Mayo, Roger Pielke Jr, Tommaso Portaluri, Theodore M Porter, **Arnald Puy**, Ismael Rafols, Jerome R Ravetz, Erik Reinert, Daniel Sarewitz, Philip B Stark, Andrew Stirling, Jeroen van der Sluijs, and Paolo Vineis. “Five ways to ensure that models serve society: a manifesto”. *Nature* 582.7813 (2020), pp. 482–484. DOI: [10.1038/d41586-020-01812-9](https://doi.org/10.1038/d41586-020-01812-9).
13. **Arnald Puy**, Samuele Lo Piano, and Andrea Saltelli. “Current models underestimate future irrigated areas”. *Geophysical Research Letters* 47.8 (2020), e2020GL087360. DOI: [10.1029/2020GL087360](https://doi.org/10.1029/2020GL087360). [R code](#).

14. **Arnald Puy**, Samuele Lo Piano, and Andrea Saltelli. “A sensitivity analysis of the PAWN sensitivity index”. *Environmental Modelling & Software* 127 (2020), p. 104679. DOI: [10.1016/j.envsoft.2020.104679](https://doi.org/10.1016/j.envsoft.2020.104679). [R code](#).
15. **Arnald Puy**, Manuel Herzog, Pedro Escriche, Amou Marouche, Yousef Oubana, and Olaf Bubenzer. “Detection of sand encroachment patterns in desert oases. The case of Erg Chebbi (Morocco)”. *Science of The Total Environment* 642 (2018), pp. 241–249. DOI: [10.1016/j.scitotenv.2018.05.343](https://doi.org/10.1016/j.scitotenv.2018.05.343).
16. **Arnald Puy**. “Irrigated areas grow faster than the population”. *Ecological Applications* 28.6 (2018), pp. 1413–1419. DOI: [10.1002/eap.1743](https://doi.org/10.1002/eap.1743).
17. Andrea Luca Balbo, **Arnald Puy**, Jaime Frigola, Fèlix Retamero, Isabel Cacho, and Helena Kirchner. “Amplified environmental change: Evidence from land-use and climate change in medieval Minorca”. *Land Degradation & Development* 29.4 (2018), pp. 1262–1269. DOI: [10.1002/ldr.2869](https://doi.org/10.1002/ldr.2869).
18. **Arnald Puy**, Rachata Muneeppeerakul, and Andrea Luca Balbo. “Size and stochasticity in irrigated social-ecological systems”. *Scientific Reports* 7 (2017), p. 43943. DOI: [10.1038/srep43943](https://doi.org/10.1038/srep43943).
19. **Arnald Puy**, José María García Avilés, Andrea Luca Balbo, Michèle Keller, Svenja Riedesel, Daniel Blum, and Olaf Bubenzer. “Drip irrigation uptake in traditional irrigated fields: The edaphological impact”. *Journal of Environmental Management* 202 (2017), pp. 550–561. DOI: [10.1016/j.jenvman.2016.07.017](https://doi.org/10.1016/j.jenvman.2016.07.017).
20. Andrea Luca Balbo and **Arnald Puy**. “Terrace landscapes. Editorial to the special issue”. *Journal of Environmental Management* 202.3 (2017), pp. 495–499. DOI: [10.1016/j.jenvman.2017.02.001](https://doi.org/10.1016/j.jenvman.2017.02.001).
21. Andrea Luca Balbo, Erik Gómez-Baggethun, Matthieu Salpeteur, **Arnald Puy**, Stefano Biagetti, and Jürgen Scheffran. “Resilience of small-scale societies: a view from drylands”. *Ecology and Society* 21.2 (2016), art53. DOI: [10.5751/ES-08327-210253](https://doi.org/10.5751/ES-08327-210253).
22. **Arnald Puy**, Andrea Luca Balbo, and Olaf Bubenzer. “Radiocarbon dating of agrarian terraces by means of buried soils”. *radiocarbon. an international journal of cosmogenic isotope research* 58.02 (2016), pp. 345–363. DOI: [10.1017/RDC.2015.21](https://doi.org/10.1017/RDC.2015.21).
23. **Arnald Puy**, Andrea Luca Balbo, Camila Zinsli, and Morten Ramstad. “High-resolution stratigraphy of Scandinavian coastal archaeological settlements: the case of Håkonshella, W Norway”. *boreas. münstersche beiträge zur archäologie* 45.3 (2016), pp. 508–520. DOI: [10.1111/bor.12166](https://doi.org/10.1111/bor.12166).
24. **Arnald Puy**. “Land selection for irrigation in al-Andalus (Spain, 8th century AD)”. *Journal of Field Archaeology* 39.1 (2014), pp. 84–100. DOI: [10.1179/0093469013Z.00000000072](https://doi.org/10.1179/0093469013Z.00000000072).
25. **Arnald Puy**, Andrea Luca Balbo, Antoni Virgili, and Helena Kirchner. “The evolution of Mediterranean wetlands in the first millennium AD: The case of Les Arenes floodplain (Tortosa, NE Spain)”. *Geoderma* 232–234 (2014), pp. 219–235. DOI: [10.1016/j.geoderma.2014.05.001](https://doi.org/10.1016/j.geoderma.2014.05.001).
26. **Arnald Puy** and Andrea Luca Balbo. “The genesis of irrigated terraces in al-Andalus. A geoarchaeological perspective on intensive agriculture in semi-arid environments (Ricote, Murcia, Spain)”. *Journal of Arid Environments* 89 (2013), pp. 45–56. DOI: [10.1016/j.jaridenv.2012.10.008](https://doi.org/10.1016/j.jaridenv.2012.10.008).
27. **Arnald Puy**. “Tracking down the gliter of gold in the Diplomatarium de Santes Creus”. *Imago Temporis - Medium Aevum* 7 (2013), pp. 175–224. DOI: [10.17605/OSF.IO/P6KMG](https://doi.org/10.17605/OSF.IO/P6KMG).

Peer-reviewed book chapters

1. Andrea Saltelli, Samuele Lo Piano, and **Arnald Puy**. “Sensitivity auditing”. *Elgar Encyclopaedia of Ecological Economics*. Ed. by Emilio Padilla Rosa and Jesús Ramos Martín. Edward Elgar Publishing, 2023. DOI: [10.2139/ssrn.3977104](https://doi.org/10.2139/ssrn.3977104).
2. Andrea Saltelli, **Arnald Puy**, and Samuele Lo Piano. “Sensitivity analysis”. *Elgar Encyclopedia of Ecological Economics*. Ed. by Emilio Padilla Rosa and Jesús Ramos Martín. Edward Elgar Publishing, 2023. DOI: [10.2139/ssrn.3977108](https://doi.org/10.2139/ssrn.3977108).
3. **Arnald Puy** and Andrea Saltelli. “Mind the Hubris: Complexity Can Misfire”. *Views on Mathematical Modelling*. Ed. by Andrea Saltelli and Monica Di Fiore. Oxford University Press, 2023. arXiv: [2009.01147](https://arxiv.org/abs/2009.01147). [R code](#).

4. Samuele Lo Piano, Razi Sheikholeslami, **Arnald Puy**, and Andrea Saltelli. “Sensitivity Auditing: An Important Ingredient in the Evaluation of Models and Metrics”. *Views on Mathematical Modelling*. Ed. by Andrea Saltelli and Monica Di Fiore. Oxford: Oxford University Press, 2023.
5. Andrea Saltelli, Monica Di Fiore, Marta Kuk, Samuele Lo Piano, and **Arnald Puy**. “Mind the Framings”. *Views on Responsible Modelling*. Ed. by Andrea Saltelli and Monica Di Fiore. Oxford: Oxford University Press, 2023.
6. Andrea Luca Balbo, José María García-Avilés, Johannes Hunink, Francisco Alcón, J.E. Palenzuela-Cruz, J. Martínez, **Arnald Puy**, Joaquín Rodríguez López, and Jürgen Scheffran. “Challenges and opportunities for historical irrigated agricultural systems in Mediterranean regions: Technical, cultural, and environmental assets for sustainable rural development in Ricote (Murcia, Spain)”. *Climate change, security risks , and violence conflicts. Essays from integrated climate research in hamburg*. Ed. by Michael Brzoska and Jürgen Scheffran. Hamburg: Hamburg University Press, 2020, pp. 143–162.
7. Helena Kirchner, Antoni Virgili, and **Arnald Puy**. “Drainage and irrigation systems in madina Turtusa (Tortosa, Spain) (8th-12th Centuries)”. *Agricultural Landscapes of Al-Andalus, and the Aftermath of the Feudal Conquest*. Ed. by H. Kirchner and F. Sabaté. Turnhout: Brepols Publisher, 2021, pp. 153–172.
8. **Arnald Puy**. “La huerta de ricote (murcia, españa) entre los siglos XV y XVIII”. *Estudiar el pasado: aspectos metodológicos de la investigación en Ciencias de la Antigüedad y de la Edad Media. Proceedings of the First Postgraduate Conference on Studies of Antiquity and Middle Ages Universitat Autònoma de Barcelona 26-28th October 2010*. Ed. by Ainoa Castro Correa, Daniel Gómez Castro, Gerard González Germain, Joan Oller Guzmán, **Arnald Puy**, Roger Riera Vargas, Kasia Krystyna Starczewska, and Nereida Villagra Hidalgo. Oxford: BAR International Series 2412, 2012, pp. 199–209. DOI: [10.13140/2.1.1883.4887](https://doi.org/10.13140/2.1.1883.4887).

Edited books

1. Ainoa Castro Correa, Daniel Gómez Castro, Gerard González Germain, Joan Oller Guzmán, **Arnald Puy**, Roger Riera Vargas, Kasia Krystyna Starczewska, and Nereida Villagra Hidalgo, eds. *Estudiar el pasado: aspectos metodológicos de la investigación en Ciencias de la Antigüedad y de la Edad Media. Proceedings of the First Postgraduate Conference on Studies of Antiquity and Middle Ages Universitat Autònoma de Barcelona 26-28th October 2010*. BAR International Series 2412, 2012.

Non peer-reviewed papers

1. **Arnald Puy** and Andrea Saltelli. “Discrepancy measures for sensitivity analysis in mathematical modeling”. 2022. arXiv: [2206.13470](https://arxiv.org/abs/2206.13470). [R code](#).
2. **Arnald Puy**, Razi Sheikholeslami, Hoshin Gupta, Jim Hall, Bruce Lankford, Samuele Lo Piano, Jonas Meier, Florian Pappenberger, Amilcare Porporato, Giulia Vico, and Andrea Saltelli. “How certain are we about the model-based estimations of global irrigation water withdrawal?” EGU General Assembly. 2022, EGU22–8603. DOI: [10.5194/egusphere-egu22-8603](https://doi.org/10.5194/egusphere-egu22-8603).
3. **Arnald Puy**, Emanuele Borgonovo, Samuele Lo Piano, and Andrea Saltelli. “Are the results of the groundwater model robust?” 2019. arXiv: [1912.10814](https://arxiv.org/abs/1912.10814).
4. **Arnald Puy**. “The construction of fertility in al-Andalus. Geoarchaeology in Ricote (Murcia, Spain, 8th century AD)”. *Geophysical Research Abstracts* 15 (2013), p. 2335.
5. **Arnald Puy**. “Moneda, peces de moneda d’or i magnats a santes creus”. *Revista de l’Arxiu Bibliogràfic de Santes Creus* 23 (2010), pp. 39–49.
6. **Arnald Puy**. “La moneda d’or al diplomataris de Santa Maria de Santes Creus (975-1225)”. *Gaceta Numismática* 169 (2008), pp. 39–60.

Under review

1. Andrea Saltelli and **Arnald Puy**. “What can mathematical modelling contribute to a sociology of quantification?” *Humanities & Social Sciences Communications* (2022). DOI: [10.2139/ssrn.4212453](https://doi.org/10.2139/ssrn.4212453).

2. Andrea Saltelli, Marta Kuc-Czarnecka, Samuele Lo Piano, Máté János Lőrincz, Magdalena Olczyk, **Arnald Puy**, Erik Reinert, Stefán Thor Smith, and Jeroen van der Sluijs. “A new gaze for impact assessment practices in the European Union”. *Environmental Science and Policy* (2022). DOI: [10.2139/ssrn.4157018](https://doi.org/10.2139/ssrn.4157018).
3. Samuele Lo Piano, Máté János Lőrincz, **Arnald Puy**, Steve Pye, Andrea Saltelli, Stefán Thor Smith, and Jeroen P. van der Sluijs. “Unpacking uncertainty in the modelling process for energy policy making”. *Energy Research & Social Science* (2021). arXiv: [2111.00782](https://arxiv.org/abs/2111.00782).
4. Monica Di Fiore, Marta Kuc Czarnecka, Samuele Lo Piano, **Arnald Puy**, and Andrea Saltelli. “The challenge of quantification: an interdisciplinary reading”. *Minerva: The International Review of Ancient Art and Archaeology* (2021). DOI: [10.2139/ssrn.3772676](https://doi.org/10.2139/ssrn.3772676).

Technical reports

1. **Arnald Puy**. *Intermediate Micromorphological Report of Tour Anneessens*. Brussels: Université Libre de Bruxelles, 2019.
2. **Arnald Puy**. *Micromorphological Report of La Rue Du Chien Marin*. Brussels: Université Libre de Bruxelles, 2019.
3. **Arnald Puy**. *Micromorphological Report of Watermael Boitsfort*. Brussels: Université Libre de Bruxelles, 2019.
4. **Arnald Puy**. *Micromorphological Report of La Porte De Hal*. Brussels: Université Libre de Bruxelles, 2018.
5. **Arnald Puy**. *Micromorphological Report of La Ferme Rose*. Brussels: Université Libre de Bruxelles, 2018.
6. **Arnald Puy**. *Micromorphological Report of Hof Ter Coign*. Brussels: Université Libre de Bruxelles, 2018. DOI: [10.17605/OSF.IO/YTPJH](https://doi.org/10.17605/OSF.IO/YTPJH).
7. **Arnald Puy**. *Micromorphological Report of Tour Anneessens*. Brussels: Université Libre de Bruxelles, 2018. DOI: [10.17605/OSF.IO/2AMWJ](https://doi.org/10.17605/OSF.IO/2AMWJ).

R packages

1. sensobol. <https://cran.r-project.org/web/packages/sensobol/index.html>

Fellowships, grants and awards

2018 Jan	Marie Skłodowska-Curie Individual Fellowship–Global Fellowship (IF–GF) (EU) FUNDS: 276,330.60€ SCORE: 99.2/100, ENV panel
2015 May	Outstanding PhD Award Award granted by UAB to PhD theses of exceptional scientific relevance
2014 Oct	Humboldt Research Stay Abroad Grant, Alexander von Humboldt Foundation (Germany) FUNDS: 2.000€
2013 Nov	Marie Curie Intra-European Fellowship (IEF) (EU) FUNDS: 185.558,80€ SCORE: 99.4/100, SOC panel
2013 Nov	Humboldt Research Fellowship, Alexander von Humboldt Foundation (Germany) FUNDS: 82.800€
2013 Apr	The Wenner-Gren Foundation Post-PhD Research Grant (NY, USA)

	FUNDS: 17.580€
2011 Jan	Ministry of Science and Innovation, Research Stays Abroad Grant (Spain) FUNDS: 3.100€
2010 Feb	Ministry of Science and Innovation, Research Stays Abroad Grant (Spain) FUNDS: 7.350€
2009 Nov	Ministry of Science and Innovation, Research Stays Abroad Grant (Spain) FUNDS: 3.640€
2009 Feb	Research Grant. Centro de Experimentación y Obras Públicas (CEDEX), Spain FUNDS: 6.760€
2009 Nov	Joaquín Sarret i Arboç award (Spain) 600€-award granted to the best MA dissertation
2008 Sep	Formación de Personal Investigador Fellowship (FPI) FUNDS: 60.000€

Projects directed as PI

2019-2022	The role of size in the sustainability of irrigation systems (SIZE, #792178) European Commission H2020, EU. 276.330,80€ https://cordis.europa.eu/project/rcn/214099_en.html
2015-2017	Bloom the dry II. The creation of traditional Mediterranean irrigated fields (DryIR, #623098) European Commission FP7, EU. 184.558,80€ https://cordis.europa.eu/project/rcn/187738_en.html
2014-2017	Bloom the dry I. The creation of traditional Mediterranean irrigated fields Alexander von Humboldt Foundation, Germany. 82.800€
2013-2015	Building up intensive labour areas: terraces, irrigation and agrarian change in the Ricote Valley (Murcia, Spain) after 711 AD (#8716) The Wenner-Gren Foundation for Anthropological Research, USA \$17.580 http://www.wennergren.org/grantees/puy-maeso-arnald

Stays in internationally recognized research centers (≥ 6 months)

2011	Charles McBurney Laboratory University of Cambridge, UK
2010	Departamento de Prehistoria, Arqueología, Historia Antigua, Historia Medieval y Ciencias y Técnicas Historiográficas Universidad de Murcia, Spain.

Congresses, conferences and workshops

International

2022 Aug	Model hubris and some related problems MAIN AUTHOR: Arnald Puy
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- Energy and Environmental Engineering Research Group Seminar, University of Reading, Reading, UK
- 2022 Jul **What contribution can sensitivity analysis and sensitivity auditing offer to the opening of the box of models?**
 MAIN AUTHOR: Andrea Saltelli
 CO-AUTHORS: Monica Di Fiore, Arnald Puy
 International Congress on Environmental Modelling & Software (iEMS), Brussels, Belgium
- 2022 Apr **The Cartesian dream in mathematical models for policy-making**
 MAIN AUTHOR: Arnald Puy
 CEREAL seminar (Conversations on the Environment, Responsible Energy, And Life), Princeton University, USA
- 2022 Apr **How certain are we about the model-based estimations of global irrigation water withdrawal?**
 MAIN AUTHOR: Razi Sheikholeslami
 CO-AUTHORS: Arnald Puy, Hoshin Gupta, Jim Hall, Bruce Lankford, Samuele Lo Piano, Jonas Meier, Florian Pappenberger, Amilcare Porporato, Giulia Vico, and Andrea Saltelli
 EGU General Assembly 2022, Vienna, Austria
- 2022 Mar **Sensitivity analysis as a tool to probe into the relation between model complexity and uncertainty**
 MAIN AUTHOR: Arnald Puy
 CO-AUTHORS: Pierfrancesco Beneventano, Simon Levin, Samuele Lo Piano, Tommaso Portaluri, Andrea Saltelli
 10th International Conference on Sensitivity Analysis of Model Output, Tallahassee, Florida, USA
- 2021 Oct **The project DAWN: Illuminating deep uncertainties in the estimation of irrigation water withdrawals**
 MAIN AUTHOR: Arnald Puy
 AFINO workshop, Selbu, Norway
Invited speaker
- 2021 Mar **Mathematical models for policy-making and the illusion of accuracy**
 MAIN AUTHOR: Arnald Puy
 Department of Geography. University of Bergen, Norway
- 2021 Mar **Numbers and models for policy-making in agriculture**
 MAIN AUTHOR: Arnald Puy
 Center for the Sciences and the Humanities. University of Bergen, Norway
- 2020 Nov **Complex vs. simple models. An example on irrigation agriculture**
 MAIN AUTHOR: Arnald Puy
 Conversation Hour of the Levin Lab. Ecology and Evolutionary Biology Department, Princeton University, USA
- 2020 Feb **The scale of irrigated agriculture matters. Should we believe official projections to 2050?**
 MAIN AUTHOR: Arnald Puy
 Center for the Sciences and the Humanities. University of Bergen, Norway
- 2020 Jan **Is the model robust against uncertainties? a brief introduction to sensitivity analysis**
 MAIN AUTHOR: Arnald Puy

- Brown Bag Lunch Seminar. Stockholm Resilience Center, Stockholm, Sweden.
- 2019 Dec **Why uncertainty and sensitivity analysis? Some very simple examples**
 MAIN AUTHOR: Arnald Puy
 Conversation Hour of the Levin Lab. Ecology and Evolutionary Biology Department, Princeton University, USA.
- 2019 Oct **Is it possible to improve existing sample-based algorithm to compute the total sensitivity index?**
 MAIN AUTHOR: Samuele Lo Piano
 CO-AUTHORS: Federico Ferretti, Arnald Puy, Daniel Albrecht, Stefano Tarantola, Andrea Saltelli
 Ninth International Conference on Sensitivity Analysis of Model Output. Universitat Oberta de Catalunya, Barcelona, Spain.
- 2019 Oct **How sensible is the PAWN index to its tuning parameters?**
 MAIN AUTHOR: Arnald Puy
 CO-AUTHORS: Samuele Lo Piano, Andrea Saltelli
 Ninth International Conference on Sensitivity Analysis of Model Output. Universitat Oberta de Catalunya, Barcelona, Spain.
- 2019 May **Why FAOs projection of Mediterranean (and global) irrigated areas to 2050 should not be trusted**
 MAIN AUTHOR: Arnald Puy
 Challenges and opportunities for the sustainable development of Mediterranean rural regions: integrating agricultural, environmental and cultural heritage. Ricote, Spain. Invited speaker
- 2019 Apr **Current projections of global irrigated areas are fragile against uncertainty**
 MAIN AUTHOR: Arnald Puy
 CO-AUTHORS: Samuele Lo Piano, Andrea Saltelli
 Humboldt Colloquium “Research without Borders. Alexander von Humboldt’s Legacy Today”. Madrid, Spain. Invited poster
- 2019 Mar **Can we predict future irrigated areas?**
<https://doi.org/10.6084/m9.figshare.7902623>
 MAIN AUTHOR: Arnald Puy
 Young-researchers workshop: The challenge of sustainability across scales and dimensions. Universitat Oberta de Catalunya, Barcelona, Spain. Invited speaker
- 2019 Mar **Uncertainty and global sensitivity analysis of the projection of continental and global irrigated areas to 2050**
<https://doi.org/10.6084/m9.figshare.7856963>
 MAIN AUTHOR: Arnald Puy
 CO-AUTHORS: Samuele Lo Piano, Andrea Saltelli
 Society for Risk Analysis (SRA) - Benelux 2019 Annual Conference: “Reasoning with Uncertainty”. University of Luxembourg, Luxembourg.
- 2018 Nov **Les études géoarchéologiques dans le centre historique de Bruxelles**
 MAIN AUTHOR: Yannick Devos
 CO-AUTHORS: Cristiano Nicosia, Arnald Puy
 CReA Patrimoine, Université Libre de Bruxelles. Brussels, Belgium.
- 2018 Aug **A stable floor in Tour Anneessens, Brussels**
<https://doi.org/10.6084/m9.figshare.6828668.v2>
 MAIN AUTHOR: Arnald Puy

- CO-AUTHORS: Yannick Devos
International Workshop on Archaeological Soil Micromorphology. Brussels, Belgium.
Organizing Committee
- 2018 Jun **How to better protect oases from sand encroachment? Insights from Erg Chebbi (Morocco)**
MAIN AUTHOR: Arnald Puy
Navigating Complexity: human-environmental solutions for a challenging future. XXIII International Conference of the Society for Human Ecology. Lisbon, Portugal
- 2017 Oct **Dynamics between sand inputs and irrigation in the oases of Merzouga and Hassilabiad (Morocco). Preliminary results**
MAIN AUTHOR: Arnald Puy
From refugia to oases: living in arid environments from prehistoric times to the present day. 38ème Rencontres Internationales d'Archéologie et d'Histoire d'Antibes, CEPAM, Nice, France. Invited speaker
- 2016 Aug **Increasing the resolution of Scandinavian anthropic deposits: the potential of XRF core scanning and geoarchaeology**
MAIN AUTHOR: Arnald Puy
CO-AUTHORS: A.L. Balbo, Camilla Zinsli, Morten Ramstad
4th International Landscape Archaeology Conference, University of Uppsala, Uppsala, Sweden
- 2015 May **Land use and climate change in Minorca between al Andalus and the feudal conquest**
MAIN AUTHOR: A.L. Balbo
CO-AUTHORS: Jaime Frigola, Fèlix Retamero, Helena Kirchner, Isabel Cacho
Shaping the Mediterranean basin: islands, coastlines and cultures. International Geoarchaeology Workshop, Cagliari, Sardinia
- 2015 May **An integrative approach to assess the reliability of AMS dates for terrace construction: bulk analyses, terrace clustering and statistics**
MAIN AUTHOR: Arnald Puy
Shaping the Mediterranean basin: islands, coastlines and cultures. International Geoarchaeology Workshop, Cagliari, Sardinia. Invited speaker
- 2015 Apr **A long-term perspective on Western Mediterranean irrigation: past and future prospects**
MAIN AUTHOR: Arnald Puy
Conference at Maritime Civilizations Department, Haifa University, Israel Invited speaker
- 2014 Dec **Socio-ecological resilience of small-scale societies in drought-prone regions**
MAIN AUTHOR: Andrea L. Balbo
CO-AUTHORS: Stefano Biagetti, Erik Gómez-Baggethun, Matthieu Salpeteur, Jürgen Scheffran
Conference Small-scale societies and environmental transformations: co-evolutionary dynamics, Barcelona. Invited speaker
- 2014 Nov **The creation and management of traditional Mediterranean irrigated fields**
MAIN AUTHOR: Arnald Puy
Humboldt Network Meeting, Julius-Maximilians-Universität Würzburg, Würzburg, Germany. Invited speaker
- 2014 Oct **The creation and management of traditional Mediterranean irrigated fields**
MAIN AUTHOR: Arnald Puy

- Geographisches Institut, Universität zu Köln, Köln, Germany. Invited speaker
- 2013 Jul **Terrasses et archéologie d'al-Andalus: possibilités d'étude**
 MAIN AUTHOR: Arnald Puy
 Conference at Université Sidi Mohamed ben Abdellah, Fes, Morocco. Invited speaker
- 2013 May **From dry to wet, from wet to dry. Micromorphological and physico-chemical features of strategies of soil reclamation in al-Andalus**
 MAIN AUTHOR: Arnald Puy
 CO-AUTHOR: Andrea L. Balbo
 25th International soil micromorphology workshop, Charles McBurney Geoarchaeological Laboratory, Department of Archaeology, University of Cambridge, UK
- 2013 Apr **The creation of fertility in al-Andalus. Geoarchaeology in Ricote**
 MAIN AUTHOR: Arnald Puy
 European Geosciences Union (EGU) General Assembly, Vienna, Austria
- 2013 Mar **Drylands in bloom**
 MAIN AUTHOR: Arnald Puy
 Conference at the Kimmel Centre for Archaeological Science, Weizmann Institute of Science, Israel
- 2012 Nov **Pre-andalusi soils and irrigated terraces in Ricote (Murcia, Spain).**
 MAIN AUTHOR: Arnald Puy
 Society for Medieval Archaeology student colloquium, Cardiff University, UK
- 2012 Jun **Buried soils under terrace fills. Reconstructing the formative stages of the hydraulic system of Ricote (Murcia, Spain)**
 MAIN AUTHOR: Arnald Puy
 2nd International Medieval Meeting, Universitat de Lleida, Spain
- 2011 Jun **Possibilities for topographical analysis of andalusi hydraulic systems**
 MAIN AUTHOR: Arnald Puy
 1st International Medieval Meeting, Universitat de Lleida, Spain
- 2011 Jun **Irrigation and drainage around the Islamic city of Turtusa (Spain)**
 MAIN AUTHOR: Helena Kirchner
 CO-AUTHORS: Antoni Virgili
 1st International Medieval Meeting, Universitat de Lleida, Spain

National

- 2015 Sep **La huerta de Ricote entre pasado y futuro. Historia, arqueología, tecnología**
 MAIN AUTHOR: Arnald Puy
 CO-AUTHORS: Andrea L. Balbo
 Conference at the Ayuntamiento de Ricote, Ricote, Murcia. Invited speaker
- 2014 Jun **¿Cómo se transforma un terreno seco en una zona agraria fértil y productiva?. Ejemplos de al-Andalus (siglos VIII-XV dC)**
 MAIN AUTHOR: Arnald Puy
 Converses del Raval, IMF-CSIC, Barcelona, Spain. Invited speaker
- 2013 Nov **Geoarqueología de los espacios irrigados tradicionales del Mediterráneo**
 MAIN AUTHOR: Arnald Puy
 Archéogéographie et anthropologie de l'espace. L'agriculture irriguée et la morphologie agraire des milieux humides. Casa de Velázquez, Madrid, Spain. Invited speaker

2012 Dec	<p>Cómo y cuándo se fundó la huerta de Ricote (Murcia, España) MAIN AUTHOR: Arnald Puy Centro de conferencias de Ricote, Murcia, Spain. <u>Invited speaker</u></p>
2011 Jun	<p>Possibilitats del registre topogràfic en l'estudi de les hortes del sud-est peninsular. El cas de Ricote (Murcia, Spain) MAIN AUTHOR: Arnald Puy Facultat de Geografia i Història, Universitat de València, València, Spain. <u>Invited speaker</u></p>
2010 Oct	<p>Cuestiones metodológicas sobre la arqueología hidráulica MAIN AUTHOR: Arnald Puy First postgraduate conference on studies of Antiquity and Middle Ages. Universitat Autònoma de Barcelona, Barcelona, Spain</p>
2010 Oct	<p>Cuestiones metodológicas sobre la arqueología hidráulica MAIN AUTHOR: Arnald Puy First postgraduate conference on studies of Antiquity and Middle Ages. Universitat Autònoma de Barcelona, Barcelona, Spain</p>
2010 Apr	<p>Arqueología hidráulica en Ricote MAIN AUTHOR: Arnald Puy Conference at the Universidad de Murcia, Spain</p>

Fieldwork campaigns

2017 Nov	Soil sampling in Erg Chebbi and the Ziz Valley, Morocco. PI: Arnald Puy
2016 Oct	Soil sampling and measurement of aeolian sand inputs in the oases of Hassilabiad and Merzouga, Erg Chebbi, Morocco. PI: Arnald Puy
2015 Oct	Core drilling, soil sampling and ERT (Electrical Resistivity Tomography) measurements in Saddina, Taounate, Morocco. PI: Arnald Puy
2015 Oct	Soil sampling and dune drilling in Erg Chebbi, Morocco. PIs: Arnald Puy and Olaf Bubbenzer
2015 Sep	Soil augering of drip-irrigated and flood-irrigated plots in Ricote, Murcia, Spain. PIs: Arnald Puy and Olaf Bubbenzer
2015 Feb	UAV (Unmanned Aerial Vehicle) survey of the Ricote Valley, Murcia, Spain. PIs: Arnald Puy and Steve Markofsky
2015 Jan	Geoarchaeological trenching and sampling of the huerta of Valencia, Valencia, Spain. PIs: Arnald Puy and Enric Guinot
2014 Sep	Soil sampling and geoelectrical measurements [Electrical Resistivity Tomography (ERT)] of drip-irrigated and flood-irrigated plots, Ricote, Spain. PI: Arnald Puy
2014 Feb	Geoarchaeological excavations in the irrigated terraces of Ricote, Murcia, Spain. PI: Arnald Puy
2013 Jul	Saddina and Mghila sites survey, Fès-Bouleman, Morocco. PI: Virgilio Martínez Enamorado
2012 Jun	Sampling and analysis of the Vaksdal charcoal pit (Viking Age), Bergen, Norway. PI: Morten Råmstad

2012 Apr	Sampling of Mesolithic and Neolithic soils in Hakönshella, Bergen, Norway. PI: Morten Råmstad
2011 Nov	Field survey of the Cabezo del Rife hill, Murcia, Spain. PI: Arnald Puy
2011 Jul	Field survey and geoarchaeological sampling of the Lower Ebro alluvial plain, Tortosa, Spain. PI: Helena Kirchner
2010 Nov	Archaeological excavation and geoarchaeological sampling of irrigated terraces, Ricote, Murcia, Spain. PI: Arnald Puy
2010 Jul	Field survey of the Lower Ebro river, Tortosa, Spain. PI: Helena Kirchner
2009 Jul	Archaeological excavation of Torrepexina Vella site, Menorca, Spain. PI: Helena Kirchner
2008 Jul	Survey of the hydraulic system of Casarabonela, Málaga, Spain. PI: Fèlix Retamero
2007 Sep	Field survey and archaeological excavation of Es Torretó site, Menorca, Spain. PI: Helena Kirchner

Thematic courses and workshops attended

2018 Aug	Numbers for policy: practical problems in quantification Centre for the Study of the Sciences and the Humanities, University of Bergen (Norway), & Open Evidence Research, Universitat Oberta de Catalunya (UOC) (Spain). Universitat Oberta de Catalunya, Castelldefels, Spain.
2018 Jun	Tenth summer school on sensitivity analysis of model output Joint Research Centre (JRC), European Commission. Hotel Conca Azzurra, Ranco, Italy.
2018 Apr	Fractals and scaling Complexity Explorer, Santa Fe Institute, USA.
2017 Feb	Sensitivity analysis, sensitivity auditing and beyond Institut de Ciència i Tecnologia Ambientals (ICTA), Universitat Autònoma de Barcelona, Spain
2013 Feb	Complexity and network theory Institució Milà i Fontanals, CSIC Barcelona, Spain
2011 Feb	Soil micromorphology and geoarchaeology Department of Archaeology, University of Cambridge, UK
2010 Feb	Stable isotopes and environmental change Department of Archaeology, University College London, UK
2008 Nov	GIS specialized course CREAF, Facultat de Ciències, Universitat Autònoma de Barcelona, Spain

Teaching

2011–2012	Agrarian Archaeology (fieldwork) Archaeology Degree, Universitat Autònoma de Barcelona, Spain
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2009–2010 | **Techniques for Historical Research II**
History Degree, Universitat Autònoma de Barcelona, Spain

Languages

Spanish | Mother tongue
Catalan | Mother tongue
English | Proficient

Software

R | Proficient
XLSTAT | Proficient
L^AT_EX | Proficient
Microsoft Office | Proficient

Memberships

2018 | Ecological Society of America
2018 | Society for Human Ecology

Mentored students

2014–2015 | **Svenja Riedesel (Institute of Geography, University of Cologne, Germany)**
I provided Svenja with training in soil sampling methods, follow-up during her BA degree in Geography, externally reviewed her BA thesis “Transport and sedimentation of modern litoral and fluvial deposits along the Black Sea coast of Georgia. A multi-proxy dataset approach”, graded 1 out of 4 (1 = highest grade, 4 = lowest grade), and provided references for her applications to conduct the MSc degree abroad.

Michèle Keller (Institute of Geography, University of Cologne, Germany)
I hired Michelle as a student to provide support in the laboratory, and trained her in soil physico-chemical analysis such as PSD, carbon tests and pH/EC.

Scientific and societal impact

2020 Sep | Scientific advisor for the article “Modelos matemáticos, mirada social”, published in the Spanish Newspaper [El Periódico](#)

2020 July | Op-ed with Ismael Ràfols in the Spanish Newspaper [El Periódico](#), “Modelos matemáticos y decisiones políticas”

2020 July | Interview in [Cadena SER](#) radio station (Spain) on how to make models useful to society (in Catalan)

2020 July | Interview in the [Nació Digital](#) newspaper on how to make models useful to society (in Catalan)

2020 June | Interview in [Regió 7](#) newspaper on uncertainty in models (in Catalan)

Scientific reviewing

Journals	Science, Nature Sustainability, Journal of Statistical Software, Geophysical Research Letters, Water Resources Research, Environmental Modeling & Software, Reliability Systems and Engineering Safety, Arid Land Research and Management, Catena, Land Degradation and Development, Environmental and Natural Resources Research Journal, Revista del Centro de Estudios Históricos de Granada y su Reino.
Funding	ERC Synergy Grant, National Geographic Society, Israel Science Foundation.

Scientific referees

NAME, SURNAME: Andrea Saltelli
PROFESSIONAL RELATIONSHIP WITH APPLICANT: Mentor
LENGTH OF RELATIONSHIP: 2017–present
BODY TO WHICH THEY BELONG TODAY: Universitat Pompeu Fabra
POST: Professor
TELEPHONE: +34 652-401-371
E-MAIL: andrea.saltelli@gmail.com

NAME, SURNAME: Simon Levin
PROFESSIONAL RELATIONSHIP WITH APPLICANT: Mentor in Princeton
LENGTH OF RELATIONSHIP: 2019–present
BODY TO WHICH THEY BELONG TODAY: Princeton University
POST: James S. McDonnell Distinguished University Professor in Ecology and Evolutionary Biology
TELEPHONE: +1 609 258 6880
E-MAIL: slevin@princeton.edu

NAME, SURNAME: Olaf Bubenzer
PROFESSIONAL RELATIONSHIP WITH APPLICANT: Supervisor in Cologne
LENGTH OF RELATIONSHIP: 2014–2015
BODY TO WHICH THEY BELONG TODAY: University of Heidelberg
POST: Professor in Quaternary Research and Applied Geomorphology
TELEPHONE: : +49 (0) 6221-54-4571
E-MAIL: olaf.bubenzer@geog.uni-heidelberg.de

NAME, SURNAME: Ruth Shahack-Gross
PROFESSIONAL RELATIONSHIP WITH APPLICANT: Supervisor in Haifa
LENGTH OF RELATIONSHIP: 2015–2017
BODY TO WHICH THEY BELONG TODAY: University of Haifa
POST: Professor in Sedimentary Archaeology
TELEPHONE: +972-54-760-8637
E-MAIL: rgross@univ.haifa.ac.il

NAME, SURNAME: Charles A.I. French
PROFESSIONAL RELATIONSHIP WITH APPLICANT: Supervisor in Cambridge
LENGTH OF RELATIONSHIP: 2011–2013
BODY TO WHICH THEY BELONG TODAY: University of Cambridge
POST: Professor in Geoarchaeology
TELEPHONE: +44 (0) 1223 333533
E-MAIL: caif2@cam.ac.uk

NAME, SURNAME: Andrea L. Balbo
PROFESSIONAL RELATIONSHIP WITH APPLICANT: Mentor

LENGTH OF RELATIONSHIP: 2009–2017
BODY TO WHICH THEY BELONG TODAY: University of Genève
POST: Researcher
TELEPHONE: +34 (0) 93 442 34 89
E-MAIL: kofbab@gmail.com