

Emanuele Bevacqua

Curriculum Vitae

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Personal Data

Date of Birth 29th June 1990.
Nationality Italian.

Postdoctoral work experience

03/2019–**Postdoc scientist.**
present Department of Meteorology, University of Reading, UK.
09/2018–**Postdoc scientist.**
02/2019 Wegener Center for Climate and Global Change, University of Graz, Austria.

Research experience

I am studying the impact of past and future climate change on meteorological extreme events based on regional and global climate models. I am interested in compound events (CEs), such as long-lasting precipitation events and compound flooding happening in low-lying coastal areas due to co-occurring precipitation and sea level extremes. Throughout my PhD, within the international research project CE:LLO, I focussed my scientific research on multivariate statistical modelling and the analysis of CEs. I gained expertise in multivariate statistics, e.g. Pair-copula constructions, regional climate modelling, and collaborated on research about soil moisture drought and multivariate statistical downscaling.

Education

11/2014–**PhD (Dr. rer. nat) in Physics (Climate Science).**
09/2018 2016–2018: Wegener Center for Climate and Global Change, University of Graz, Austria.
2014–2015: GEOMAR – Helmholtz Centre for Ocean Research Kiel, Germany.
Pass with distinction.
Thesis *Multivariate statistical modelling and analysis of compound events.*
Supervisor Prof. Douglas Maraun.
2012–2014 **Master of Science in Physics (Astrophysics and Geophysics).**
University of Calabria, Cosenza, Italy.
Cum laude, and honourable mention for career.
Thesis *Analysis of the magnetohydrodynamic turbulence anisotropy based on a new definition of the mean magnetic field.*

2009–2012 **Bachelor's degree in Physics.**
University of Calabria, Cosenza, Italy.
Cum laude, and honourable mention for career.

Thesis *Focus on the last glacial period.*

2004–2009 **Scientific High School.**
Cosenza, Italy.
Score of *100 out of 100.*

Research visits

03/2019 **Laboratoire de Météorologie Dynamique (LMD)**, Paris, France.
One-week short term scientific mission (STSM) within DAMOCLES project.

06/2015–
12/2015 **Laboratoire des Sciences du Climat et de l'Environnement**, Gif-sur-Yvette,
France.
Development statistical model for the CE:LLO project.

Supervisor Dr. Mathieu Vrac.

02/2015 **Norwegian Computing Center**, Oslo, Norway.
Training in Pair-copula constructions.

Supervisors Dr. I. Hobaek-Haff and Prof. A. Frigessi.

Publications

- Jézéquel, A., **Bevacqua, E.**, D'Andrea, F., Thao, S., Vautard, R., Vrac, M., Yiou, P. (2019). "Conditional and residual trends of singular hot days in Europe". *Environmental Research Letters*.
- **Bevacqua, E.**, Maraun, D., Vousdoukas, M. I., Voukouvalas, E., Vrac, M., Mentaschi, L., and Widmann, M. (2019). "Higher probability of compound flooding from precipitation and storm surge in Europe under anthropogenic climate change". *Science Advances*, Vol. 5, no. 9, eaaw5531 DOI: 10.1126/sciadv.aaw5531.
- Manning, C., Widmann, M., **Bevacqua, E.**, Van Loon, A. F., Maraun, D., and Vrac, M. (2019). "Increased probability of compound long-duration dry & hot events in Europe during summer (1950-2013)". *Environ. Res. Lett.* 14 094006.
- **Bevacqua, E.** (2018). "Multivariate statistical modelling and analysis of compound events". PhD thesis, University of Graz, Graz, Austria.
- Manning, C., Widmann, M., **Bevacqua, E.**, Van Loon, A. F., Maraun, D., and Vrac, M. (2018). "Soil moisture drought in Europe: a compound event of precipitation and potential evapotranspiration on multiple timescales". *Journal of Hydrometeorology*, 19(8), 1255-1271.
- **Bevacqua, E.**, Maraun, D., Haff, I. H., Widmann, M., and Vrac, M. (2017). "Multivariate statistical modelling of compound events via pair-copula constructions: analysis of floods in Ravenna (Italy)". *Hydrology and Earth System Sciences*, 21, 2701-2723.

- **Bevacqua, E.** (2017). "CDVineCopulaConditional: an R package for conditional sampling from multivariate copula decomposed via C- or D-vines". R-package.
- Alberti, T., Lepreti, F., Vecchio, A., **Bevacqua, E.**, Capparelli, V., and Carbone, V. (2014). "Natural periodicities and Northern Hemisphere–Southern Hemisphere connection of fast temperature changes during the last glacial period: EPICA and NGRIP revisited". *Climate of the Past*, 10, 1751-1762.

Under review

- **Bevacqua, E.**, Vousdoukas, M. I., Shepherd, T. G., and Vrac, M. (2019). "Brief communication: The role of using precipitation or river discharge data when assessing global coastal compound flooding". *Nat. Hazards Earth Syst. Sci. Discuss.*, <https://doi.org/10.5194/nhess-2019-415>. In review.
- Zscheischler, J., Martius, O., Westra, S., **Bevacqua, E.**, Raymond, C., Horton, R., van den Hurk, B., AghaKouchak, A., Jézéquel, A., Mahecha, M. D., Maraun, D., Ramos, A. M., Ridder, N., Thiery, W., Vignotto, E. (2019). "A typology of compound weather and climate events". In review, *Nature Reviews Earth Environment*.

Honours and awards

- 2019 Grant awarded for a *Short Term Scientific Mission* from the COST action DAMOCLES.
- 2018 Winner of the *Outstanding Student Poster and PICO (OSPP) Award contest of the EGU General Assembly 2018, including a fee waiver for the EGU General Assembly and for a publication in a EGU journal.*
- 2017 Winner of the *SWGEM-Hydro conference young scientist travel support.*
- 2012, 2014 Winner of scholarship for merit *John R. Mott Scholarship Foundation.*
- 2013 Grant. Selected international graduate student for attending the International Spring School on Towards a complete assessment of the impact of solar variability on the Earth's climate (*1st TOSCA training school "Sun2Climate school"*).
- 2006 Participation by invitation in the national stage of the *Olympics of mathematics, Honourable Mention.*
- 2005 Winner at the regional stages of the *Olympics of mathematics.*

Skills

Computer skills

Programming languages: R , IDL, Fortran, C, C++; Bash.

Operating Systems: Linux, Windows.

Geophysical models: FES astronomical tide model, COSMO-CLM (Regional Climate Model).

Languages

Italian (mother tongue), English (fluent), German (conversant), French (basic).

Experience

Teaching

- 02/2020 Supervisor of a group project ("Present and future changes in tropical cyclone translation speeds") undertaken by a group of five master students. University of Reading.
- 09/2019 Trainee at the "Training School on Statistical Modelling of Compound Events" (together with Prof. Carlo De Michele): supervision and organisation of the group project "Model evaluation of bivariate relationships with copulas", undertaken by a group of six among PhD students and early Postdocs.
- 10/2019 Invited lecturer at the "Training School on Statistical Modelling of Compound Events": "Physical processes driving compound flooding (CF) and its future changes".

Memberships

- 2018-present Member and secondary proposer of the funded COST Action "DAMOCLES: UnDerstanding And Modeling cOmpound CLimate and weather EventS", CA17109.
- 2019-present Management committee (MC) member for the United Kingdom in the COST Action "DAMOCLES" (CA17109).
- 2018-2019 Management committee (MC) member substitute for Austria in the COST Action "DAMOCLES" (CA17109).
- 2015-present European Geosciences Union (EGU).
- 2013-2014 Member of the amateur weather association "Cosenza Meteo".

Organisational experience

- 06/2020 Organiser of the workshop "Bottom-up identification of key elements of compound events" funded by the COST Action "DAMOCLES" (CA17109), *Tirana, Albania, June 1-3 2020*.
- 2019-present Manager of the Group Workspace "storycc" on the JASMIN computing infrastructure.
- 2016-2019 Seminar series organiser for the Reloclim group at the Wegener Center for Climate and Global Change.
- 2016-12-15 Moderator of T4Science seminar "How to ask good scientific questions? A panel discussion" at the University of Graz.
- 2012-2014 Seminar series co-organiser for the CuboRisonante group at the Physics Department of the University of Calabria.

Outreach and appearances in media

- 12/2019 "Climate change increases the "perfect storm" coastal flood potential". Published on the Meteorology blog of the University of Reading [Link] .
- 03/2019 Interview with the BBC and the New Scientist.
- 03/2019 Our paper on future changes of compound flooding was largely discussed by the media. [Link to some articles] .
- 03/2019 "Visualizzazione dei cambiamenti climatici, cosa sta succedendo?" Scopriamone di più, calabrianews24.it.

- 03/2019 "Visualizzazione dei cambiamenti climatici, cosa sta succedendo? scopriamone di più. PARTE 2", MeteoCalabria.net.
- 12/2018 "Visualizzazione dei cambiamenti climatici, perchè è importante conoscere questa minaccia? Scopriamone di più. PARTE 1", MeteoCalabria.net.
- 12/2018 "Visualizzazione dei cambiamenti climatici, perchè è importante conoscere questa minaccia?", calabrianews24.it.
- 11/2018 Eguraldia show, EITB TV.

Voluntary work

2013-2015 Student representative at the Physics Department of the University of Calabria.

Conference and workshop presentations

Oral presentations

- 10/2019 **Bevacqua, E.**, "Physical processes driving compound flooding (CF) and its future changes". Climate and Ocean Dynamics (COD) group Seminars, University of Reading.
- 04/2019 Maraun, D., and **Bevacqua, E.**, "Storylines of a future precipitation extreme event - what is the event, what are the storylines, and are they sensible?". Workshop on physical modeling supporting a "storyline approach". Oslo Science Park, Norway.
- 04/2019 **Bevacqua, E.**, Maraun, D., Vousdoukas, M. I., Mentaschi, L., Voukouvalas, E., Zappa, G., and Vrac, M. "Changing compound flood probability at the global scale under anthropogenic climate change". EGU General Assembly 2019, Vienna, Austria.
- 03/2019 **Bevacqua, E.** Assessing the impact caused by compound events, with a focus on the future changes in the compound flooding hazard, Workshop on Compound Events, Paris, France.
- 01/2019 **Bevacqua, E.**, Maraun, D., Vousdoukas, M. I., Voukouvalas, E., Vrac, M., Mentaschi, L., and Widmann, M. "Higher compound flood probability in Europe under anthropogenic climate change". Jour-fixe, University of Graz, Austria.
- 10/2018 **Bevacqua, E.**, Piazza, M., Maraun, D., and Truhetz, H. "An attempt to estimate the climate change effect on the June 2009 Austrian extreme event based on the storyline approach". Annual CORDEX-FPS meeting on Convection over Europe and the Mediterranean, University of Lisbon, Portugal.
- 09/2018 **Bevacqua, E.**. "Multivariate statistical modelling and analysis of compound events". Public PhD defence, University of Graz, Austria.
- 11/2017 **Bevacqua, E.**, Maraun, D., Vousdoukas, M. I., Voukouvalas, E., Vrac, M., Mentaschi, L., and Widmann, M. "Increasing likelihood of compound flooding over northern europe in response to anthropogenic climate change". Compound flood events meeting, European Joint Research Centre, Ispra, Italy (Invited).
- 11/2017 **Bevacqua, E.**, and Maraun, D. "On the link between cyclones and potential compound flooding". Compound flood events meeting, European Joint Research Centre, Ispra, Italy (Invited).

- 09/2017 **Bevacqua, E.**, Maraun, D., Haff, I. H., Widmann, M., and Vrac, M. "Multivariate statistical modelling of compound events via pair-copula constructions: analysis of floods in Ravenna (Italy)". International Workshop on Stochastic Weather Generators for Hydrological Applications (SWGen-Hydro), Berlin, Germany.
- 04/2017 **Bevacqua, E.**, Maraun, D., Haff, I. H., Widmann, M., and Vrac, M. "Multivariate statistical modelling of compound events via pair-copula constructions: analysis of floods in Ravenna (Italy)". EGU General Assembly 2017, Vienna, Austria.
- 04/2017 **Bevacqua, E.**, Maraun, D., Haff, I. H., Widmann, M., and Vrac, M. "The R-package CDVineCopulaConditional for modelling Compound Events". Workshop on Addressing the Challenge of Compound Events, ETH Zurich, Switzerland (Invited).
- 09/2016 **Bevacqua, E.**, Maraun, D., Haff, I. H., Widmann, M., and Vrac, M. "Statistical modeling of compound events via pair-copula constructions: Ravenna flooding case study". Statussymposium "Extremes" 2016: VolkswagenStiftung, Hannover, Germany (Invited).
- 06/2016 **Bevacqua, E.**, Maraun, D., Haff, I. H., Widmann, M., and Vrac, M. "A model based on Pair-Copula Construction to analyze and represent Compound Flooding". The 13th International Meeting on Statistical Climatology, Canmore, Canada.
- Poster presentations**
- 04/2018 **Bevacqua, E.**, Maraun, D., Voudoukas, M. I., Voukouvalas, E., Vrac, M., Mentaschi, L., and Widmann, M. "Changing risk of compound flooding over Europe in response to climate change". EGU General Assembly 2018, Vienna, Austria.
- 09/2017 **Bevacqua, E.**, Maraun, D., Haff, I. H., Widmann, M., and Vrac, M. "The R-package CDVineCopulaConditional for modelling Compound Events". International Workshop on Stochastic Weather Generators for Hydrological Applications (SWGen-Hydro), Berlin, Germany.
- 04/2017 **Bevacqua, E.**, Maraun, D., Voukouvalas, E., Voudoukas, M. I., Widmann, M., Manning, C., and Vrac, M. "Analysis of present and future potential compound flooding risk along the European coast". EGU General Assembly 2017, Vienna, Austria.
- 04/2017 **Bevacqua, E.**, Maraun, D., Voukouvalas, E., Voudoukas, M. I., Widmann, M., Manning, C., and Vrac, M. "Analysis of present and future potential compound flooding risk along the European coast". Workshop on Addressing the Challenge of Compound Events, ETH Zurich, Switzerland (Invited).
- 04/2016 **Bevacqua, E.**, Maraun, D., Haff, I. H., Widmann, M., and Vrac, M. "Statistical Modelling of Compound Floods: a Sensitivity Analysis". EGU General Assembly 2016, Vienna, Austria.
- 04/2016 **Bevacqua, E.**, Maraun, D., Vrac, M., Widmann, M., and Manning, C. "Statistical Modelling of Compound Floods". 17th Austrian Climate Day - "KlimaTag", Graz, Austria (Pitch and Poster).
- 11/2015 **Bevacqua, E.**, Maraun, D., Haff, I. H., Widmann, M., and Vrac, M. "Multivariate Statistical Modelling of Compound Floods". Statistical and mathematical tools for the study of climate extremes, Cargèse, France.

- 08/2015 **Bevacqua, E.**, Maraun, D., Haff, I. H., Widmann, M., and Vrac, M. "Statistical Modelling of Compound Floods". 14th Swiss Climate Summer School - "Extreme Events and Climate", Ascona, Switzerland.
- 03/2013 Alberti, T., **Bevacqua, E.** (presenter), Capparelli, V., Lepreti, F., Vecchio, A., and Carbone, V. "Natural periodicities and North–South hemispheres connection of fast temperature changes during the last glacial period: EPICA and NGRIP revisited". 1st TOSCA training school "Sun2Climate school", Thessaloniki, Greece.

Contributions to presentations

Oral presentations

- 04/2018 Manning, C. (presenter), Widmann, M., **Bevacqua, E.**, Van Loon, A., Maraun, D., and Vrac, M. "Soil Moisture Drought in Europe: A Compound Event of Precipitation and Potential Evapotranspiration on Multiple Timescales". EGU General Assembly 2018, Vienna, Austria.
- 09/2017 Manning, C. (presenter), Widmann, M., **Bevacqua, E.**, Van Loon, A., Maraun, D., and Vrac, M. "A multivariate statistical model describing the compound nature of soil moisture drought". International Workshop on Stochastic Weather Generators for Hydrological Applications (SWGGen-Hydro), Berlin, Germany.
- 04/2015 Alberti, T. (presenter), Lepreti, F., Vecchio, A., **Bevacqua, E.**, Capparelli, V., and Carbone, V. "Natural periodicities and Northern Hemisphere-Southern Hemisphere connection of temperature changes during the last glacial period: EPICA and NGRIP data sets revisited". EGU General Assembly 2015, Vienna, Austria.

Poster presentations

- 04/2017 Manning, C. (presenter), Widmann, M., **Bevacqua, E.**, Maraun, D., Van Loon, A., and Vrac, M. "A Multivariate Statistical Model Describing the Compound Nature of Soil Moisture Drought". EGU General Assembly 2017, Vienna, Austria.
- 04/2017 Manning, C. (presenter), Widmann, M., Maraun, D., Vrac, M., Van Loon, A., and **Bevacqua, E.** "A Multivariate Description of Compound Events of Meteorological Drought and Heat Waves". EGU General Assembly 2017, Vienna, Austria.
- 04/2017 Manning, C. (presenter), Widmann, M., **Bevacqua, E.**, Maraun, D., Van Loon, A., and Vrac, M. "A Multivariate Statistical Model Describing the Compound Nature of Soil Moisture Drought". Workshop on Addressing the Challenge of Compound Events, ETH Zurich, Switzerland.
- 09/2016 Manning, C. (presenter), Widmann, M., Vrac, M., Maraun, D., Van Loon, A., and **Bevacqua, E.** "Soil Moisture Drought as a Compound Event of Meteorological Drought and Heat Waves". Statussymposium "Extremes" 2016: VolkswagenStiftung, Hannover, Germany.
- 08/2016 Manning, C. (presenter), Widmann, M., Vrac, M., Maraun, D., Van Loon, A., and **Bevacqua, E.** "The Relevance of Meteorological Drought and Heat Wave Compound Events to Soil Moisture". 15th International Swiss Climate Summer School: Climate Risks - Coping with Uncertainty, Grindelwald, Switzerland.

- 06/2016 Manning, C. (presenter), Widmann, M., Maraun, D., **Bevacqua, E.**, Van Loon, A., and Vrac, M. "Statistical Modelling of Drought and Heat Wave Compound Events". The 13th International Meeting on Statistical Climatology, Canmore, Canada.
- 04/2016 Manning, C. (presenter), Widmann, M., Vrac, M., Maraun, D., and **Bevacqua, E.** "Multivariate Statistical Modelling of Drought and Heat Wave Events". EGU General Assembly 2016, Vienna, Austria.