CV of Giovanni Baccolo

environmental scientist

I am a specialized environmental scientist with a strong focus on paleoclimatic reconstructions using ice cores and extensive experience in geomorphological studies of glacial and high-elevation environments. My research expertise lies in utilizing Alpine and Polar ice cores to unravel the Earth's past climate, employing innovative techniques that have enabled me to establish new connections between ice core science, paleoclimatology, and planetary sciences.

Beyond ice cores, my research encompasses a keen interest in environmental radioactivity as a tool for tracking surface processes in high-altitude areas, particularly in glacial regions. I am currently studying the radioactive pollution of glaciers and utilizing fallout radionuclides in Alpine soils to trace soil erosion, combining insights from geomorphology and geomorphometry. Additionally, I am exploring the cultural implications of glacier retreat, recognizing the broader societal impacts of climate change.

Currently, I hold a postdoctoral position at the Paul Scherrer Institut in Switzerland, where I am working on the effects of climate change on the preservation of climatic signals in melting mountain glaciers. I had the opportunity to join several field expeditions, spanning from Alpine to Greenlandic glaciers. My commitment has fostered international collaborations with partners in Italy, the United States, the United Kingdom, Japan, and several other European countries.

In addition to research and mentorship, I give value on science communication as an integral part of my academic path. I am actively collaborating with different institutions and media in the context of science communication and maintain a personal blog in Italian dedicated to mountain science and glaciology. I also give talks and seminars to the general public or high-school students, in the contexts of events, festivals or meetings.

Apart from my academic pursuits, I am passionate about mountaineering, alpinism, and history.

Personal information

- ORCID: 0000-0002-1246-8968
- Google Scholar ID: Giovanni Baccolo
- Scopus ID: 55929305200

- Habilitation: I hold the Italian habilitation (since Nov. 2020) as associate professor in Applied Geology, Physics Geography and Geomorphology (04/A3).

Education:

- PhD in Environmental, Geologic and Polar Sciences at the University of Siena (Italy): I defended my PhD thesis on March 3rd 2017, with a thesis entitled: "*Atmospheric mineral dust in ice cores: application of Neutron Activation and Synchrotron Radiation X-ray fluorescence*".

- Bachelor and Master:
  - **BA in Environmental Sciences** obtained at the University Milano-Bicocca on 10/11/2010, thesis title "*Talos Dome Ice Core Drilling Project: Analysis of Aeolian dust in the last glacial period and of its relationship with climate-environmental changes of the Southern Hemisphere*".
  - **MD in Environmental Sciences** obtained at the University Milano-Bicocca on 19/03/2013, thesis title "*Elemental analysis of Antarctic mineral dust: characterization of potential dust sources in the Victoria Land region (Ross Sea sector)*".

Employment history:

- **01/02/2024 - ongoing:** Assistant Professor at the University of Roma Tre (Science Department) in Climate Change and Physical Geography.
- **1/10/2022 - 31/01/2024:** postdoc position at the Paul Scherrer Institute in the ice core research group (Switzerland). I am studying the effect of climate change on the preservation of climatic and environmental paleo-signals in ice cores drilled from melting glaciers.
- **15/04/2022 – 30/09/2022:** postdoc position (*borsa di ricerca*) at the University of Milano-Bicocca (s.s.d. Geo-04). I have been working on environmental radioactivity, investigating its radioecological significance in glacial environments and applying it as a tracer of surficial natural processes.
- **01/02/2018- 31/01/2022:** postdoc position (*assegno di ricerca*) at the University of Milano-Bicocca (s.s.d. Geo-04). I have been working on paleoclimatic reconstructions from polar and continental ice cores and on ice-related geochemistry.

Research products and bibliometrics:

As of January 2024, **I have published 57 papers** in international peer-reviewed journals. In 15 I am the first and corresponding author, 24 papers have been published without my PhD and postdoc supervisors. As of January 2024 I have been cited 1521 times and my H-index is 21 (data from google-scholar). I have personally presented my research with talks and posters at 22 international conferences.

Teaching Assignments

- **Academic year 2023-2024:**
  - course on *Climate Change* for students (bachelor degree) in Natural Sciences and Geology (4 CFU)
  - course for PhD students of Rome Universities on ice cores and paleoclimatology (1 CFU)
  - course for PhD students of Rome Universities on tracking soil erosion with radioactivity (1 CFU)

Invited contributions at meetings and conference:

1. **Invited Talk**: Baccolo, G. (September 2016; Diamond Light Source; Didcot, UK) "X-ray spectroscopy and ice core science: first results and climatic evidences from the Talos Dome ice core (East Antarctica, Ross Sea sector)" *Diamond Light Source User Meeting*.
2. **Invited Talk**: Baccolo, G. (August 2018; University of Plymouth; Plymouth, UK) "Cryoconite: a glacial sponge" *Workshop on fallout radionuclides and anthropogenic contaminants in glacial environments*.
3. **Invited Poster:** Baccolo, G., Azzoni, R.S., Delmonte, B., Di Mauro, B., Franzetti, A., Gaca, P., Lokas, E., Massabò, D., Nastasi, M., Prata, M., Previtali, E., Maggi, V. (April 2019; Wien; Austria) "Cryoconite: a novel environmental monitor for atmospheric deposition?" *General Assembly of the European Geoscience Union*
4. **Invited Talk:** Baccolo, G. "Looking for radioactive contamination in the High Arctic" (February 2023, Wien; Austria) *Arctic Summit Science Week*
5. **Invited Talk:** Baccolo, G. "From Antarctica to Mars: how englacial processes in deep polar ice support the importance of ancient Martian glacialism" (May 2023, Milano, Polar Day workshop organized by the University of Milano-Bicocca)
6. **Invited talk** at the University of Roma3 "A brief glacial odyssey", Rome December 2023. Lesson for PhD students.
7. **Invited talk** at the University of Brescia "Possiamo imparare qualcosa dalle carote di ghiaccio estratte dai ghiacciai temperate? Sembra di sì", Brescia March 2024. Talk given during the final communication event of the ClimADA project.

Analytical and Coding competences:

During my academic path I have been working with the following analytical techniques:

- **Coulter counter** for the quantification of insoluble impurities in ice cores (grain size distribution and concentration)
- **ICP-MS** for the analysis of elemental concentration (in ice core samples and in matrices requiring a chemical pre-treatment, such as acidic dissolution)
- **Instrumental Neutron Activation Analysis**: for the determination of elemental concentration in µg-size samples of mineral dust extracted from ice cores
- **Gamma Spectroscopy** for the analysis of gamma-emitting radionuclides in environmental samples.
- **X-ray fluorescence** for the analysis of major elements in mineral dust extracted from ice cores
- **Synchrotron X-ray Absorption Spectroscopy** for the analysis of oxidation and speciation of selected elements in mineral dust extracted from ice cores.

I have worked with these techniques attending the following international laboratories and facilities: EUROCOLD laboratory of the Milano-Bicocca University (Italy); Laboratory of Applied Nuclear Energy of the University of Pavia (Italy); Atomic Spectrometry Laboratory of the Milano-Bicocca University (Italy); Low Background Radioactivity Laboratory of the Milano-Bicocca University/National Institute for Nuclear Physics (Italy); Diamond Light Source Synchrotron (Rutherford Appleton Laboratory, UK); European Synchrotron Facility (ESRF, France); Institute of Geological and Nuclear Sciences (New Zealand); Institut des Geosciences de l'Environment (France); Ice core laboratory at the Paul Scherrer Institute (Switzerland).

For data analysis, the preparation of graphs and the development of data analysis procedures, I use the following software and languages:

- **Matlab** for the general treatment of data, the application of algorithms and the preparation of graphs.
- **R** for the general treatment of data, the application of algorithms and the preparation of graphs.
- **Phyton:** I have basic knowledge of this language, but it I am progressively switching from Matlab to python.
- **Q-gis/SAGA**: these are the software I use for the analysis, interpretation and curation of spatially distributed data, including geomorphometric analysis and mapping.
- **Conversion models**: I have extended knowledge of the most established conversion models used to convert FRN inventories into soil redistribution rates. In particular I have already applied the MODERN model.

Institutional responsibilities

- **2020-2021:** I have been the representative of postdocs at the Department of Environmental and Earth Sciences of the University of Bicocca.
- **From July 2024:** member of the Orientation committee of the Science Department of University Roma Tre

Approved research projects and funding

- **TALDEEP:** I have been the PI of this project which has been founded by PNRA (Italian Antarctic Research Institute). It was focused on the analysis of the deepest part of the Talos Dome ice core (Antarctica) and on the post-depositional processes that alter the signals preserved in deep Antarctic ice. The project has been funded with 95500 euro. It began in July 2019 and finished in March 2023.
- **RadIce:** I am the PI of this project which has been founded by INTER-ACT (International Network for Terrestrial Research and Monitoring in the Arctic, Horizon2020-EU). I have received 21070 euro to organize and lead a scientific expedition to the Flade Isblink ice cap in Northern Greenland (August 2022). The objective of the project is to collect cryoconite from this major Arctic ice cap and analyse its radioactivity. The other members of the team come from the UK and Poland. The expedition took place in August 2022.
- **JSPS fellowship:** I obtained a fellowship (22000 euro) from the Japan Society for the Promotion of Science to visit for 4 months the ice core laboratory of Prof. Yoshinori Iizuka at the University of Sapporo. Unfortunately, I could not exploit the fellowship because of COVID-19.

Supervision of students:

- **September 2014:** co-supervisor of a MD student (Environmental Sciences, University of Milano-Bicocca), thesis title "Concentration and grain-size of mineral dust in Antarctic ice cores: extension of size interval to the submicron scale". Student: F. Marasci.
- **July 2017:** co-supervisor of a BA student (Geology, University of Milano-Bcocca), thesis title: "Heavy minerals in Alpine glacial sediments: a case study from the Morteratsch glacier (Bernina range)". Student: C. Tentorio.
- **February 2019:** co-supervisor of a MD student (Environmental Sciences, University Milano-Bicocca), thesis title: "Characterization of cryoconite samples from the Forni Glacier (Italian Alps): geochemistry and environmental radioactivity". Student: C. Ghidoni.
- **March 2019:** co-supervisor of a BA student (Environmental Sciences, University of Milano-Bicocca), thesis title: "Construction of mineral dust concentration record from the Antarctic SOLARICE ice core". Student: M. Di Lenardo.
- **May 2020:** co-supervisor of a MD student (Environmental Sciences, University of Milano-Bicocca), thesis title: "Mineral dust in the deepest part of the Talos Dome ice core (East Antarctica)". Student: G. Carrieri.
- **March 2021:** co-supervisor of a MD student (Environmental Sciences, University of Milano-Bicocca), thesis title: "Analysis of particulate atmospheric matter in the RICE ice core (Antarctica) and paleoclimatic reconstruction of the last glacial/interglacial cycle". Student: S. Cerri.
- **March 2021:** co-supervisor of a MD student (Environmental Sciences, University of Milano-Bicocca), thesis title: "Instrumental Neutron Activation Analysis of mineral dust extracted from the Quelccaya ice core (Perù)". Student: G. Ghezzi.
- **April 2021:** co-supervisor of a PhD student (University of Siena), thesis title: "Geochemical characterization of dust from the Talos Dome ice core". Student: E. Di Stefano.
- **September 2021:** co-supervisor of a MD student (Physics Department, University of Milano-Bicocca), thesis title: "Environmental radioactivity measurements of cryoconite samples (glacial sediment)". Student: G. Bianco.
- **March 2022:** co-supervisor of a MD student (Environmental Sciences, University of Milano-Bicocca), thesis title: "Application of environmental radioactivity to study soil sedimentation/erosion in a high Alpine pasture". Student: E. Tarantini.
- **November 2022:** co-supervisor of a MD student (Physics Department, University of Milano-Bicocca), thesis title: "Hyperspectral scanning of a temperate Alpine ice core: an exploratory investigation". Student: D. Fiorini.
- **November 2022:** co-supervisor of a BA student (Environmental Sciences, University of Milano-Bicocca), thesis title: "Evaluating the distribution of FRNs in an Alpine grassland (Dolomites)". Student: S. Bonfanti.

Teaching activities and outreach talks (selected)

- Lecture for PhD students at the University Milano-Bicocca: "The Silurian Hypothesis: perspectives on the history of Earth and human civilization", March 2019.
- Lectures for third age students, I held 3 lessons on climate science and geology to third age students, 2020.
- Lecture for bachelor students (Mountain Sciences) at the Tuscia University: "Alpine glaciers: stories, science and adventures", June 2021.
- Lecture for PhD students, part of a seminar series related to the forthcoming conference on Quaternary Sciences INQUA 2023: "Ice cores: from Antarctic paleoclimate to Mars: A short story about how Antarctic ice helped us to understand the Earth's climate and some extra-terrestrial implications", June 2021.
- Lecture for high-school teachers and mountain guides, held in Agordo (Dolomites): "Geomorphology and glaciology of the Pale di San Martino range", July 2021.
- Talk at the Italian Festival of Literature (Mantua) on Glaciers and Climate Change, September 2021
- Lecture for high-school students (Bottoni scientific High School, Milan): "Stories of glaciers and climate", March 2022.
- Lecture for high-school students (Rosmini scientific High School, Trento): "Science, glaciers and adventures", April 2022.
- Lecture for the glaciological operators of the Lombardy Glaciological Service (Lanzada, Sondrio): "Glaciers and Pollution: a long journey", June 2022.

- Talk at the Italian Festival of Literature (Mantua) on the geologic concept of Anthropocene (September 2022).
- Talk open to the public on Earth Climatology (Milan municipality, March 2023)
- Lecture for high-school students (Bottoni scientific High School, Milan): "Glaciers tell", March 2023.
- Lecture for PhD students (University of Milano-Bicocca): "Cold vs. temperate ice, the effects of climate change on mountain glaciers, June 2023.

Field Activity

- 2012 – Lys Glacier (Monte Rosa, Italian/Swiss Alps): 10 days in a tent camp on the glacier at 4200 m to drill an ice core to bedrock; member of the drilling team.
- 2014 – Lys Glacier (Monte Rosa, Italian/Swiss Alps): 7 days in a tent camp on the glacier at 4200 m to drill an ice core to bedrock; scientific leader.
- 2015-2021 – Multiple expeditions to Alpine glaciers for collecting cryoconite; expedition leader.
- 2021 – Adamello glacier (Italian Alps): 10 days spent on the glacier in a tent camp to drill the longest ice core ever obtained from an Alpine glacier (220 m); scientific leader.
- 2022 – Flade Isblink ice cap (Northeast Greenland): 7 days spent in fully autonomy in the Crown Prince Christian Land peninsula with a PhD student (D. Beard from the University of Plymouth) to collect cryoconite samples from the local ice cap; expedition leader.
- 2023 – Tödi ice cap (Swiss Alps): I was part of a small team (3 persons) to drill two ice cores to bedrock to reconstruct the onset of the neoglaciation during the Early Holocene.

Memberships in panels, boards and individual scientific reviewing activities

- I have completed 55 reviews in international peer review journals. A complete list of my reviewing activity is found here. Among the journals for which I reviewed manuscripts there are Cryosphere, Science Advances, Journal of Glaciology, Environmental Science and Technology, Journal of Geophysical Research, Nature Geoscience.
- I have been guest editor for the special issue entitled "Recent Advances in Cryospheric Sciences", hosted by *Remote Sensing* and *Hydrology*.
- I have been guest editor for the special issue entitled "The Impacts of Atmospheric and Environmental Changes of Urban Cities and Suburbs on The Tibetan Plateau and other northern Hemispheric Cryosphere", hosted by *Frontiers in Environmental Sciences*.
- Member of the scientific panel of the Lombardy Glaciological Service (since December 2023).
- Member of the scientific committee of L'AltraMontagna, a magazine dedicated to mountain and nature culture (since January 2024).

Active memberships in scientific societies, fellowships in renowned academies

I am a member of the following societies and academies, Italian Glaciological Committee, Lombardy Glaciological Society, European Geoscience Union (member of the Cryospheric division and chief editor of the blog dedicated to cryospheric sciences), Italian Geochemical Society, Mountain Wilderness. Since 2019 I am qualified to become an associate professor of Physical Geography and Geomorphology in the Italian higher education system.

Organisation of conferences

- February 2020: Member of the organization committee of the Alpine Glaciological Meeting (Milan, Italy). The event was cancelled because of COVID-19 pandemic.
- April 2022: Convener of the session "Glaciers and Ice Caps under Climate Change" at EGU2022 (Wien, Austria).

Prizes, awards, fellowships

- March 2016: I have received a grant to attend the IPICS conference on ice core science in Hobart. The grant was funded by the EPICA consortium (European Project for Ice Coring in Antarctica) (Hobart, Australia)
- April 2016: Award for the best talk from a young researcher at the International Conference on Radioanalytical and Nuclear Chemistry (Budapest, Hungary).
- October 2018: Third place at the Young Talent contest organized by the Lincei Academy.
- November 2019: Italian Qualification for University Associate Professor in Physical Geography, Geomorphology and Applied Geology.
- October 2020: Third place at the National Outreach Award organized by the Centro Scienza Onlus.
- October 2021: Third place at the Young Talent contest organized by the Lincei Academy.

Major international collaborations

- INFN (National Institute of Nuclear Physics): I am affiliated to INFN since my PhD and collaborate with many of its sections (UNIMIB, Gran Sasso, Roma-Frascati)
- DIAMOND Synchrotron Light Source and ESRF Synchrotron (UK and France): I have performed several experiments at both these facilities in the last 5 years.
- GNS (Institute of Geological and Nuclear Sciences, New Zealand): I have visited the GNS for two months in 2015 for conducting research on Antarctic ice cores
- Institut de Geosciences de l'Environnement (France): I have visited the laboratory of this institute in Grenoble for two weeks for analyzing an Antarctic ice core
- University of Plymouth and Polish Institute of Nuclear physics (UK and Poland): I am collaborating with these institutions in relation to the radioactivity of glacial environments. I have published several papers with researchers and professors from there.
- NASA and Institute for Low Temperature Physics: I am collaborating with these institutions on the geochemistry of deep ice and its implication for planetary sciences.
- Chinese Academy of Science, I am collaborating with prof. Dong to monitor the environmental radioactivity of the glacial basins in the Tibetan Plateau.

Major scientific achievements

- **Development of a new method to explore mineralogy and speciation of Fe in ice core mineral dust**
  I have developed a method based on synchrotron light to determine iron speciation and mineralogy in microgram size samples of dust extracted from Antarctic ice cores. The method is highly innovative in that it has made it possible to geochemically characterise extremely challenging samples, such as mineral dust extracted from Antarctic ice cores, present into ice at concentrations of only a few parts per billion. To make the method fully quantitative, I implemented a linear combination fitting model to reproduce sample X-ray absorption spectra with mineral reference spectra.

- **Foundation of a first link between ice core science and planetary science**
  After having developed the method, I analysed real dust samples from Antarctic ice cores by means of synchrotron X-ray absorption spectroscopy at the UK and European synchrotrons. Data showed that Fe-mineralogy in deep Antarctic ice cores is subject to englacial chemical weathering, promoted by ice metamorphism. To correctly interpret the data, I compared my results with the ones related to Martian geochemistry, identifying a potential link between Antarctic englacial geochemistry and Martian geochemical processes. This result is having important consequences for both the Antarctic and Martian scientific communities.

- **Discovery of cryoconite radioactivity and exploration of its environmental and glaciological significance**
  I have autonomously developed a side-project on the environmental radioactivity of cryoconite, the sediment forming on the melting surface of glaciers. Results were impressive, from the first analyses I conducted it was clear that cryoconite is one of the most radioactive environmental matrices present on the Earth surface. Thanks to this research line, I came in contact with other scientists from UK and Poland, establishing a fruitful collaboration. Our studies have deeply changed the perception of environmental radioactivity in glacial environments, which is now starting to be accurately investigated. I am one of the main contributors to this emerging research field which links glaciology, environmental sciences, applied physics and the study of radioactivity.

Giovanni Baccolo: research output list

1. Publications in peer-reviewed scientific journals:

1. Baccolo, G., Baroni, C., Clemenza, M., Delmonte, B., Maggi, V., Motta, A., Nastasi, M., Previtali, E. Salvatore, M.C. "Neutron activation analysis on sediments from Victoria Land, Antarctica: multi-elemental characterization of potential atmospheric dust sources" *Journal of Radioanalytical and Nuclear Chemistry* **299**:1615-1623, DOI: 10.1007/s10967-013-2851-x, 2014.
2. Baccolo, G., Clemenza, M., Delmonte, B., Maffezzoli, N., Nastasi, M., Previtali, E., Maggi, V. "Assessing the geochemical fingerprint of the 2010 Eyjafjallajokull tephra through instrumental neutron activation analysis: a trace element approach" *Journal of Radioanalytical and Nuclear Chemistry* **306**:429-435, DOI: 10.1007/s10967-015-4092-7, 2015.
3. Baccolo, G., Maffezzoli, N., Clemenza, M., Delmonte, B., Prata, M., Salvini, A., Maggi, V., Previtali, E. "Low-background neutron activaion analysis: a powerful tool for atmospheric mineral dust analysis in ice cores" *Journal of Radioanalytical and Nuclear Chemistry* **306**:589-597, DOI: 10.1007/s10967-015-4206-2, 2015.
4. Baccolo, G. "Tantalizing tantalum" *Nature Chemistry* **7**:854-854, DOI: 10.1038/nchem.2350, 2015.
5. Di Mauro, B., Fava, F., Ferrero, L., Garzonio, R., Baccolo, G., Delmonte, B., Colombo, R. "Mineral dust impact on snow radiative properties in the European Alps combining ground, UAV and satellite observations" *Journal of Geophysical Research Atmosphere* **120**: 6080-6097, DOI: 10.1002/2015JD023287, 2015.
6. Potenza, M.A.C., Albani, S., Delmonte, B., Villa, S., Sanvito, T., Paroli, B., Baccolo, G., Mahowald, N., Maggi, V "Shape and size constraints on dust optical properties from the Dome C ice core, Antarctica" *Scientific Reports* **6**:28162, DOI: 10.1038/srep28162, 2016.
7. Baccolo, G., Clemenza, M., Delmonte, B., Maffezzoli, N., Nastasi, M., Previtali, E., Maggi, V. "A new method based on low background instrumental neutron activation analysis for major, trace and ultra-trace element determination in atmospheric mineral dust from polar ice cores" *Analytica Chimica Acta* **922**:11-18, DOI: 10.1016/j.aca.2016.04.008, 2016.
8. FAMU collaboration "Steps toward the hyperfine splitting measurement of the muonic hydrogen ground state: pulsed muon beam and detection system characterization" *Journal of Instrumentation* **11**:P05007, DOI: 10.1088/1748-0221/11/05/P05007, 2016.
9. Clemenza, M., Contini, A., Baccolo, G., di Vacri M.L., Ferrante, M., Nisi, S., Carpinelli, M., Cremonesi, O., Enzo, S., Fiorini, E., Mulas, G., Prata, M., Previtali, E., Salvini, A., Sipala, V. "Development of a multi-analytical approach for the characterization of ancient Roman lead ingots" *Journal of Radioanalytical and Nuclear Chemistry* **311**:1495-1501, DOI: 10.1007/s10967-016-5040-x, 2016.
10. Aarons, S., Aciego, S.M., Arendt, C.A., Blakowski, M.A., Steigmeyer, A., Gabrielli, P., Sierra-Hernandez, M.R., Beaudon, E., Delmonte, B., Baccolo, G., May, N.W., Pratt, K.A. "Dust composition changes from Taylor Dome Glacier (East Antarctica) during the last glacial-interglacial transition: a multi-proxy approach" *Quaternary Science Reviews* **162**:60-71, DOI: 10.1016/j.quascirev.2017.03.011, 2017.
11. Caiazzo, L., Baccolo, G., Barbante, C., Becagli, S., Bertò, M., Ciardini, V., Crotti, I., Delmonte, B., Dreossi, G., Frezzotti, M., Gabrieli, J., Giardi, F., Han, Y., Hong, S.B., Hur, S.D., Hwang, H., Jang, J.H., Narcisi, B., Proposito, M., Scarchilli, C., Selmo, E., Severi, M., Spolaor, A., Stenni, B., Traversi, R., Udisti, R. "Prominent features in isotopic, chemical and dust stratigraphies from coastal East Antarctica ice sheet (Eastern Wilkes Land)" *Chemosphere* **176**: 272-287, DOI: 10.1016/j.chemosphere.2017.02.115, 2017
12. Delmonte, B., Paleari, C.I., Andò, S., Garzanti, E., Andersson, P.S., Petit, J.R., Crosta, X., Narcisi, B., Baroni, C., Salvatore, M.C., Baccolo, G., Maggi, V. (2017). Causes of dust size variability in central East Antarctica (Dome B): atmospheric transport from expanded South American sources during marine isotopic stage 2. *Quaternary Science Reviews* **168**:55-68, DOI: 10.1016/j.quascirev.2017.05.009, 2017.
13. Potenza, M.A.C., Cremonesi, L., Delmonte, B., Sanvito, T., Paroli, B., Pullia, A., Baccolo, G., Maggi, V. "Single particle extinction and scattering allows detection and characterization of aggregates of aeolian dust grains in ice cores" *Earth and Space Chemistry* **1**:261-269, DOI: 10.1021/acsearthspacechem.7b00018, 2017.

14. Baccolo, G., Di Mauro, B., Massabò, D., Clemenza, M., Nastasi, M., Delmonte, B., Prata, M., Prati, P., Previtali, E., Maggi, V. "Cryoconite as a temporary sink for anthropogenic species stored in glaciers" *Scientific Reports* **7**:9623 DOI: 10.1038/s41598-017-10220-5, 2017.
15. Di Mauro, B., Baccolo, G., Garzonio, R., Giardino, C., Massabò, D., Piazzalunga, A., Rossini, M., Colombo, R. "Impact of impurities and cryoconite on the optical properties of the Morteratsch Glacier (Swiss Alps)" *Cryosphere* **11**:2393-2409, DOI: 10.5194/tc-11-2393-2017, 2017.
16. Rossini, M., Di Mauro, B., Garzonio, R., Baccolo, G., Cavallini, G., Mattavelli, M., De Amicis, M., Colombo, R. "Rapid melting dynamics of an Alpine glacier with repeated UAV photogrammetry" *Geomorphology* **304**:159-172, DOI: 10.1016/j.geomorph.2017.12.039, 2018.
17. FAMU collaboration "First FAMU observation of muon transfer from μp atoms to higher-Z elements" *Journal of Instrumentation* **13**:P02019 DOI: 10.1088/1748-0221/13/02/P02019, 2018.
18. RICE Collaboration "The Ross Sea Dipole – Temperature, Snow Accumulation and Sea Ice Variability in the Ross Sea Region, Antarctica, over the Past 2,700 Years" *Climate of the Past* **14**:193-214, DOI: 10.5194/cp-14-193-2018, 2018.
19. Simonsen, M.F., Cremonesi, L., Baccolo, G., Bosch, S., Delmonte, B., Erhardt, T., Kjaer, H.A., Potenza, M., Svensson, A., Vallelonga, P. "Particle shape accounts for instrumental discrepancy in ice core dust size distributions" *Climate of the Past* **14**:601-608, DOI: 10.5194/cp-14-601-2018, 2018.
20. Macis, S., Cibin, G., Maggi, V., Baccolo, G., Hampai, D., Delmonte, B., D'Elia, A., Marcelli, A. "Microdrop Deposition Technique: Preparation and Characterization of Diluted Suspended Particulate Samples" *Condensed Matter* **3**:21, DOI: 10.3390/condmat3030021, 2018.
21. Baccolo, G., Cibin, G., Delmonte, B., Hampai, D., Marcelli, A., Di Stefano, E., Macis, S., Maggi, V. "The Contribution of Synchrotron Light for the Characterization of Atmospheric Mineral Dust in Deep Ice Cores: Preliminary Results from the Talos Dome Ice Core (East Antarctica)" *Condensed Matter* **3**: 25, DOI: 10.3390/condmat3030025, 2018.
22. Baccolo, G., Delmonte, B., Albani, S., Baroni, C., Cibin, G., Frezzotti, M., Hampai, D., Marcelli, A., Revel, M., Salvatore, M.C., Stenni, B., Maggi, V. "Regionalization of the Atmospheric Dust Cycle on the Periphery of the East Antarctic Ice Sheet Since the Last Glacial Maximum" *Geochemistry Geophysics Geosystems* **19**: 3540-3554, DOI: 10.1029/2018GC007658, 2018.
23. FAMU collaboration "FAMU: study of the energy dependent transfer rate Λ μp → μO. Journal of Physics: Conference Series **1138**:012017, DOI: 10.1088/1742-6596/1138/1/012017, 2018.
24. Maggi, V., Baccolo, G., Cibin, G., Delmonte, B., Hampai, D., Marcelli, A. "XANES Iron Geochemistry in the Mineral Dust of the Talos Dome Ice Core (Antarctica) and the Southern Hemisphere Potential Source Areas" *Condensed Matter* **3**:45, DOI: 10.3390/condmat3040045, 2018.
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58. Di Stefano, E., Baccolo, G., Clemenza, M., Delmonte, B., Fiorini, D., Garzonio, R., Schwikowkski, M., Maggi, V. "Temporal markers in a temperate ice core: insights from H and Cs profiles from the Adamello Glacier" *Cryosphere* **18**:2865-2874, DOI: 10.5194/tc-18-2865-2024, 2024.

2. Contributions to books

1. Di Mauro, B., Garzonio, R., Baccolo, G., Gilardoni, S., Rossini, M., Colombo, R. "Light-Absorbing Particles in Snow and Ice: A Brief Journey Across Latitudes" in *Springer Series in Light Scattering*, **Volume 7**:Light Absorption and Scattering in Turbid Media, Springer, 2021.

3. Contributions to conferences (I have only included contributions presented by myself)

1. Poster: Baccolo, G., Baroni, C., Clemenza, M., Delmonte, B., Maggi, V., Motta, A., Nastasi, M., Previtali, E., Salvatore, M.C. "Elemental Characterization of potential atmospheric dust sources of Victoria land (antarctica, ross sea sector) by neutron activation" DUST international conference (June 2014), Taranto, Italia.
2. Poster: Baccolo, G., Clemenza, M., Delmonte, B., Maffezzoli, N., Maggi, V., Previtali, E. "Application of Instrumental Neutron Activation Analysis on ice core samples" International Nuclear Chemistry Congress (September 2014), Maresias, Brazil. 2nd place at the competition for the best poster from a young researcher.
3. Poster: Baccolo, G., Delmonte, B., Clemenza, M., Previtali, E., Maggi, V. "A new method for geochemical characterization of atmospheric mineral dust from polar ice cores: preliminary results from Talos Dome ice core (East Antarctica, Pacific-Ross Sea sector)" EGU (April 2015), Wien, Austria.
4. Poster: Baccolo, G., Delmonte, B., Cibin, G., Clemenza, M., Hampai, D., Marcelli A., Previtali, E., Maggi, V. "New insights from neutron activation analysis and synchrotron X-ray fluorescence and absorption spectroscopy on aeolian dust from the Talos Dome ice core (East Antarctica, Ross Sea Sector)" International Partnership in Ice Core Science (March 2016), Hobart, Australia
5. Invited talk: Baccolo, G. "X-ray spectroscopy and ice core science: first results and climatic evidences from the Talos Dome ice core (East Antarctica, Ross Sea sector)" Diamond Light Source User Meeting (September 2016), Didcot, UK.
6. Poster: Baccolo, G., Capitelli, B., Clemenza, M., Delmonte, B., Magarini, R., Montanaro, G., Riscassi, R. "Soluble and insoluble elemental content in Antarctic ice cores: new advances using a new generation ICP-MS" European Mineralogical Conference (September 2016), Rimini, Italia.
7. Talk: Baccolo, G., Clemenza, M., Delmonte, B., Nastasi, M., Previtali, E., Maggi, V. "Instrumental neutron activation analysis applied to ice cores" International Conference on Radioanalytical and Nuclear Chemistry (April 2016), Budapest, Hungary. Award for the best talk from a young researcher.
8. Poster: Baccolo, G., Di Mauro, B., Clemenza, M., Nastasi, M., Delmonte, B., Previtali, E., Maggi, V. "Cryoconite composition: radioecological and geochemical perspectives" Alpine Glaciology Meeting (February 2017), Zurich, Switzerland.
9. Talk: Baccolo, G., Cibin, G., Clemenza, M., Delmonte, B., Di Mauro, B., Hampai, D., Marcelli, A., Nastasi, M., Previtali, E., Maggi, V. "A comprehensive geochemical characterization of atmospheric dust and impurities in snow and ice from past and recent times: Antarctic and Alpine perspectives" Workshop: Aerosols in snow and ice: markers of environmental pollution and climate changes. European and Asian perspectives (September 2017), Roma, Italia.
10. Poster: Baccolo, G., Delmonte, B., Cibin, G., Clemenza, M., Hampai, D., Marcelli, A., Nastasi, M., Previtali, E., Maggi, V. "New results from the mineral dust record of the TALDICE ice core" Polar 2018 – Scientific Committee on Antarctic Research (June 2018), Davos, Switzerland.
11. Invited talk: Baccolo, G. "Cryoconite: a glacial sponge" Workshop on fallout radionuclides and anthropogenic contaminants in glacial environments (August 2018), Plymouth, UK.
12. Invited poster: Baccolo, G., Azzoni, R.S., Delmonte, B., Di Mauro, B., Franzetti, A., Gaca, P., Lokas, E., Massabò, D., Nastasi, M., Prata, M., Previtali, E., Maggi, V. "Cryoconite: a novel environmental monitor for atmospheric deposition?" EGU (April 2019), Wien, Austria.
13. Poster: Baccolo, G., Varotto, M., Taufer, G. "Can we learn something from extinct glaciers? On the trails of the pioneer of glaciology Bruno Castiglioni in the Pale di San Martino range (Dolomites, Italy)" Alpine Glaciology Meeting (February 2020), Milano, Italia. Cancelled because of COVID-19.
14. Talk: Baccolo, G., Lokas, E., Delmonte, B., Gaca, P., Massabò, D., Nastasi, M., Previtali, E., Maggi, V. "Cryoconite: a novel monitor for artificial and natural radionuclides in glacial environments" International Conference on radionuclide metrology – Low level radioactivity measurements and techniques (May 2020), L'Aquila, Italia. Cancelled because of COVID-19.
15. Talk: Baccolo, G., Delmonte, B., Niles, P.B., Cibin, G., Di Steafno, E., Hampai, E., Keller, L., Maggi, V., Marcelli, A., Michalski, J., Sneda, C., Frezzotti, M. "Jarosite in Antarctic deep ice supports the ice-weathering model for jarosite formation on Mars" EGU (April 2019), virtual.
16. Talk: Baccolo, G., Niles, P.B., Delmonte, B., Cibin, G., Di Stefano, E., Hampai, D., Keller, L., Maggi, M., Marcelli, A., Michalski, J., Snead, C., Frezzotti, M. "Acidic brines in deep antarctic ice promote the

englacial precipitation of jarosite and supports the ice weathering model for jarosite formation on mars" Modern Brines (October 2021), virtual.
17. Talk: Baccolo, G., Varotto, M. "Mountains with no ice: deciphering the disappearance of glaciers in a renowned mountain range, the Dolomite case (Eastern Alps)" EGU (May 2022), Wien, Austria.
18. Invited talk: Baccolo, G. "Looking for radioactive contamination in the High Arctic" Arctic Summit Science Week (February 2023), Wien, Austria.
19. Invited talk: Baccolo, G. "From Antarctica to Mars: how englacial processes in deep polar ice support the importance of ancient Martian glacialism in shaping the surface mineralogy of the Red Planet" (May 2023, Milano, Polar Day workshop organized by the University of Milano-Bicocca)
20. Talk: Baccolo, G. "Uncovering cryoconite: the radioactive legacy of glaciers" (September 2023, The Geoscience Paradigm, Potenza)
21. Talk: Baccolo, G.: "Can we learn something from ice cores drilled at temperate glaciers? Apparently yes" (November 2023, Mendrisio, Swiss Geoscience Meeting).
22. Talk: Baccolo, G. "Is temperate ice a good paleoclimatic archive? Insights from the Adamello temperate ice core (Italian Alps)" (April 2024, European Geoscience Meeting, Wien, Austria)

4. Outreach activities

1. I am a regular author and one of the two chief (since February 2021) editors (since February 2021) of the EGU blog dedicated to Cryospheric sciences. Here my contributions to the blog:
   1.1. "The gaze of the ice cap", January 2023.
   1.2. "Summer 2022: A perfect storm for Alpine glaciers", July 2022.
   1.3. "With ice we are also losing a piece of our cultural heritage: a glaciologist's perspective", November 2021.
   1.4. "Did you know about artificial glaciers?", August 2021.
   1.5. "Did you know about regenerated glaciers?", October 2020.
   1.6. "Did you know… the surface of melting glaciers is one of the most radioactive places on Earth?", May 2020.
2. I have a personal blog (in Italian, StorieMinerali), mostly dedicated to the communication of science conducted in glacial and high-elevation environments. It is visited on average by 1200 people per month and is supported by social media account that I personally manage.
3. Talk for the public at the outreach event held in Padua during the Research Night: "On the trails of Bruno Castiglioni among the glaciers of the Pale di San Martino, September 2017.
4. Talk for the public during an outreach event dedicated to climate sciences at the University of Milano-Bicocca: "Snow Ball Earth – global glaciations: myth or reality?", February 2019.
5. Lesson for PhD students at the University Milano-Bicocca: "The Silurian Hypothesis: perspectives on the history of Earth and human civilization", March 2019.
6. Meetings and talks with high school students during the screening of the movie-documentary Anthropocene, 2019-2020.
7. Talk for the public at the Italian festival dedicated to outreach and dissemination from young researchers, I presented a talk (3rd place) entitled: "What glaciers do (not) tell: the guardians of environmental radioactivity" (here the video-registration, in Italian), October 2020.
8. Lessons for third age students, I held 3 lessons on climate science and geology to third age students, 2020.
9. Article in a science magazine (in Italian): "Glaciers and radiaoctivity: a strange couple" Sapere, n. febbraio/gennaio 2021:28-33, DOI: 10.12919/sapere.2021.01.4, 2021.
10. Book dedicated to pioneering glaciological studies in the Dolomites (in Italian): "Small Alpine glaciers: on the trails of Bruno Castiglioni among the Pale di San Martino", Cierre Edizioni, January 2021.
11. Article in the Annual Review of the Diamond Synchrotron: "Analyzing deep Antarctic ice to understand a Martian mineral", May 2021.
12. Lesson for bachelor students (Mountain Sciences) at the Tuscia University: "Alpine glaciers: stories, science and adventures", June 2021.
13. Lesson for PhD students, part of a seminar series related to the forthcoming conference on Quaternary Sciences INQUA 2023: "Ice cores: from Antarctic paleoclimate to Mars: A short story

about how Antarctic ice helped us to understand the Earth's climate and some extra-terrestrial implications", June 2021.
14. Lesson for high-school teachers and mountain guides, held in Agordo (Dolomites): "Geomorphology and glaciology of the Pale di San Martino range", July 2021.
15. Personal blog dedicated to mountain geography and glaciology (in Italian): "Storie Minerali"
16. Talk for the public at the Italian Festival of Literature (Mantua): "What glaciers do (not) say", September 2021.
17. Lesson for high-school students (Bottoni scientific High School, Milan): "Stories of glaciers and climate", March 2022.
18. Lesson for high-school students (Rosmini scientific High School, Trento): "Science, glaciers and adventures", April 2022.
19. Lesson for the new glaciological operators of the Lombardy Glaciological Service (Lanzada, Sondrio): "Glaciers and Pollution: a long journey", June 2022.
20. Lesson for high-school students (Rosmini scientific High School, Trento): "Science, glaciers and adventures", February 2023.
21. Talk open to the public on Earth Climatology (Milan municipality, March 2023)
22. Lecture for high-school students (Bottoni scientific High School, Milan): "Glaciers tell", March 2023.
23. Invited talk at the 2023 Trento Film Festival (National Event on Mountain Culture) titled "I ghiacciai, sentinelle del clima, tra scienza e filosofia" (Trento, April 2023)
24. Article published in Le Science magazine (May issue) on the current decline of Alpine glaciers, title "La ritirata dei ghiacciai Alpini"
25. Article published on Repubblica (April 2023) about the decline of Alpine glaciers, title: "Cambiamenti climatici, il caldo fonde il cuore profondo dei ghiacciai"
26. I have been commissioned by the Italian Alpine Club (since May 2023) to write science communication articles on Glaciology, Mountain Science and Climatology for its online magazine Lo Scarpone, up to now I have published the following articles:
    26.1. Il nuovo, grande, crepaccio sul Breithorn occidentale
    26.2. Il ghiaccio più antico della Terra
27. Article published on Il Dolomiti: Quella misteriosa foschia che è comparsa sulle nostre montagne, dalle Alpi Occidentali a quelle Orientali: ecco qual è la ragione, October 2023.
28. Public talk at the event "Scienza in paese", title: "What do we learn from glaciers?" (Brescia, October 2023).
29. Public talk on Climate Change "Il cambiamento climatico tra tempo geologico e tempo umano" (Bottoni High School, Milan), April 2024.
30. Lecture for secondary-school students (ICI Bellano, LC): "*I ghiacciai raccontano*", May 2023.
31. Collaboration with the online magazine L'Altra Montagna and creation of communication science contents on the topics of climate change and glaciology. Published contributions:
    31.1. CORSI E RICORSI CLIMATICI: PERCHÉ IL CAMBIAMENTO CLIMATICO NON FA PARTE DI UN CICLO
    31.2. L'AUMENTO DELLA TEMPERATURA CANCELLA LE STORIE CLIMATICHE CONSERVATE NEL GHIACCIO
    31.3. CAMBIAMENTO CLIMATICO ALL'ENNESIMA POTENZA: IL 2023 L'ANNO PIÙ CALDO MAI REGISTRATO
    31.4. SE GEOLOGICAMENTE NON SIAMO NELL'ANTROPOCENE, PERCHÈ NON SIAMO PRONTI A RICONOSCERE CON UN NOME UFFICIALE I NOSTRI IMPATTI?
    31.5. CON I GHIACCIAI VENEZUELANI SCOMPAIONO ANCHE IMPORTANTI STORIE DI ALPINISMO

5. General contributions to science

1. I am the PI of a project about the geochemical characterization of the deepest part of an Antarctic ice core (Talos Dome ice core, TALDEEP project). I have received a 95,500 euro grant from PNRA (Italian Antarctic Research Institute)
2. I have received 21070 euro from the International Network for Terrestrial Research and Monitoring in the Arctic, to conduct a field expedition at the Flade Isblink ice cap (Northern Greenland). The expedition is planned for summer 2022.
3. I have received a postdoctoral fellowship from the Japan Society for the Promotion of Science to attend the laboratory for ice core analyses of Dr. Yoshinori Iizuka in Sapporo, at the Institute for

Low Temperature Sciences. My visit in Sapporo was planned for the first part of 2021 but it was cancelled because of the COVID-19 pandemic.

4. I have conducted several expeditions to Alpine glaciers for sampling cryoconite and participated to ice core drilling campaigns in the Monta Rosa and Adamello ranges.

6. Submitted but not yet accepted/published publications.

1. Securo, A. Del Gobbo, C., Baccolo, G., Barbante, C., Citterio, M., De bLasi, F., Marcer, M., Valt, M., Colucci, R.R. "The Glaciers of the Dolomites: last 40 years of melting" under consideration in *Cryosphere*.

2. Beard, D., Baccolo, G., Clason, C., Millward, G.E., Lokas, E., Rangecroft, S., Sala, D., Wachniew, P., Blake, W. " Accumulation of environmental radioactivity on the surface of a High Arctic ice cap (Flade Isblink, NE Greenland)" under consideration in *Communications Earth and Environment*.

3. Lokas, E., Baccolo, G., Cwanek, A., Buda, J., Koltonik, K., Takeuchi, N., Wachniew, P., Clason, C., Zawierucha, K., Beard, D., Ambrosini, R., Pittino, F., Franzetti, A., Owens, P., Nastasi, M., Sisti, M., Di Mauro, B. "Isotopic signature of plutonium accumulated in glaciers worldwide" under review in *Science of the Total Environment.*

7. Unpublished work

1. Baccolo, G., PhD thesis: "Atmospheric mineral dust in ice cores: application of Neutron Activation and Synchrotron Radiation X-ray fluorescence", 2017.
2. Baccolo, G., Baroni, C., Salvatore, M.C. "No more ice in the Dolomites (Eastern Alps): deciphering the disappearance of glaciers in a renowned mountain range" *in preparation*.
3. Baccolo, G., Schwikowksi, M. "What can we learn from temperate glaciers? Is it reasonable to drill melting glaciers?" *in preparation*
4. Baccolo, G., Schwikowksi, M., Maggi, V., Bohleber, P. "The effect of self-purification of temperate ice on the preservation of climatic signals in mountain glaciers" *in preparation*

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