CURRICULUM VITAE

Monica Barbero

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1 Present position

Associate professor of Geotechnics

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2 Education

1987 Graduated in Civil Engineering at Politecnico di Torino.

1987 State exam to be licensed as a practising engineer.

1992 Ph.D. in Geotechnics at Politecnico di Torino. Title of thesis: “Mechanical shear behaviour of rock discontinuities subjected to dynamic loads”.

3 Teaching activities

Master of Science’s courses

- Politecnico di Torino:

2018 – present: holder of the chair of “Analysis and design of geotechnical structures and earthworks”

2016 – present: holder of the chair of “Geotechnics” - Civil Engineering Turin Polytechnic University in Tashkent (Uzbekistan)

2012 – present: holder of the chair of “Slope stability and retaining structures”

2011: teacher at the course “Numerical methods in geotechnical engineering”

2003 – 2011: holder of the course “Slope stability”, II Faculty of Engineering

2004 – 2006: holder of the course “Rock mechanics”, I Faculty of Engineering – branch seat of Alessandria 2003: holder of the course “Rock mechanics A”, I Faculty of Engineering 1998 – present: teacher at the course “Rock mechanics”

II level Master Courses teaching activities

- Politecnico di Milano:

2017: teacher at Master in “Tunnel Engineering”. Title of the lecture “"Rock and rock mass characterization"

- Politecnico di Torino:

2013 – present: vice-coordinator of Master in “Tunnelling and Tunnel Boring Machines”

2013 – present: holder of the course “Tunnel supports”, Master in “Tunnelling and Tunnel Boring Machines”

2008, 2010, 2012, 2014, 2016, 2018: teacher at Master in “Tunnelling and Tunnel Boring Machines”. Title of the course “Outlines of rock mechanics”.

- Università di Udine:

2009, 2010, 2012: teacher at Master in "Analysis, evaluation and mitigation of hydrogeological risk". Title of the courses: “Outlines of rock mechanics”, “Rock slope stability analysis”, “Stabilization and defence works for unstable rock slopes”. 2011: lecturer at Master in "Analysis, evaluation and mitigation of hydrogeological risk". Title of the lecture: “Some techniques for landslide risk analysis”

Other teaching activities

2015, 2016: teacher at the PhD course “Rockfall defence works”, Politecnico di Torino

2016: coordinator, scientific manager and teacher at the course “Rock slope stability” within the training course “Estabilidad de pendientes de rocas” , organized by ANAS International Enterprise S.p.A. and the Servicio Nacional De Aprendizaje (SENA), national board ascribed to Ministry of Work of the Republic of Colombia, Bogotà, Colombia.

2014: coordinator and teacher at the course “Study and design of rockfall risk mitigation works” for the Regione Autonoma Valle d'Aosta

2013: coordinator and teacher at the course “Rock slope stability”, within the training course “Defence of roads from natural hazards” organized by ANAS (National Board for Roads), Roma.

2012: co-coordinator and teacher at the course “Rockfall defence works” within the training course “Defence of roads from natural hazards” organized by ANAS (National Board for Roads), Roma.

2008, 2010, 2011 and 2013: teacher at the course “Rockfall defence works: Design and regulatory aspects”, organized by GEAM (Georesources and Environment Society)

Tutor of:

- PhD in Environmental Engineering: 1 student (from 2013 to 2017) – Politecnico di Torino

- PhD in Civil and Environmental Engineering: 1 student (from 2016 to present) – Politecnico di Torino

- II level Master in “Tunnelling and Tunnel Boring Machines” stage and thesis: 10 students (from 2011 to present) - Politecnico di Torino

- Master of Science's thesis in Civil Engineering, Building Engineering, Environmental Engineering: more than150 students (from 1998 to present) – Politecnico di Torino

- Bachelor's thesis in Civil Engineering and Building Engineering: 62 students (from 2003 to present) – Politecnico di Torino

- Master of Science's stages in Companies.

Co-tutor of:

- PhD in Environment and Territory: 2 student (from 2012 to 2016) – Politecnico di Torino

4 Research

In the following some of the main research topics are very briefly described. The research activity produced, at present, 96 publications on national and international Journals and Congresses.

4.1 Mechanical behaviour of natural and artificial interfaces in rock.

This topic has been studied mainly during the PhD activity. The aim of the research was to contribute to the understanding of the shear behaviour of rock discontinuities subjected to static and dynamic loads. One of the main products of the activity was the design, construction and calibration of a device for performing direct shear tests on rock discontinuities, both in static and dynamic conditions. A huge number of tests were performed on natural and artificial rock discontinuities by applying an impulsive shear load. The results allowed to draw interesting conclusions on the effects of impulsive loads on rock discontinuities. The thermal effects induced on rock discontinuities by an earthquake were also analysed.

4.2 Slope stability.

These research topics can be summarized as follows:

- Numerical slope stability analyses in static and dynamic conditions

- Interaction between slopes and infrastructures (tunnels, dams, viaducts)

- Rockfall stability analyses and related problems

- Design and calibration of a retaining work prototype for soil slopes, constituted of a combination of a steel frame and logs of wood

- Instrumentation and monitoring of a debris flow barrier in order to study the effects of the impact of a debris flow event on a defence structure

- Landslide hazard, vulnerability and risk analysis procedures, with particular reference to rockfall. Small and large scales have been considered. The procedures have been applied to different case studies

- Snow avalanches hazard and risk analysis.

4.3 Complex rock mass formations.

The rock mass complex formations are studied by means of experimental and numerical approaches. At present, bimrock (block in matrix rocks) formations have been analysed with the aim to understand their mechanical behaviour. Also the engineering implications of this complex type of rock mass on some usual geotechnical problems (slope stability, tunnelling, etc.) have been studied. In laboratory a reconstituted material was tested, characterized by the geometrical and mechanical peculiarities of bimrocks. Numerically,2D and 3D analyses were used to model the experimental results. Also, a stochastic approach was used to model a slope in bimrock, by means of numerical analysis. This research topic is going on and a PhD, whose the writer is tutor, is devoted to the study of complex formations.

4.4 Snow avalanches and defence works.

These research topics can be summarized as follows.

- Design and realization of a test site in Aosta Valley, Monterosa Sky Area, equipped with a structural instrumented obstacle, specially designed and constructed in order to measure the state of stress induced in the structure by the impact of both natural and artificially detached snow avalanches

- Design, construction and set up of a portable shear box to perform direct shear tests on snow, both in laboratory and in situ.

- Study of the mechanical characteristics of snow by means of experimental tests in cold room on natural snow samples, performed by using the new shear device for direct shear tests on snow.

- Design and installation of monitoring instruments on a snow barrier (umbrella) in Valsavaranche (Aosta Valley), with the aim to analyse the effects of snow gliding on the umbrella; monitoring during the winter season, elaboration and interpretation of the measures. Development of a theoretical model to correct the measured data, to take into account the transducers stiffness and its influence on the measures.

4.4 Seismic analysis of dams This research activity is related to seismic analysis for dam safety, estimation of seismic hazards, analysis of expected performance during earthquakes, two and three dimensional finite element modelling and constitutive modelling of materials.

4.5 Tailings characterization Quarry and mine waste disposals have been studied by means of experimental and numerical approaches. In particular, the research was focused on: - stability analysis of marble quarries waste disposals, with reference to Carrara sites - experimental mechanical and hydraulic characterization of tailings in undrained conditions. The last topic has been mainly studied by a PhD student whose the writer is tutor.

5 Projects

5.1 Research Project (principal investigator)

2019: TTPU-GYM Teaching Experimentations, funded by Politecnico di Torino

2015: Stability of existing dams under seismic conditions, funded by IREN Energia.

2016: Stability of existing dams under seismic conditions, funded by IREN Energia.

2016 – present: Interpretation of Cassas landslide monitoring data, funded by Musinet Engineering S.p.A.

5.2 Research Projects (participant or coordinator of work groups)

2016-2018: Risk Evaluation Dashboard, funded by Regione Autonoma Valle d'Aosta

2014-2015: Rockfall risk scenarios, funded by Regione Autonoma Valle d'Aosta.

2012-2014: Monitoring for the Avalanche Prevision, Prediction and Protection, funded by Regione Autonoma Valle d'Aosta. Within European territorial cooperation – Italy-France Programme (Alps) 2007/2013 – ALCOTRA

2012: Studies for the construction of deep fencing by means of diaphragm walls, funded by Trevi S.p.A.

2011-2012: Study of the water flow in the deep levels of Cogne mine, funded by Regione Autonoma Valle d'Aosta.

2011: Studies on innovative works for the stabilization of soil slopes, funded by PMP S.r.l.

2011: Monitoring system for the debris flow barriers located in Pèrriere-Bois de Sapé, along the Grand Valey torrent, in Saint-Vincent town, funded by Regione Autonoma Valle d'Aosta.

2009-2012: Safety management of transboundary mountain territory, funded by Regione Autonoma Valle d'Aosta. Within European territorial cooperation – Italy-France Programme (Alps) 2007/2013 - ALCOTRA

2009: Landslides risk analyses and risk mitigation works, funded by ARPA Piemonte (Regional Agency for the Protection of the Environment). Within the project Alpine Space ADAPTALP Adaptation To Climate Change in the Alpine Space.

2007-2013: Dynamique des avalanches: déclenchement et intéraction écoulement-obstacles acronyme: DYNAVAL, funded by Regione Autonoma Valle d'Aosta. Within European territorial cooperation – ItalyFrance Programme (Alps) 2007/2013.

2000: Geotechnical characterization of the Capanne Marcarolo serpentine, funded by Università di Genova.

1996: Characterization of a claystone in Ravascletto town, funded by G.Rodio S.p.A.

1987 – 1991: Shear behaviour of rock discontinuities in dynamic conditions, funded by ENEL (National electricity supplier) S.p.A. CRIS (Hydraulic and structural research centre).

5.3 Projects Funded by the Italian Ministry of Education, University and Scientific Research (principal investigator)

2008: Design analysis of underground works in seismic conditions.

5.4 Projects Funded by the Italian Ministry of Education, University and Scientific Research (participant)

2006-2007: Seismic effects on underground works.

2001-2002: Mechanized excavation of tunnels.

1999-2000: Tunnels in difficult conditions.

6 Visiting scientist

2018 and 2019: invited professor at Snow and Ice Research Center (SIRC) of the National Research Institute for Earth Science and Disaster Resilience (NIED), Nagaoka, Japan.

2014: invited professor presso at the Universidade Federal de Minas Gerais (UFMG), Belo Horizonte (Brasil).

7 International and national work groups

1996: AGI (Italian Geotechnical Association) working group on: Translation of ISRM Suggested Methods

2013-2017: ITA (International Tunnelling and Underground Space Association) - Working Group 02: Research. Italian delegate at ITA WG02, designated by the Italian Tunneling Society

2014-2016: SIG (Italian Tunneling Society) working group Research. Animateur of the SIG WG Research.

2015 – present: AGI (Italian Geotechnical Association) committee on: Guidelines for the design of landslide risk mitigation works. Committee member 2018 to present: member of the Council of GNIG (National Group of Geotechnical Engineering)

2016 – present: SIG (Italian Tunneling Society) working group Research. Component of the SIG WG Research.

2019: Work Group on Education in Civil Engineering, Politecnico di Torino.

8 Peer Review Service

Reviewer for the following international journals:

- Cold Regions Science and Technology
- Geoingegneria Ambientale e Mineraria - Geomatics Natural Hazards and Risk
- International Journal of Geomechanics
- International Journal of Rock Mechanics and Mining Sciences
- Landslides
- Natural Hazard
- Rock Mechanics and Rock Engineering
- Tunnelling and Underground Space Technology.

9 Other scientific activities

Component of the GNIG (National Group of Geotechnical Engineering) Council.

10 Affiliations

- Associazione Geotecnica Italiana (Italian Geotechnical Society)

- Associazione Georisorse e Ambiente (Georesources and Environment Society)

- International Society for Rock Mechanics

- Società Italiana Gallerie (Italian Tunnelling Society)

11 Conferences organizing and scientific committees

2019: IACMAG 2020 “Challenges and Innovations in Geomechanics”, Torino, Italy. Member of the International Scientific commettee.

2019: International Workshop on Complex Formations: Characterization and Case Studies, May 30, Torino, Italy. Organizing and Scientific committee member.

2017: ITA-AITES World Tunnel Congress 2019 “Tunnels and underground cities: Engineering and Innovation meet Archaeology, Architecture and Art”, Napoli, Italy. Scientific committee member.

2016: XVI Ciclo di Conferenze di Meccanica e Ingegneria delle Rocce “Innovazioni nella progettazione realizzazione e gestione delle opere in sotterraneo”, Torino. Scientific and organizing committee member.

2015: ITA-AITES World Tunnel Congress 2015 “SEE Tunnel - Promoting Tunnelling in SEE Region”, Dubrovnik, Croatia. Scientific committee member.

2014: XV Ciclo di Conferenze di Meccanica e Ingegneria delle Rocce "Interventi e opere nelle formazioni complesse", Torino. Scientific and organizing committee member.

2004: X Ciclo di Conferenze di Meccanica e Ingegneria delle Rocce “La caratterizzazione degli ammassi rocciosi nella progettazione geotecnica”, Torino. Scientific and organizing committee member.

2000: VIII Ciclo di Conferenze di Meccanica e Ingegneria delle Rocce “Lo scavo meccanizzato delle gallerie”, Torino. Scientific and organizing committee member.

12 Main publications on international journals with referee

1. Napoli Maria Lia, Barbero Monica, Ravera Elena, Scavia Claudio (2018). “A stochastic approach to slope stability analysis in bimrocks”. INTERNATIONAL JOURNAL OF ROCK MECHANICS AND MINING SCIENCES. - ISSN 1365-1609. - 101, pp. 41-49.

2. De Biagi Valerio, Barbero Monica, Barpi Fabrizio, Borri-Brunetto Mauro, Podolskiy Evgenyi (2018). “Failure mechanics of snow layers through image analysis”. EUROPEAN JOURNAL OF MECHANICS. A, SOLIDS. - ISSN 0997-7538. - 74, pp. 26-33.

3. Bella Gianluca, Barbero Monica, Barpi Fabrizio, Borri Brunetto Mauro, Peila Daniele (2017). "An innovative bio-engineering retaining structure for supporting unstable soil". JOURNAL OF ROCK MECHANICS AND GEOTECHNICAL ENGINEERING, ISSN: 1674-7755, doi: 10.1016/j.jrmge.2016.12.002

4. De Biagi Valerio, Napoli Maria Lia, Barbero Monica (2017). A quantitative approach for the evaluation of rockfall risk on buildings. NATURAL HAZARDS, p. 1-28, ISSN: 0921-030X, doi: 10.1007/s11069-017-2906-3

5. De Biagi Valerio, Napoli Maria Lia, Barbero Monica, Peila Daniele (2017). Estimation of the return period of rockfall blocks according to their size. NATURAL HAZARDS AND EARTH SYSTEM SCIENCES, vol. 17, p. 103-113, ISSN: 1684-9981, doi: 10.5194/nhess-17-103-2017

6. Pirulli Marina, Barbero Monica, Marchelli Maddalena, Scavia Claudio (2017). The failure of the Stava Valley tailings dams (Northern Italy): numerical analysis of the flow dynamics and rheological properties. GEOENVIRONMENTAL DISASTERS, vol. 4, p. 1-15, ISSN: 2197-8670, doi: 10.1186/s40677-016-0066-5

7. De Biagi Valerio, Barbero Monica, Borri-Brunetto Mauro (2016). A reliability-based method for taking into account snowfall return period in the design of buildings in avalanche-prone areas. NATURAL HAZARDS, vol. 81, p. 1901-1912, ISSN: 0921-030X, doi: 10.1007/s11069-016-2161-z

8. Barbero M., Barpi F., Borri Brunetto M., Pallara O. (2016). An apparatus for in-situ direct shear tests on snow. EXPERIMENTAL TECHNIQUES, vol. 40, p. 149-158, ISSN: 0732-8818, doi: 10.1007/s40799-016-0019-7

9. Borri-Brunetto Mauro, Alessio Marco, Barbero Monica, Barpi Fabrizio, De Biagi Valerio, Pallara Oronzo (2016). Stiffening effect of bolt-on transducers on strain measurements. LATIN AMERICAN JOURNAL OF SOLIDS AND STRUCTURES, vol. 13, p. 536-553, ISSN: 1679-7817, doi: 10.1590/1679-78252109

10. Luciani Andrea, Peila Daniele, Barbero Monica (2016). Numerical study of the influence of deterioration on the rockfall protection net fences. GEAM GEOINGEGNERIA AMBIENTALE E MINERARIA, vol. 147, p. 31-38, ISSN: 1121-9041

11. De Biagi V., Botto A., Napoli M.L., Dimasi C., Laio F., Peila D., Barbero M. (2016). Estimation of the return period of rock falls according to the block size. GEAM. GEOINGEGNERIA AMBIENTALE E MINERARIA, vol. LIII, p. 19-26, ISSN: 1121-9041

12. Iabichino Giorgio, Isaia Marco, Barbero Monica (2014). Sviluppo di un software per l'interpretazione dei dati ottenuti con cella CSIRO. GEAM. GEOINGEGNERIA AMBIENTALE E MINERARIA, vol. 142, p. 55-59, ISSN: 1121-9041

13. Iabichino G., Barbero M., Cravero M., Fidelibus C., Usai G. (2014). Experimental tests for the assessment of the shear strength of marble waste dumps. ENVIRONMENTAL EARTH SCIENCES, vol. 71, p. 3259-3271, ISSN: 1866-6280, doi: 10.1007/s12665-013-2993-8

14. E. A. Podolskiy, M. Barbero, F. Barpi, G. Chambon, M. Borri-Brunetto, O. Pallara, B. Frigo, B. Chiaia, M. Naaim (2014). Healing of snow surface-to-surface contacts by isothermal sintering. THE CRYOSPHERE, vol. 8, p. 1651-1659, ISSN: 1994-0424, doi: 10.5194/tc-8-1651-2014

15. Barbero M., Barpi F., Borri-Brunetto M., De Biagi V., Olivero G., Pallara O. (2014). Snow Pressure on a Semiflexible Retaining Structure. JOURNAL OF COLD REGIONS ENGINEERING, vol. 28, p. 04014002-1-04014002-19, ISSN: 0887-381X, doi: 10.1061/(ASCE)CR.1943-5495.0000065

16. De Biagi V., Barbero M. (2013). Sviluppo di un modello meccanico per l'analisi del crollo di seracchi di ghiaccio. GEAM. GEOINGEGNERIA AMBIENTALE E MINERARIA, vol. L, p. 19-26, ISSN: 11219041

17. M. Barbero, F. Barpi, M. Borri-Brunetto, E. Bovet, B. Chiaia, V. De Biagi, B. Frigo, O. Pallara, M. Maggioni, M. Freppaz, E. Ceaglio, D. Godone, D. Viglietti, E. Zanini (2013). A new experimental snow avalanche test site at Seehore peak in Aosta Valley (NW Italian Alps) – Part II: Engineering aspects. COLD REGIONS SCIENCE AND TECHNOLOGY, vol. 86, p. 14-21, ISSN: 0165-232X, doi: 10.1016/j.coldregions.2012.10.014

18. M. Maggioni, M. Freppaz, E. Ceaglio, D. Godone, D. Viglietti, E. Zanini, M. Barbero, F. Barpi, M. Borri Brunetto, E. Bovet, B. Chiaia, V. De Biagi, B. Frigo, O. Pallara (2013). A new experimental

snow avalanche test site at Seehore peak in Aosta Valley (NW Italian Alps)—part I: Conception and logistics. COLD REGIONS SCIENCE AND TECHNOLOGY, vol. 85, p. 175-182, ISSN: 0165-232X, doi: 10.1016/j.coldregions.2012.09.006

19. Barbero M., Peila D., Picchio A., Chieregato A., Bozza F., Mignelli C. (2012). Procedura sperimentale per la valutazione dell'effetto del condizionamento del terreno sull'abrasione degli utensili nello scavo con EPB. GEAM. GEOINGEGNERIA AMBIENTALE E MINERARIA, vol. 135, p. 13-19, ISSN: 1121-9041

20. Barbero M., Bonini M., Borri Brunetto M. (2012). Numerical Simulations of Compressive Tests on Bimrock. THE ELECTRONIC JOURNAL OF GEOTECHNICAL ENGINEERING, vol. 17, p. 33973414, ISSN: 1089-3032

21. Barpi F., Barbero M., Peila D. (2011). Numerical modelling of ground-tunnel support interaction using bedded-beam-spring model with fuzzy parameters. GOSPODARKA SUROWCAMI MINERALNYMI, vol. 27, p. 71-87, ISSN: 0860-0953

22. Barbero M., Barpi F. (2011). Quarry-Induced Slope Instability at a Broadcasting Transmission Plant near Valcava, Lombardia, Italy. INTERNATIONAL JOURNAL OF GEOENGINEERING CASE HISTORIES, vol. 2, p. 163-181, ISSN: 1790-2045, doi: 10.4417/IJGCH-02-02-04

23. BARBERO M., BARLA G (2010). Stability Analysis of a Rock Column in Seismic Conditions. ROCK MECHANICS AND ROCK ENGINEERING, vol. 43, p. 845-855, ISSN: 0723-2632, doi: 10.1007/s00603-010-0097-2

24. M. BARBERO, BARLA G., G.V. DEMARIE (2004). Applicazione del Metodo degli Elementi Distinti alla dinamica di mezzi discontinui. RIVISTA ITALIANA DI GEOTECNICA, vol. 3, p. 9-24, ISSN: 0557-1405

25. BARLA G., BARBERO M., CASTELLETTO M. (1999). Fenomeni di instabilità per scivolamento planare nella Collina Torinese. RIVISTA ITALIANA DI GEOTECNICA, vol. 2, p. 5-25, ISSN: 05571405

26. M. Barbero, G. Barla, A. Zaninetti (1996). Dynamic shear strength of rock joints subjected to impulse loading. INTERNATIONAL JOURNAL OF ROCK MECHANICS AND MINING SCIENCES & GEOMECHANICS ABSTRACTS, vol. 33, p. 141-151, ISSN: 0148-9062, doi: 10.1016/01489062(95)