
Bruno Brunone
Curriculum Vitae et Studiorum

Department of Civil and Environmental Engineering

University of Perugia



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BRUNO BRUNONE

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Current position

Professor

Director of the Water Engineering Laboratory (WEL)

Director of the Climate and Climate Change Research Centre (CRC)

University of Perugia - Department of Civil and Environmental Engineering

AREAS OF SPECIALIZATION

Transient test-based techniques for the analysis of pipe system performance throughout the urban environment (fault detection);

Modeling of transients in pressurized pipe systems: unsteady friction simulation, viscoelastic effects in polymeric pipes, 2-D models and local velocity measurement;

Devices for pressure wave generation and their use in real pipe systems;

Leak-law for leakage evaluation;

Pumping optimization;

Pressure control by PRVs.

In two early representative works (Brunone et al, 1991a; 1991b), an unsteady friction (UF) model based on the idea that unsteady shear stress can be modeled using the mean local and convective accelerations of the fluid has been proposed. Such a model has been found to be superior to many other models and still to maintain simplicity from the computational point of view of the equations in which the unsteady friction is evaluated by means of uniform flow formulas (i.e., the steady-state approach). Such a model is the most representative within the so-called Instantaneous Acceleration Based (IAB) ones. It has been found to be a basis of much follow-on research as proven by the large number of citations of the papers where such an UF model was proposed (Brunone et al, 1991a; 1991b; 1995); it is worthy of noting that some papers refer to it even in their title (e.g., Li et al, 2011; Yao et al, 2014).

In another pioneering work (Brunone et al, 2000), the velocity profiles in an unsteady pipe flow using the ultrasonic technique have been measured. This work has provided some much required experimental evidence which is of great importance to the development of a better understanding of the unsteady pipe flow and its modeling.

Starting with the very pioneering work (Brunone, 1989) — at that time the use of transients for leak detection was very innovative — transient test-based techniques for pipe fault (e.g., leaks, partially closed in-line valves, and partial blockages) detection have been explored both in laboratory and real pipe systems. With the aim of generating save pressure waves, the Portable Pressure Wave Maker (PPWM)

device has been refined at the Water Engineering Laboratory of the University of Perugia (Brunone et al, 2008). At the 2016 H2O Water International Exhibition of Bologna (Italy), the PPWM received the "sustainability award".

To confirm the role played in the field of pipe system management, Bruno Brunone (<https://www.youtube.com/watch?v=EVb27V7JXig>) is one of 47 respondents – engineers, modelers, researchers and practitioners – who have made significant contributions to the development of the field of the Water Distribution Systems Analysis (WDSA) within the WDSA History Project, sponsored by the Environmental and Water Resources Institute (EWRI).

The valuable results of the research in the four-year period 2011-2014 is proved by the fact that in the analysis of the research quality for such a period of time (VQR 2011-2014) executed by the Italian Ministry of Education, University and Research (MIUR), the Hydraulics team of the University of Perugia occupies the first place in Italy.

Bruno Brunone has been the President of the Organizing Committee of important International Conferences: 2013 - *Computing and Control for the Water Industry - CCWI2013*, Perugia; 2014: *Water Distribution System Analysis - WDSA2014*, Bari; 2015: *7th Groundwater Symposium of the International Association for Hydro-Environment Engineering and Research (IAHR)*, Perugia. He is the founder and President of the Organizing Committee of the biennial Italian Conferences on *Pipe System Management* (seven editions; University of Perugia: 2003, 2005, 2007; the Second University of Napoli: 2009; Sapienza University of Rome, and ACEA: 2011; University of Trento: 2015; University of Cassino and Southern Lazio: 2017). Brunone is an Associate Editor of the *J. of Hydraulic Engineering* of the American Society of Civil Engineers ASCE, a member of the Editorial Board of *Water*, *The Open Civil Engineering Journal*, and the Italian Journal *Servizi a Rete*.

Brunone, B. (1989). "A technique for leak detection in wastewater outfalls. Numerical experiments." Conf. on "Wastewater Outfalls", University of Naples, Naples, Italy, D.223–236 (in Italian).

Brunone, B., Golia, U.M., and Greco, M. (1991a). "Some remarks on the momentum equation for fast transients." Proc., Int. IAHR Meeting on "Hydraulic Transients and Water Column Separation", E. Cabrera and M.A. Fanelli (eds), Valencia (E),

201-209.

Brunone, B., Golia, U.M., and Greco, M. (1991b). "Modelling of fast transients by numerical methods." Proc., Int. IAHR Meeting on "Hydraulic Transients and Water Column Separation", E. Cabrera and M.A. Fanelli (eds), Valencia (E), 273-280.

Brunone, B., Golia, U.M., and Greco, M. (1995). "The effects of twodimensionality on pipe transients modeling." J. of Hydraulic Engineering, ASCE, 121(12), 906-912.

Brunone, B., Karney, B. W., Mecarelli, M., and Ferrante, M. (2000). "Velocity profiles and unsteady pipe friction in transient flow." J. of Water Resources Planning and Management, ASCE, 126(4), 236-244.

Brunone, B., Ferrante, M., and Meniconi, S. (2008). "Portable pressure wave-maker for leak detection and pipe system characterization.", J. of American Water Works Association, AWWA, 100(4):108-116.

Li, C., Liao, K., Jia, W., and Wu, X. (2011). "Waterhammer analysis of oil transportation pipeline using Brunone-Vitkovsky unsteady flow friction model.", Proc., Asia-Pacific Power and Energy Engineering Conference (APPEEC), in: "Asia-Pacific Power and Energy Engineering Conference" Book series.

Yao, E., Kember, G., and Hansen, D. (2014). "Analysis of water hammer attenuation in the Brunone model of unsteady friction." Quart. Appl. Math., 72(2), 281-290.

MAIN EMPLOYMENT HISTORY

- 2000 - University of Perugia: Professor
- 1997 - University of Perugia: Director of the Water Engineering Laboratory (WEL)
- 2011 - 2012 University of Perugia: Member of the Committee for the new constitution
- 2003 - 2013 University of Perugia: Deputy Director of the Department of Civil and Environmental Engineering
- 2003 - 2010 University of Perugia: Member of the Board of Directors
- 2001 - 2004 University for Foreigners of Perugia: Director of the Water Resources and Documentation Centre (WARREDOC)
- 1992 - 2000 University of Perugia: Associate Professor
- 1991 - 1992 University of Napoli Federico II: Assistant Professor
- 1989 - 1990 University of Napoli Federico II: Research Fellow
- 1988 University of Napoli Federico II: "Giuseppe Pistilli" scholarship

1986 - 1987 University of Napoli Federico II: Research Fellow

Education

- 1983 MSc in Civil-Hydraulic Engineering (cum laude) – University of Napoli Federico II
- 1986 PhD in Hydraulic Engineering – University of Napoli Federico II and Sapienza Università di Roma

AWARDS

- 2016 SUSTAINABILITY AWARD FOR THE PORTABLE PRESSURE WAVE MAKER (PPWM) – H₂O Bologna Water Exhibition

International Conferences - INVITED LECTURES

- 2017 “37th IAHR World Congress” (Special Session on Transients), International Association for Hydro-Environment Engineering and Research (IAHR), Kuala Lumpur, Malaysia
- 2016 “WaterIdeas2016”, International Water Association (IWA), Bologna, Italy
- 2015 “PAVCO Chair’s 20th year anniv. celebration”, Universidad de los Andes, Bogotá, Colombia
- 2015 “Smart Urban Water Systems”, Hong Kong University of Science & Technology, Hong Kong
- 2013 London Global Leakage Summit, London, UK
- 2008 International Expo Zaragoza “Water and Sustainable Development”, Zaragoza, Spain
- 2004 XXIX National Conference of Hydraulics and Hydraulic Works, Trento, Italy

PUBLICATIONS

INTERNATIONAL REFEREED JOURNAL PAPERS AND CONTRIBUTIONS

- 2018 Meniconi, S., Brunone, B., Mazzetti, E., Laucelli, D.B., and Borta, G. "Hydraulic characterization and transient response of Pressure Reducing Valves. Laboratory experiments", *J. of Hydroinformatics, IWA*, on line.
doi: 10.2166/hydro.2017.158
- 2018 Louati, M., Ghidaoui, M.S., Meniconi, and Brunone, B. "Bragg-type resonance in blocked pipe system and its effect on the eigenfrequency shift", *J. of Hydraulic Engineering, ASCE*, 144(1), 04017056.
doi: 10.1061/(ASCE)HY.1943-7900.0001383
- 2018 Martins, N.C., Brunone, B., Meniconi, S., Ramos, H.M., and Covas, I.D. "CFD and 1D approaches for the unsteady friction analysis of low Reynolds number turbulent flows", *J. of Fluids Engineering, ASME*, 140(1), 011102.
doi: 10.1115/1.4037504
- 2017 Martins, N.M.C., Brunone, B., Meniconi, S., Ramos, H.M., and Covas, D.I.C. "Efficient CFD model for transient laminar flow modeling: pressure wave propagation and velocity profile changes", *J. of Hydraulic Engineering, ASCE*, 143(12), 04017050.
doi: 10.1061/(ASCE)HY.1943-7900.0001372
- 2017 Federici, E., Meniconi, S., Ceci, E., Mazzetti, E., Casagrande, C., Montalbani, E., Businelli, S., Mariani, T., Mugnaioli, P., Cenci, G., and Brunone, B. "Legionella survey in the plumbing system of a sparse academic campus: a case study at the University of Perugia", *Water*, 9, 662.
doi: 10.3390/w9090662
- 2017 Louati, M., Meniconi, S., Brunone, B., and Ghidaoui, M.S. "Experimental study of the eigenfrequency shift mechanism in a blocked pipe system", *Journal of Hydraulic Engineering, ASCE* 143(10), 04017044.
doi:10.1061/(ASCE)HY.1943-7900.0001347
- 2017 Duan, H.F., Meniconi, S., Lee, P.J., Brunone, B., and Ghidaoui, M.S., "Local and integral energy based evaluation for the unsteady friction relevance in transient pipe flows", *Journal of Hydraulic Engineering, ASCE* 143(7): 04017015.
doi:10.1061/(ASCE)HY.1943-7900.0001304
- 2017 Meniconi, S., Brunone, B., van Zyl, K., and Mazzetti, E., "Aqualibrium competition: laboratory data and EPAnet simulations", *Procedia Engineering, Elsevier* 186: 522-

529.
doi:10.1016/j.proeng.2017.03.265
- 2017 Cerlini B. Paolina, Meniconi, S., and Brunone, B., "Groundwater supply and climate change management by means of global atmospheric datasets. Preliminary results", *Procedia Engineering, Elsevier* 186: 420-427.
doi:10.1016/j.proeng.2017.03.245
- 2017 Meniconi, S., Brunone, B., Frisinghelli, M. Mazzetti, E., Larentis, M., and Costisella, C., "Safe transients for pipe survey in a real transmission main by means of a portable device: the case study of the Trento (I) supply system", *Procedia Engineering, Elsevier* 186: 228-235.
doi:10.1016/j.proeng.2017.03.232
- 2016 Pezzinga, G., Brunone, B., and Meniconi, S. "On the relevance of pipe period on Kelvin-Voigt viscoelastic parameters: 1-D and 2-D inverse transient analysis", *Journal of Hydraulic Engineering, ASCE* 142(12): 04016063.
doi: 10.1061/(ASCE)HY.1943-7900.0001216
- 2016 Meniconi, S., Brunone, B., Mazzetti, E., Laucelli, D.B., and Borta, G. "Pressure reducing valve characterization for pipe system management", *Procedia Engineering, Elsevier* 162: 455-462 .
doi: 10.1016/j.proeng.2016.11.088
- 2016 Brunone, B., Discussion of "Hydraulic transients in viscoelastic branched pipelines by S. Evangelista, A. Leopardi, R. Pignatelli, and G. de Marinis", *Journal of Hydraulic Engineering, ASCE* 142(8): 07016005.
doi: 10.1061/(ASCE)HY.1943-7900.0001173
- 2016 Franchini, M., and Brunone, B. "Editorial: Innovative and sustainable methodologies for smart water network management", *Civil Engineering and Environmental Systems* 33(1):1-2.
doi: 10.1080/10286608.2016.1148144
- 2016 Ferrante, M., Capponi, C., Collins, R., Edwards, J., Brunone, B., and Meniconi, S. "Numerical and transient analysis of random leakage in time and frequency domain", *Civil Engineering and Environmental Systems* 33(1):70-84.
doi: 10.1080/10286608.2016.1138941
- 2016 Meniconi, S., Brunone, B., Ferrante, M., and Capponi, C., "Mechanism of interaction of pressure waves at a discrete partial blockage", *J. of Fluids and Structures* 62:

33-45

doi:10.1016/j.jfluidstructs.2015.12.010

2015 Brunone, B., Ferrante, M., Meniconi, S., and Berardi, L., "Editorial (CCWI2013)", *J. of Hydroinformatics, IWA* 17(3):329-330.

doi: 10.2166/hydro.2015.000

2015 Meniconi, S., Brunone, B., Ferrante, M., Capponi, C., Carrettini, C.A., Chiesa, C., Segalini, D., and Lanfranchi, E.A., "Anomaly pre-localization in distribution-transmission mains. Preliminary field tests in the Milan pipe system", *J. of Hydroinformatics, IWA* 17(3): 377-389.

doi:10.2166/hydro.2014.038

2015 B. Brunone, M. Ferrante, S. Meniconi, and L. Berardi, "Water quality and fault assessment in pipe systems - Editorial", *J. of Water Supply: Research and Technology – AQUA, IWA* 64(5):493-495.

doi:10.2166/aqua.2015.000

2015 Massari, C., Yeh, J. T.-C, Ferrante, M., Brunone, B., and Meniconi, S., "A stochastic approach for extended partial blockage detection in viscoelastic pipelines: numerical and laboratory experiments", *J. of Water Supply: Research and Technology – AQUA, IWA* 64(5): 583-595.

doi:10.2166/aqua.2015.034

2015 Guadagnini, A., Sanchez-Vila, X., and Brunone, B., "Preface", *Procedia Environmental Sciences, Elsevier* 25:1-3.

doi: 10.1016/j.proenv.2015.04.001

2015 Ferrante, M., Mazzetti, E., Fiori, A., Burini, M., Fioriti, B., Mazzoni, A., Schirò, G., Vacca, G., Brunone, B., Meniconi, S., and Capponi, C., "Delineation of wellhead protection areas in the Umbria region. 1. A simplified procedure", *Procedia Environmental Sciences, Elsevier* 25: 90-95.

doi: 10.1016/j.proenv.2015.04.013

2015 Ferrante, M., Mazzetti, E., Fiori, A., Burini, M., Fioriti, B., Mazzoni, A., Schirò, G., Vacca, G., Brunone, B., Meniconi, S., and Capponi, C., "Delineation of wellhead protection areas in the Umbria region. 2. Validation of the proposed procedure", *Procedia Environmental Sciences, Elsevier* 25: 96-103.

doi: 10.1016/j.proenv.2015.04.014

2015

- Brunone, B., Meniconi, S., Capponi, C., and Ferrante, M., "Leak-induced pressure decay during transients in viscoelastic pipes. Preliminary results", *Procedia Engineering, Elsevier* 119:243-252.
doi: 10.1016/j.proeng.2015.08.882
- 2015 Ferrante, M., Capponi, C., Brunone, B., and Meniconi, S., "Hydraulic characterization of PVC-O pipes by means of transient tests", *Procedia Engineering, Elsevier* 119:263-269.
doi: 10.1016/j.proeng.2015.08.884
- 2015 Meniconi, S., Brunone, B., Ferrante, M., Mazzetti, E., Laucelli, D.B., and Borta, G., "Transient effects of self-adjustment of pressure reducing valves", *Procedia Engineering, Elsevier* 119:1030-1038.
doi: 10.1016/j.proeng.2015.08.999
- 2015 Brunone, B., Ferrante, M., and Meniconi, S., Discussion of "Single-event leak detection in pipeline using first three resonant responses by J. Gong, M.F. Lambert, A.R. Simpson, and A.C. Zecchin", *J. of Hydraulic Engineering, ASCE* 141(2):07014019-1/2.
doi:10.1061/(ASCE)HY.1943-7900.0000720
- 2014 Meniconi, S., Brunone, B., Ferrante, M., and Massari, C., "Energy dissipation and pressure decay during transients in viscoelastic pipes with an in-line valve", *J. of Fluids and Structures* 45:235-249.
doi: 10.1016/j.jfluidstructs.2013.12.013
- 2014 Massari, C., Yeh, T.-C.J., Ferrante, M., Brunone, B., and Meniconi, S., "Detection and sizing of extended partial blockages in pipelines by means of a stochastic successive linear estimator", *J. of Hydroinformatics, IWA* 16(2):248-258.
doi: 10.2166/hydro.2013.172
- 2014 Meniconi, S., Duan, H.F., Brunone, B., Ghidaoui, M.S., Lee, P.J., and Ferrante, M., "Further developments in rapidly decelerating turbulent pipe flow modeling", *J. of Hydraulic Engineering, ASCE* 140(7):04014028-1/9.
doi: 10.1061/(ASCE)HY.1943-7900.0000880
- 2014 Pezzinga, G., Brunone, B., Cannizzaro, D., Ferrante, M., Meniconi, S., and Berni, A., "Two dimensional features of viscoelastic models of pipe transients", *J. of Hydraulic Engineering, ASCE* 140(8):0401403-1/9.
doi:10.1061/(ASCE)HY.1943-7900.0000891
- 2014

- Ferrante, M., Meniconi, S., and Brunone, B., "Local and global leak laws. The relationship between pressure and leakage for a single leak and for a district with leaks", *Water Resources Management, EWRA* 28(11):3761-3782.
doi: 10.1007/s11269-014-0708-x
- 2014 Brunone, B., and Giustolisi, O., "Preface", *Procedia Engineering, Elsevier* 70:1-3.
doi: 10.1016/j.proeng.2014.02.001
- 2014 Brunone, B., Meniconi, S., Ferrante, M., Carrettini, C.A., Chiesa, C., Capponi, C., and Segalini, D., "The characterization of Milan WDS by pumping switching off: field test assesment", *Procedia Engineering, Elsevier* 70:201-208.
doi: 10.1016/j.proeng.2014.02.023
- 2014 Capponi, C., Ferrante, M., Pedroni, M., Brunone, B., Meniconi, S., Zaghini, M., and Leoni, F., "Real data analysis and efficiency of the TEA Mantova Casale (Italy) variable-speed pumping station", *Procedia Engineering, Elsevier* 70:248-255.
doi: 10.1016/j.proeng.2014.02.028
- 2014 Ferrante, M., Brunone, B., Meniconi, S., Capponi, C., and Massari, C., "The leak law: from local to global scale", *Procedia Engineering, Elsevier* 70:651-659.
doi: 10.1016/j.proeng.2014.02.071
- 2014 Massari, C., Yeh, T.-C.J., Ferrante, M., Brunone, B., and Meniconi, S., "A stochastic tool for determining the presence of partial blockages in viscoelastic pipelines: first experimental results", *Procedia Engineering, Elsevier* 70:1112-1120.
doi: 10.1016/j.proeng.2014.02.123
- 2014 Meniconi, S., Brunone, B., Ferrante, M., Carrettini, C.A., Chiesa, C., Capponi, C., and Segalini, D., "The skeletonization of Milan WDS on transients due to pumping switching off: preliminary results", *Procedia Engineering, Elsevier* 70:1131-1136.
doi: 10.1016/j.proeng.2014.02.125
- 2014 Ferrante, M., Brunone, B., Meniconi, S., Karney, B.W., and Massari, C., "Leaks size, detectability and test conditions in pressurized pipe systems. How leak size and system functioning conditions affect the effectiveness of leak detection techniques", *Water Resources Management, EWRA* 28(13):4583-4598.
doi: 10.1007/s11269-014-0752-6
- 2014 Giustolisi, O., and Brunone, B., "Preface", *Procedia Engineering, Elsevier* 89:1-3.
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- 2014 Giustolisi, O., Berardi, L., Laucelli, D., Savic, D., Walski, T., and Brunone, B., "Battle of background leakage assessment for water networks (BBLAWN) at WDSA

- Conference 2014”, *Procedia Engineering, Elsevier* 89:4-12.
doi: 10.1016/j.proeng.2014.11.152
- 2014 Verde, D., Cima, E., Ferrante, M., Brunone, B., and Meniconi, S., ”The dependence of district minimum night flow on pressure head: the case study of Lenola”, *Procedia Engineering, Elsevier* 89:1224-1230.
doi: 10.1016/j.proeng.2014.11.424
- 2014 Ferrante, M., Capponi, C., Collins, R., Edwards, J., Brunone, B., and Meniconi, S., ”Effect of uncertainty demand location on transient behavior of WDS”, *Procedia Engineering, Elsevier* 89:1321-1328.
doi: 10.1016/j.proeng.2014.11.447
- 2014 Meniconi, S., Brunone, B., Ferrante, M., Capponi, C., Pedroni, M., Zaghini, M., and Leoni, F., ”Transmission main survey by transient tests: the case of Villanova plan in Mantova (I)”, *Procedia Engineering, Elsevier* 89:1343-1349.
doi: 10.1016/j.proeng.2014.11.454
- 2014 Brunone, B., Ferrante, M., Meniconi, S., and Berardi, L., ”Preface: CCWI2013”, *Drinking Water Engineering and Science, DUT* 7:99-100.
doi:10.5194/dwes-7-99-2014
- 2014 Capponi, C., Ferrante, M., Pedroni, M., Brunone, B., Meniconi, S., Zaghini, M., and Leoni, F., ”Functioning conditions of the Casale pumping station in Mantova, Italy”, *Drinking Water Engineering and Science, DUT* 7: 93-97.
doi: 10.5194/dwes-7-93-2014
- 2013 Ferrante, M., Massari, C., Todini, E., Brunone, B., and Meniconi, S., ”Experimental investigation of leak hydraulics”, *J. of Hydroinformatics, IWA* 15(3):666-675.
doi: 10.2166/hydro.2012.034
- 2013 Massari, C., Yeh, T.-C.J., Ferrante, M., Brunone, B., and Meniconi, S., ” Diagnosis of pipe systems by means of a stochastic successive linear estimator”, *Water Resources Management, EWRA* 27(13):4637-4654.
doi: 10.1007/s11269-013-0433-x
- 2013 Meniconi, S., Duan, H.-F., Lee, P.J., Brunone, B., Ghidaoui, M., and Ferrante, M., ”Experimental investigation of coupled frequency- and time-domain transient test-based techniques for partial blockage detection in pipelines”, *J. of Hydraulic Engineering, ASCE*139(10):1033-1040.
doi: 10.1061/(ASCE)HY.1943-7900.0000768
- 2013

- Brunone, B., Ferrante, M., Meniconi, S., and Massari, C., "Effectiveness assessment of pipe systems by means of transient test-based techniques", *Procedia Environmental Sciences, Elsevier* 9:814-822.
doi: <http://dx.doi.org/10.1016/j.proenv.2013.06.090>
- 2013 Franchini, M., and Brunone, B. (2013). "Editorial: New techniques and tools for improving efficiency in leakage detection and management", *Water Science and Technology: Water Supply, IWA* 13(4):871-874.
doi: 10.2166/ws.2013.159
- 2013 Massari, C., Yeh, T.-C. J., Ferrante, M., Brunone, B., and Meniconi, S., "Diagnosis of pipe systems by the SLE: first results", *Water Science and Technology: Water Supply, IWA*13(4): 958-965.
doi: 10.2166/ws.2013.051
- 2013 Ferrante, M., Massari, C., Brunone, B., and Meniconi, S., "Leak behaviour in pressurized PVC pipes", *Water Science and Technology: Water Supply, IWA* 13(4):987-992.
doi: 10.2166/ws.2013.047
- 2013 Brunone, B., and Meniconi, S., Discussion of "Case studies of leak detection and location in water pipe systems by inverse transient analysis by D. Covas and H. Ramos", *J. Water Resources Planning and Management, ASCE* 139(1):126-127
doi:10.1061/(ASCE)0733-9496(2010)136:2(248)
- 2013 Brunone, B., Discussion of "Evaluation of unsteady wall shear stress by Zielke's method by A.E. Vardy, and J.M.B. Brown.", *J. of Hydraulic Engineering, ASCE* 139(5): 564-565.
doi:10.1061/(ASCE)HY.1943-7900.0000379
- 2012 Ferrante, M., Todini, E., Massari, C., Brunone, B., and Meniconi, S., "Equivalent hydraulic resistance to simulate pipes subject to diffuse outflows", *J. of Hydroinformatics, IWA* 14(1):65-74.
doi:10.2166/hydro.2011.043
- 2012 Collins, R.P., Boxall, J.B., Karney, B.W., Brunone, B., and Meniconi, S., "How severe can transients be after a sudden depressurization?", *J. of American Water Works Association, AWWA* 104(4): E243-E251.
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- 2012 Meniconi, S., Brunone, B., Ferrante, M., and Massari, C., "Transient hydrodynamics of in-line valves in viscoelastic pressurised pipes. Long period analysis", *Experi-*

- ments in Fluids* 53(1): 265-275.
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- 2012 Massari, C., Ferrante, M., Brunone, B., and Meniconi, S., "Is the leak head-discharge relationship in polyethylene pipes a bijective function?" *J. of Hydraulic Research, IAHR* 50(4):409-417.
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- 2012 Meniconi, S., Brunone, B., and Ferrante, M., "Water hammer pressure waves interaction at cross-section changes in series in viscoelastic pipes", *J. of Fluids and Structures* 33:44-58.
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- 2012 Collins, R.P., Boxall, J.B., Karney, B.W., Brunone, B., and Meniconi, S., "Expanded summary of "How severe can transients be after a sudden depressurization?", *J. of American Water Works Association, AWWA* 104(4): 67-68.
- 2011 Meniconi, S., Brunone, B., Ferrante, M., and Massari, C., "Small amplitude sharp pressure waves to diagnose pipe systems", *Water Resources Management, EWRA* 25(1):79-96.
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- 2011 Meniconi, S., Brunone, B., Ferrante, M. and Massari, C., "Potential of transient tests to diagnose real supply pipe systems: what can be done with a single extemporary test", *J. of Water Resources Planning and Management, ASCE* 137(2):238-241.
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- 2011 Meniconi, S., Brunone, B., Ferrante, M., and Massari, C., "Transient tests for locating and sizing illegal branches in pipe systems", *J. of Hydroinformatics, IWA* 13(3):334-345.
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- 2011 Meniconi, S., Brunone, B., and Ferrante, M., "In-line pipe device checking by short period analysis of transient tests", *J. of Hydraulic Engineering, ASCE* 137(7):713-722.
doi:10.1061/(ASCE)HY.1943-7900.0000309
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- 2010

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SCOPUS: h-index: 23; number of citations: 1645 (number of papers: 110)
ISI WEB OF SCIENCE: h-index: 22; number of citations = 1340 (number of papers: 101)

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- 2015 Brunone, B., Bertola, P., Ferrante, M., Meniconi, S., e Righetti, M., Raccolta dei sommari del Sesto Seminario Nazionale *Efficienza e risparmio energetico dei sistemi idrici* Trento, 8-9 luglio 2015 ([http:// www.tecneditazioni.it/IT/ editoria-pubblicazioni.aspx](http://www.tecneditazioni.it/IT/editoria-pubblicazioni.aspx)).
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- 2010 Brunone, B., Di Natale, M., Ferrante, M., Gisonni, C., e Meniconi, S., *Atti del Quarto Seminario La ricerca delle perdite e la gestione delle reti di acquedotto Aversa* (CE), 18-19 settembre 2009 (L’Acqua, AII, Suppl. al n. 2, pp. iv + 188).
- 2008 Brunone, B., Ferrante, M., e Meniconi, S., *Atti del Terzo Seminario La ricerca delle perdite e la gestione delle reti di acquedotto* Perugia, 20-21 settembre 2007 (pp. iv + 406).
- 2008 Corradini, C., Brunone, B., Manciola, P., Mannocchi, F., Casadei, S., Ferrante, M., Morbidelli, R., Saltalippi, C., Flammini, A., e Meniconi, S., *Atti del XXXI Convegno Nazionale di Idraulica e Costruzioni Idrauliche* Morlacchi, Perugia, 9-12 settembre 2008 (pp. 294 e CD ROM).
- 2006 Brunone, B., Ferrante, M., e Meniconi, S., *Atti del Secondo Seminario La ricerca delle perdite e la gestione delle reti di acquedotto* Perugia, 22 settembre 2005 (pp. iii + 342).
- 2004 Brunone, B., e Ferrante, M., *Atti del Seminario La ricerca delle perdite e la gestione delle reti di acquedotto* Perugia, 26 settembre 2003 (pp. x + 300).

BOOKS (IN ITALIAN)

- 2008 Brunone, B., Ferrante, M., e Meniconi, S., "Ricerca e controllo delle perdite nelle reti di condotte. Manuale per una moderna gestione degli acquedotti, *CittàStudi Edizioni* Novara (pp. XXIII + 540).
- 2006 Brunone, B., Ferrante, M., Meniconi, S., e Almandori, C., "Esercizi di Idraulica – parte II, *Morlacchi Editore* Perugia (pp. 167).
- 2003 Brunone, B., Ferrante, M., e Berni, A., "Esercizi di Idraulica – parte I, *Morlacchi Editore, Perugia* (pp. ii + 163).

INTERNATIONAL CONFERENCE COMMITTEES

Computing and Control for the Water Industry - CCWI (Universities of Exeter, De Montfort, Sheffield and Imperial College):

- 1999 Exeter, UK
- 2001 Leicester, UK
- 2003 London, UK
- 2005 Exeter, UK
- 2007 Leicester, UK
- 2009 Sheffield, UK
- 2011 Exeter, UK
- 2013 Perugia, I (**President of the Organizing Committee**)
- 2015 Leicester, UK
- 2017 Sheffield, UK

Water Distribution System Analysis WDSA:

- 2006 Cincinnati, USA
- 2010 Tucson, USA
- 2012 Adelaide, AUS
- 2014 Bari, I (**President of the Organizing Committee**)
- 2016 Cartagena, COL

Pressure Surges (British Hydromechanics Research Group Limited - bHr Group):

- 2000 The Hague, NL
- 2004 Chester, UK

- 2008 Edinburgh, UK
- 2011 Lisboa, PL
- 2015 Dublin, IRL
The 1st International Electronic Conference on Water Sciences, 2016)
- 2015 *7th Groundwater Symposium of the International Association for Hydro-Environment Engineering and Research (IAHR) Perugia, I (President of the Organizing Committee)*
- 2012 *Leakage Technology Conference (International Water Association IWA) Ferrara, I*
- 2012 *WaterLossEurope2012 (International Water Association IWA) Ferrara, I*
- 2014 *WaterIdeas (International Water Association IWA)*
- 2014 Bologna, I
- 2016 Bologna, I
Water Pipeline Systems (British Hydromechanics Research Group Limited - bHr Group):
- 1994 Edinburgh, UK
- 1997 The Hague, NL
- 2001 York, UK
- 2005 *Water and Wastewater Pumping Stations (British Hydromechanics Research Group Limited - bHr Group) Cranfield, UK*
- 2003 *Pumps, Electromechanical Devices and Systems Applied to Urban Water Management PEDS 2003 (Universidad Politecnica de Valencia, IWA and IAHR) Valencia, E*
- 2003 *First Annual Water Distribution Modelling Symposium (Haestad Methods) Perugia, I (President of the Organizing Committee)*
- 1988 *Asian and Pacific Division (APD) of the International Association for Hydro-Environment Engineering and Research (IAHR) Kyoto, Japan*

NATIONAL CONFERENCES ON PIPE SYSTEM MANAGEMENT

Bruno Brunone is the founder and president of the Organizing Committee of the following biennial Italian Conferences on pipe system management:

- 2003 *Leak Detection and Pipe System Management (The University of Perugia), Perugia*
- 2005 *Leak Detection and Pipe System Management (The University of Perugia), Perugia*
- 2007 *Leak Detection and Pipe System Management (The University of Perugia), Perugia*

- 2009 *Leak Detection and Pipe System Management (The University of Perugia, and the Second University of Napoli, Aversa*
- 2011 *Pipe System Fault Detection and Management (The University of Perugia, Sapienza University of Rome, and ACEA, Roma*
- 2015 *Efficiency and Energy Saving in Pipe Systems (The University of Perugia, and the University of Trento, Trento*
- 2017 *Management and Rehabilitation of Pipe Systems (The University of Perugia, and the University of Cassino and Southern Lazio, Gaeta*

The above cycle of Conferences has been launched by the University of Perugia who organized the first three editions. Since 2009 it has been hosted by other Italian Universities but with the University of Perugia being strongly involved in the organization.

REVIEWER

INTERNATIONAL JOURNALS

Journal of Hydraulic Engineering, ASCE
Journal of Water Resources, Planning and Management, ASCE
Journal of Hydraulic Research, IAHR
Journal of Fluids Engineering, ASME
Journal of Engineering Mechanics, ASCE
Water Management
Water Resources Management
Journal of Fluids and Structures
Journal of Hydroinformatics
Urban Water Journal
Computers and Fluids
Acta Mechanica
Structural Health Monitoring
Inverse Problems in Science & Engineering
Transport in Porous Media
Estonian Academy of Sciences

Journal of Zhejiang University - Science A
Advances in Engineering Software
Civil Engineering and Environmental Systems
Automation in Construction
Materials
Journal of Irrigation and Drainage Engineering, ASCE
Proceedings of the iMechE, Part C: Journal of Mechanical Engineering Science
Water
Strojniški vestnik - Journal of Mechanical Engineering
Journal of Water Supply: Research and Technology - AQUA
Journal of Hydrodynamics, Ser. B
Engineering Structures
Mathematical Problems in Engineering
International Journal of Distributed Sensor Networks
Water Science and Technology: Water Supply

ORGANIZATIONS AND AGENCIES

2017 *University of Canterbury (New Zealand)*
2016 *Research Grant Council (RGC) of Hong Kong*
2015 *University of Canterbury (New Zealand)*
2015 *Imperial College London*
2015 *Mitacs Elevate (Canada)*
2015 *Research Grant Council (RGC) of Hong Kong*
2014 *University of Catania (Italy)*
2014 *Research Grant Council (RGC) of Hong Kong*
2013 *University of Padova (Italy)*
2013 *Research Grant Council (RGC) of Hong Kong*
2013 *Natural Sciences and Engineering Research Council of Canada (NSERC)*
2012 *Estonia Research Council*
2012 *Natural Sciences and Engineering Research Council of Canada (NSERC)*
2011 *Marsden Fund (New Zealand)*
2004 *Portuguese Research Funding Agency*

INTERNATIONAL PHD OPPONENT/EXTERNAL EXAMINER/PROGRAMME SUPERVISOR

- 2014-2018 *Instituto Superior Técnico (IST), École Polytechnique Fédérale de Lausanne (EPFL), Laboratório Nacional de Engenharia Civil (LNEC) and CEHIDRO, Centre for Hydro-Systems Studies of IST - “H2Doc - Environmental Hydraulics and Hydrology”* Doctoral Programme, Supervisor
- 2016 *Universidade de Lisboa - Instituto Superior Técnico* - candidate: N. M. da Conceição Martins
- 2014 *University of Sheffield* - candidate: W. J. Hampson
- 2013 *University of Adelaide* - candidate: J. Gong
- 2011 *Tallinn University of Technology* - candidate: I. Annus
- 2010 *Universidad Politecnica de Valencia* - candidate: M.A. Pardo Picazo
- 2010 *Norwegian University of Science and Technology (NTNU)* - candidate: Pal-Tore Storli

Italian University Committees

FULL PROFESSOR POSITION

- 2016 *Professor of Hydraulics, University of Ferrara*

ASSOCIATE PROFESSOR POSITION

- 2016 *Associate Professor of Hydraulics, University of Perugia*
- 2016 *Associate Professor of Hydraulic Works, University of Ferrara*
- 2015 *Associate Professor of Hydraulic Works, Technical University of Bari*
- 2014 *Associate Professor of Hydraulics, La Sapienza University of Roma*
- 2014 *Associate Professor of Hydraulic Works, Second University of Napoli*

ASSISTANT PROFESSOR POSITION

- 2016 *Assistant Professor of Hydraulic Works, University of Cassino e Lazio Meridionale*
- 2016 *Assistant Professor of Hydraulics, University of Bologna*
- 2014 *Assistant Professor of Hydraulics, Technical University of Milano*
- 2012 *Assistant Professor of Hydraulics, University of Bologna*
- 2012 *Assistant Professor of Hydraulics, University of Napoli Federico II*

- 2012 *Assistant Professor of Hydraulics*, Technical University of Torino
- 2011 *Assistant Professor of Hydraulics*, Technical University of Bari
- 2011 *Assistant Professor of Hydraulics*, University of Catania
- 2010 *Assistant Professor of Hydraulics*, University of Enna “KORE”

PHD DEFENCE

- 2012 *Ingegneria Idraulica e Ambientale* (XXIV ciclo), University of Palermo
- 2012 *Scienze dell’Ingegneria - Ingegneria Civile* (XXVI ciclo), University of Ferrara
- 2011 *Ingegneria Idraulica* (XXII ciclo), Technical University of Milan
- 2011 *Ingegneria Civile* (XXII ciclo), University of Cassino
- 2011 *Ingegneria Idraulica per l’Ambiente e il Territorio* (XXII ciclo), University of Calabria
- 2008 *Ingegneria e Modellistica Fisico-Matematica* (XVIII ciclo), University of L’Aquila
- 2008 *Idrodinamica e Modellistica Ambientale* (XVII ciclo), University of Padova

TEACHING

AT THE UNIVERSITY OF PERUGIA

- 1995 - *Hydraulics* for Civil and Environmental Engineers
- 1992 - 2015 *Fluid Mechanics* for Mechanical Engineers
- 1995 - 2000 *Water Resources System Modelling* for Civil and Environmental Engineers
- 2007 Director of the International Master in *Urban Water Engineering (UWE)* funded by the Italian Ministry for Foreign Affairs (MAE) for Engineers from Subsaharian Africa
- 2002 Director of the International Master in *Integrated Water Resources Management (IWRM)*, funded by the Italian Ministry for Foreign Affairs (MAE) for Engineers from Subsaharian Africa

SHORT COURSES

- 2008 *Management of water supply and water distribution systems*, within the Int. Master on “Management and governance of the integrated water service cycle” 7th Program HYDROAID, Hydroaid 2008, ONU, Torino
- 2007

- Characteristics and criticality of pressurised pipe systems*, within the Int. Master on "Governance of water systems and services" 6th Program HYDROAID, Hydroaid 2007, ONU, Torino
- 2007 *Characteristics and criticality of pressurised pipe systems*, 6th Program HYDROAID, Hydroaid 2007, ONU, Torino
- 2007 *Monitoring of groundwater*, Scuola Edile, Perugia
- 2007 Director course for professional engineers on *Prelocalization and location of leaks in pipe systems* with the Italian Federation of Water and Gas Distribution Companies (Federutility)
- 2007 Director course for professional engineers on *Energy management of pipe systems* with the Italian Federation of Water and Gas Distribution Companies (Federutility) for professional engineers
- 2006 Director course for professional engineers on *Monitoring and management of well-fields* with the Italian Federation of Water and Gas Distribution Companies (Federutility)
- 2005 Director course for professional engineers on *Monitoring and rehabilitation of pipe systems* with the Italian Federation of Water and Gas Distribution Companies (Federutility)
- 2005 Director course for professional engineers on *Numerical models and GIS for pipe system management* with the Italian Federation of Water and Gas Distribution Companies (Federutility)
- 2003 Director course on *Pressure transients and leakage control in water pipe networks*, XXX IAHR Congress, Thessaloniki (GR)
- 2003 Director course for professional engineers on *Leak detection in pipe systems* with the Italian Federation of Water and Gas Distribution Companies (Federutility)

National Meetings - INVITED LECTURES

- 2012 *Perugia Green Days, Perugia* - Seminario su "Le buone pratiche nella gestione di acqua e rifiuti: riduzione degli sprechi e cultura del riciclo"
- 2011 *Perugia Green Days, Perugia* - Tecniche Innovative per la diagnosi dei sistemi di condotte
- 2010 *Università della Calabria, Guardia Piemontese (CS)* - 31° Corso di Aggiornamento in "Tecniche per la difesa dall'inquinamento"

- 2010 *Seconda giornata di studio Gruppo Italiano di Idraulica GII, Milano* - “La qualità della ricerca e della didattica nelle discipline idrauliche”
- 2009 *Giornata di studio su “Strategie per il miglioramento dell’efficacia del servizio idrico integrato”, Enna* - Ricerca e controllo delle perdite nelle reti di condotte
- 2008 *Progetto DISWIP - Development of an Integrated System for Water Infrastructures Protection against Intentional Attacks, Sorrento* - Transitori “buoni” e transitori “cattivi”. Diagnosi dei sistemi interconnessi di condotte
- 2008 *Leakage Technology Conference “ACCADUEO 2008”, Ferrara* - Presentazione delle attività di ricerca nel campo dei sistemi di condotte
- 2008 *Labelab (workshop G), Ravenna* - Ricerca e controllo delle perdite nelle reti di condotte. Manuale per una moderna gestione degli acquedotti
- 2008 *Lions Club di Assisi, Assisi* - Azioni per la tutela ed il rispetto dell’acqua
- 2008 *Regione Umbria, Perugia* - La ricerca scientifica per l’ottimizzazione delle reti acquedottistiche
- 2007 *University of L’Aquila* - La pianificazione di bacino. Metodologie, analisi e piani di intervento regionale sui corsi d’acqua
- 2007 *Regione Umbria, Terni* - Il Servizio Idrico Integrato e gli utenti
- 2006 *Fondazione AMGA, Genova* - Convegno su “Verso una gestione più efficace delle perdite nei sistemi idrici secondo l’approccio dell’International Water Association (IWA)”
- 1998 *Fondazione AMGA, Genova* - ADAPT – Adattamento della forza lavoro ai mutamenti industriali. “Scuola dell’Acqua” – Gestione delle reti tecnologiche dei servizi idrici integrati

RESEARCH GRANTS

- 2017 *AcegasApsAmga - Padova, Italy*
 “Fault detection of the Trieste submarine pipeline”
 co-PI
- 2017 *HK Research Grant Council (RGC)’s Theme-based Research Scheme - Hong Kong University of Science and Technology (HKUST), Hong Kong SAR*
 “Smart Urban Water Supply System (Smart UWSS)”
 co-PI
- 2017

- Fondazione Cassa Risparmio Perugia - Perugia, Italy
 “Effects of the earthquake on water resources and water systems and possible re-
 mediations”
 PI
- 2016 University of Perugia - Perugia, Italy
 “Dynamic behavior of polymeric pipes”
 co-PI
- 2015 ASMM (Tolentino Water Company) - Tolentino, Italy
 “Tolentino water distribution system: drinking water balance and reservoir per-
 formance analysis”
 co-PI
- 2015 Italian Ministry of Education, University and Research (MIUR) Project of Relevant
 National Interest (PRIN 2012)
 “Tools and procedures for an advanced and sustainable management of water dis-
 tribution systems”
 co-PI
- 2015 Flu.Project - Perugia, Italy
 “Fire network of the Doha underground: transient analysis and protection device
 design”
 co-PI
- 2015 Calzoni SpA
 ”Analysis of pipe bursts in the Montedoglio irrigation system”
 PI
- 2015 University of Perugia - Perugia, Italy
 “Via del Giochetto campus: drainage system”
 co-PI
- 2015 University of Perugia - Perugia, Italy
 “Transient test-based techniques for fault detection”
 co-PI
- 2015 University of Perugia - Perugia, Italy
 “Design of the Health and Sport Centre of the University of Perugia”
 co-PI
- 2014 Fondazione Cassa Risparmio Perugia - Perugia, Italy
 “Hydraulic and microbiological combined approach towards water quality con-

- trol”
co-PI
- 2014 Umbra Acque SpA (Perugia Water Company) - Perugia, Italy
“Research activity on the application of simplified protection area delineation models to minor resources at a regional scale”
co-PI
- 2012 Metropolitana Milanese SpA (Milan Water Company) - Milan, Italy
“Anomaly pre-localization in elevatory transmission-distribution mains”
PI
- 2012 TEA Acque srl (Mantova Water Company) - Mantova, Italy
“Optimal criteria for pumping system management”
PI
- 2012 Fondazione Cassa Risparmio Perugia - Perugia, Italy
“Hydraulic characterization of innovative pipe materials”
co-PI
- 2012 Bassetti Building Workshop srl - Fabriano, Italy
“Urban regeneration of Giano river in the historic city of Fabriano”
co-PI
- 2011 Spoleto Municipality - Spoleto, Italy
“Risk analysis of Tessino and Marroggia streams”
co-PI
- 2011 Fondazione Cassa Risparmio Perugia - Perugia, Italy
“Leaks and blockages detection techniques for reducing energy and natural resources wastage”
co-PI
- 2009 University of Perugia - Perugia, Italy
“Innovative criteria for pipe system management”
PI
- 2008 Umbria Water Authority - Perugia, Italy
“Analysis of the management procedures of Umbra Acque SpA, Perugia”
PI
- 2008 IDRAo8 Committee - Perugia, Italy
“Transient test-based techniques for for pipe system management”
PI

- 2008 Fondazione Cassa Risparmio Perugia - Perugia, Italy
 “Trasimeno lake water balance”
 co-PI
- 2007 Marche Region - Ancona, Italy
 “Potenza river monitoring (within Hydrocare EU project)”
 PI
- 2007 Siciliacque SpA (Sicilia Water Company) - Palermo, Italy
 “Leak detection in transmission mains by means of transient tests”
 PI
- 2007 Federutility (Confederation of the Italian Water Companies) - Rome, Italy
 “Energy and leakage management in pipe systems”
 PI
- 2007 University of Perugia - Perugia, Italy
 “Innovative criteria for pipe system management”
 PI
- 2007 Italian Ministry of Education, University and Research (MIUR) Project of Relevant
 National Interest (PRIN 2007)
 “Innovative techniques for the diagnosis of pressurised pipe systems”
 PI
- 2006 Direzione del Genio Militare per la Marina (Italian Navy) - Roma, Italy
 “Check of the moorings of the Italian Navy Club at Tiber river in Rome”
 co-PI
- 2006 Federutility (Confederation of the Italian Water Companies) - Rome, Italy
 “Management and monitoring of well-fields”
 PI
- 2006 Federutility (Confederation of the Italian Water Companies) - Rome, Italy
 “Numerical models and Geographic Information System (GIS) for pipe system
 management” and “Monitoring and rehabilitation of pipe networks”
 PI
- 2005 ASTEA SpA (Osimo and Recanati Water Company) - Osimo, Italy
 “Capture area of the Marolino (Potenza Picena) e Acquesalate (Montecassiano)
 well-fields: pumping tests and numerical models”
 PI
- 2005

- Sintagma Srl - Perugia, Italy
 ”Interaction between Corno river and the state road S.S. no.320 “Di Cascia”
 PI
- 2005 EIUT - Ente Irriguo Umbro-Toscano (Toscana and Umbria Irrigation Authority) -
 Arezzo, Italy
 ”Bottom spillway of the Montedoglio dam: advanced numerical CFD model”
 PI
- 2004 Spoleto Municipality - Spoleto, Italy
 “Check of the landslide risk at Ancaiano”
 co-PI
- 2004 Spoleto Municipality - Spoleto, Italy
 “Analysis of the pipe system of Montemartano”
 co-PI
- 2004 European Union
 “AMMA - African Monsoon Multidisciplinary Analyses”
 co-PI
- 2003 Italian Ministry of Education, University and Research (MIUR) Project of Relevant
 National Interest (PRIN 2003)
 “Leakage detection in the management of water supply systems: innovative tech-
 niques and vulnerability analysis of the entry of uncontrolled liquid”
 co-PI
- 2003 ASMM (Tolentino Water Company) - Tolentino, Italy
 “Capture area of the Cisterna (Tolentino) well-field: pumping tests and numerical
 model”
 PI
- 2002 Italian Ministry of Education, University and Research (MIUR) Project of Relevant
 National Interest (PRIN 2003)
 “Transient test-based techniques for fault detection in pipe systems”
 PI
- 2002 European Union
 “Surge-net - Organizations involved in the prediction and analysis of fluid tran-
 sients in pipe systems (GTC1-2001-43053)”
 PI
- 2000

- Perugia Consorzio Acquedotti (Perugia water supply company) - Perugia, Italy
 “Extreme transient pressures in the Media Valle del Tevere transmission main”
 PI
- 2000 Italian Ministry of Education, University and Research (MIUR) under the Project
 of Relevant National Interest (PRIN 2000)
 “Transient local velocity field and energy dissipation in pressurized pipes”
 PI
- 1999 Umbria Region Water Authority
 “Criteria for the survey of pipe and drainage systems in the Umbria Region”
 PI
- 1998 Italian Ministry of Education, University and Research (MIUR) under the Project
 of Relevant National Interest (PRIN 1998) “Wave breaking analysis”
 PI
- 1998 De Lieto Costruzioni Generali SpA - Napoli, Italy
 “Laboratory model of the emergency and bottom spillways of Chiascio dam”
 PI
- 1997 Italian Ministry of Education, University and Research (MIUR) under the Project
 of Relevant National Interest (PRIN 1997)
 “Hydrodynamic characterization of transients in hydro-systems with applications
 for the diagnosis of pressurised pipe networks”
 PI
- 1997 European Union
 “Transient pressures in pressurized conduits for municipal water and sewage wa-
 ter transport (SMT4-CT97-2188)”
 PI
- 1996 AST Recanati (Recanati Water Company) - Recanati, Italy)
 “Capture area of the Chiarino well-field: pumping tests and numerical model”
 PI
- 1995 National Research Council of Italy (CNR)
 “Drinking water management: modeling of groundwater flow and pipe systems”
 PI
- 1994 AST Recanati (Recanati Water Company) - Recanati, Italy)
 “Capture area of the Vallememoria well-field: pumping tests and numerical model”
 PI

- 1994 Autorità Portuale di Genova (Genova Harbour Authority) - Genova, Italy))
 “The rehabilitation of the Duca di Galliera breakwater at Genoa port: laboratory
 model”
 PI
- 1994 Italian Ministry of Education, University and Research (MIUR) under the Project
 of Relevant National Interest (PRIN 1994)
 “Pollutant transport phenomena in groundwater”
 PI
- 1993 AST Recanati (Recanati Water Company) - Recanati, Italy
 “Configuration and steady-state behavior of the Recanati pipe system”
 PI