

CV of Carlo Doglioni

orcid-ID 0000-0002-8651-6387

Born in Feltre (Italy), 1957

Liceo Classico (Feltre), 1975

Doctor in Geology at the University of Ferrara, 1981

Assistant at the University of Ferrara, 1981-1983

Post-Doc at the University of Basel (CH), 1983-1984

Researcher at the University of Ferrara, 1983-1992

Associate professor University of Bari 1992-1994

Full Professor University of Basilicata, 1994-1997

Full Professor of Geodynamics, Sapienza University – Roma, 1997-

President Istituto Nazionale di Geofisica e Vulcanologia, 2016-2025

Vice-President Accademia dei Lincei and President of the Physical Sciences Class, 2024-

Experiences:

1985 - Visiting researcher at the University of Oxford,

1988; 1992; 1994 - Visiting researcher at the Rice University in Houston,

2015 - Visiting researcher at Columbia University, Lamont-Doherty Lab, New York,

1995 - Scientific party ODP Leg 161 in the western Mediterranean

1999 – present Research Associate of CNR-IGAG,

Field research besides Italy: in Morocco, Mexico, Iran, Tunisia, Bulgaria, Hungary, Greece, Turkey, Japan, California, El Salvador, Ecuador, Iceland

Supervisor of 15 PhD thesis

Awards:

1986 - Dal Piaz Award of the Italian Geological Society

1994 - Distinguished Lecturer of the AAPG, US tour

2004 - Spendiarov Award of the Russian Academy of Sciences, 32° IGC

2005 - Distinguished Lecturer of the AAPG, Europe tour

2009 - Alfred Wegener Award, European Association of Geoscientists and Engineers

2009 - Premio Sapienza Ricerca

2009 - Premio Bellunesi nel Mondo

2013 - Premio Santi Vittore e Corona, Feltre

2015 - Honorary Professor of Chinese Geosciences University, Beijing

2016 - 100 Eccellenze Italiane

2017 - Premio Speciale Majella 2017 con Silvia Peppoloni

2018 - Robert R. Berg AAPG Award for Outstanding Research

2018 - School of Advanced Studies Award UniCam Università di Camerino

2025 - PhD honoris causa Università di Catania

Academies:

2005 - Member of the Academia Europaea

2006 - Member of the Istituto Lombardo di Scienze Lettere ed Arti

2007 - Member of the Istituto Veneto di Scienze Lettere ed Arti

2009 - Member of the Accademia dei Lincei

2011 - Member of the Accademia Nazionale delle Scienze, detta dei XL

2014 - Member of the European Academy of Sciences and Arts

2016 - Member of the Accademia delle Scienze di Torino

2022 - First Italian in tectonics and geophysics of the Stanford University evaluation of world Geoscientists

<http://dx.doi.org/10.17632/btchxktzyw.1#file-bade950e-3343-43e7-896b-fb2069ba3481>
<https://doi.org/10.1371/journal.pbio.3000384>

Google Scholar: H index 73, Citations 19.000

<http://scholar.google.com/citations?user=LBFxf2IAAAAJ&hl=en>

Services:

Member of the Tectonics Panel, Ocean Drilling Program, 1992-1994

Director of the Geodynamics Department at the University of Basilicata, 1994-1997

President of the CNR strategic project CROP – Crosta Profonda (CNR-AGIP-ENEL), 1999-

Member of the PhD Earth Science program – Collegio di dottorato Sapienza 2002-2008

Member of the Italian Geological Committee, 2003-

Vice-President of the Italian Geological Society, 2003-2008

Editor-in-Chief of Terra Nova 2003-

Editor-in-Chief of Earth Science Reviews 2012-

Associate Editor of Tectonics 2004-2012

Associate Editor of the Brazilian Journal of Geology 2013-2018

Council member of Geoscience Frontiers, 2020-

Editorial board Journal Structural Geology, 1987-2007; Bull. Soc. Géol. de France 2000-2005 Compte Rendu Ac. Sci. Bulgare, 2006-; Italian Journal of Geosciences 2000-2005

Coordinator project-PI of Sismologia 1 of the Italian Civil Protection 2008-2010

Chairman of the School in Geological Sciences (Sapienza University) 2009-2012

President of the Italian Geological Society 2009-2014

Scientific Panel of the CNR-Dipartimento Terra e Ambiente 2010-2014

Research Panel (Sapienza University) 2010-2011

Commission of the Accademia dei Lincei for Environment and the Natural Hazards 2010-

Commission of the Accademia dei Lincei for Scientific Research 2014-

Reviewer of ERC, ESF, MIUR-PRIN, CIVR, ANVUR, International Private and Public universities, foundations and institutions, etc.

Chairman Commissione Abilitazione Scientifica Nazionale Area 04/A2 - 2012-2014

International Atomic Energy Agency-IAEA expert 1998-2000

Member of the National Committee for International Union of Geological Sciences 2010-

Member of the CIRM, Ministry of Industry, Ministry of Environment of Italy 2012-

Member of the Scuola Studi Avanzati Sapienza 2014-2018

Member of the ANVUR-GEV 04 panel 2015-2016

Member of the Scientific Council of the Med-Or Foundation 2025-

President of Istituto Nazionale di Geofisica e Vulcanologia (INGV) 27/4/2016-26/3/2025

International Union of Geological Sciences (IUGS) delegate for the ISC GeoUnions, Committee on Disaster Risk Reduction (DRR) 2020- <http://www.iscgdrr.com/>

Vice President Accademia Nazionale dei Lincei 1/8/2024-present

Research activity:

- Asymmetry of orogens and foreland basins as a function of the subduction polarity
- Asymmetry of rift zones
- Rotational and tidal forces on plate tectonics
- Evidence for the polarization of plate tectonics and westward drift of the lithosphere
- Seismicity versus Earth's rotation, lithostatic load and tectonic setting
- Mechanisms and energy of earthquakes
- Structure and geodynamic evolution of the Alps, Apennines and the Mediterranean
- Relationship between tectonics and sedimentation

Main achievements:

- Tectonic mainstream of plate motion
- Tectonic asymmetry of plate boundaries
- Earth's rotation and tidal drag in driving plate tectonics
- New model on earthquake generation (graviquakes and elastoquakes)
- Atlas of the Italian deep crust (CNR-Agip-Enel) - Mediterranean geodynamics

Fundings and research grants:

- PI of European Project, Miur-Prin (both national and local coordinator), ASI, CNR, Sapienza University, PI of several industrial contracts

PhD programs

He has supervised doctoral theses at the University of Bari and Sapienza University of Rome, and has also co-supervised doctoral students from other institutions.

The 15 doctoral students for whom he served as supervisor, in addition to others for whom he was co-supervisor, have gone on to become researchers at various research institutions (CNR, INGV, ISPRA). Others work at foreign universities, foreign research institutes, or in industry.

He was a member of the Doctoral College at Sapienza University from 2002 to 2008.

He has served on dozens of doctoral examination committees, both in Italy and in other European countries.

Furthermore, he has taught several courses for doctoral students at various national institutions, as well as in Switzerland and China.

He has participated in numerous selection processes for various cycles at Sapienza University for admission to doctoral programs.

CUN classification:

GSD 04/GEOS-02 SSD GEOS-02/C

Classes:

- Geodynamics and sedimentary basins (12 cfu)
- Geology of Italy (3 cfu)

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<https://scholar.google.com/citations?user=LBFxf2IAAAAJ&hl=en&oi=ao>

Main scientific contributions by Carlo Doglioni with a number of co-authors:

- The recognition and description of Triassic tectonics and diapiric features in the Dolomites (1984, *Eclogae Geol. Helv.*);
- The analysis and unravelling of klippen in the Dolomites (1985, *Eclogae Geol. Helv.*);
- A model for sea-level changes due to Earth's axis oscillation (1990, *Nature*);
- The reconstruction of the structure and kinematics of the eastern Southern Alps (1992, *Eclogae Geol. Helv.*; 1992, *Thrust Tectonics*; 2008, *Memorie Carta Geol. d'Italia*) and the Central (2015, *Gondwana Research*) and Southern Apennines (2005, *Tectonics*);
- The geodynamic evolution of the Mediterranean region (1997; 1998; *Terra Nova*; 1999, *Bollettino Soc. Geol. Italiana*; 2005, *Encyclopedia of Geology*; 2012, *Tectonophysics*);
- The proposition and demonstration of the existence of a mainstream of plate motions, exemplified by the definition of the 'tectonic equator' (1990, *J. Geodynamics*; 1993; *Geological Soc. London*; 2007, *Geophysical J. Int.*; 2007, *Geol. Soc. America Sp. Publ.*);
- The interplay between tectonics and sedimentation as a function of the geodynamic setting (1997; 1998, *Marine and Petroleum Geology*);
- The 'westerly' polarization of the lithosphere relative to the underlying mantle;
- The asymmetry of subduction zones as a function of their geographic direction relative to the tectonic equator (1990, *J. Geodynamics*);
- The asymmetry of rift zones as a function of their geographic direction relative to the tectonic equator (2010, *Geology*; 2017, *Lithos*);
- The mantle depletion at rift zones and the uplift of Africa and Europe and (2003, 2009; *Tectonics*);
- The asymmetry of the regional monocline of the Alps and the Apennines as a function of the subduction polarity (2000, *Earth Planetary Sci. Letters*);
- The structural grain of the Apennines accretionary prism in the Ionian Sea (1999, *Earth Planetary Sci. Letters*);
- The subsidence of Venice generated by the Apennines subduction (2003, *Geophysical Research Letters*);
- The Mesozoic origin of the Ionian Sea (2001, *Geophysical J. International*);
- The structural difference of the orogens with respect to the westward drift of the lithosphere comparing Mediterranean (e.g., Alps and Apennines belts) and western versus eastern Pacific subduction zones (1999, 2012; *Earth Science Reviews*);
- The different origin of foredeep basins and trenches as a function of the subduction polarity (1993, *Tectonophysics*; 1994, *Geology*);
- The origin of W-directed subduction zones (1999, *Geol. Soc. London Sp.P.*);
- The computation of subduction rate worldwide with a new formula where convergence rate is partitioned into upper plate contraction and subduction rate being this value controlled by the versus and rate of the subduction hinge (2007, *Earth Science Reviews*; 2008, *Earth Planetary Sci. Letters*);
- The occurrence of a new mantle and a new forming Moho in the hangingwall of the W-directed subduction zones (1991, *Terra Nova*);
- The origin of the Apulian uplift in the foreland of the Southern Apennines (1994, *Tectonics*);
- An alternative interpretation of the California-San Andreas system geodynamics (1996, *Terra Nova*);
- The geodynamic origin of the Etna volcano along a transfer zone of the Apennines subduction (2001, *Terra nova*);
- The structure of the Eastern Balkans (1996, *Marine and Petroleum Geology*);
- The origin of the Aegean and western Anatolia rift and related magmatism (2002, *J. Virtual Explorer*; 2005, *Marine Geology*; 2010; *Tectonophysics*);
- The opposite migration of fault rupture and seismicity of thrusts versus normal faults (2004, *Earth Science Reviews*);
- The absence of relation of the subduction dip with age and convergence rate of the slab (2005, *Earth and Planetary Science Letters*);
- The El Salvador geodynamic and volcanic setting (2007, *G3*);
- The discovery and interpretation of carbonatites at the Vulture volcano (2007, *Lithos*);
- The existence of two coexisting rotations of single plates or subrotations (2008, *Tectonics*);
- The asymmetry and origin of mantle wedges at subduction zones (2007, *Lithos*);
- Structure and evolution of salients and recesses in accretionary prisms (2017, *J. Geophys. Res*);
- The shallow origin of mantle plumes (2005; 2015, *Geol. Soc. America Sp. Publ.*);
- The sediment composition as a function of subduction polarity (2008, *J. of Geology*);
- The paleomagnetic signature of the Southern Alps (1993; 1994, *Tectonics*);
- The tidal tuning of plate tectonics and seismicity (2006, *Bulletin Geol. Soc. America*; 2010, *Tectonophysics*);
- The South Zagros structure (2015, *Gondwana Research*; 2017, *-Tectonophysics*);
- The polarization and origin of plate tectonics (2015, *Advances in Geophysics*; 2017, *Scientific Reports*);

- The role of the brittle-ductile transition on fault activation (2011, Physics of the Earth and Planetary Interiors);
- The lower strain rate in areas of higher seismic hazard (2012, Physics of the Earth and Planetary Interiors);
- The energy distribution of seismicity across the globe (2012, Tectonophysics)
- The colonization of life of lands in the Cambrian (2016, Geoscience Frontiers);
- The gravitational energy of normal fault-related earthquakes or graviquakes (2011, Physics of the Earth and Planetary Interiors; 2015, Scientific Reports; 2015, Tectonophysics; 2017; Scientific Reports; 2019, Scientific Reports);
- The fluids behaviour as a function of the interseismic, preseismic and coseismic times (2014, Geoscience Frontiers; 2017, Scientific Reports);
- The longer duration of seismic sequences associated to graviquakes (2017, Scientific Reports);
- A classification of induced seismicity (2018, Geoscience Frontiers);
- The coseismic subsidence increasing masonry damages during earthquakes (2019, Soil Dynamics and Earthquake Engineering);
- The requirement of a dilated/fractured volume in the brittle crust during the interseismic period in order to allow the generation of normal fault earthquakes or graviquakes (2019, Scientific Reports).
- Unlike other thrust and strike-slip earthquakes, normal fault earthquakes are controlled by gravity and not elastic rebound (2019: 2020, Annals of Geophysics).
- The low frequency oscillation (>6 months) of the solid Earth's tides horizontal component is able to drag plates, i.e., providing a clue for triggering plate motions and mantle convection (2020, Earth Science Reviews).

CD started his studies in geology when the 1976 magnitude 6.5 Friuli earthquake devastated northeast Italy and caused 1,000 deaths. Four years later in southern Italy, Irpinia, another magnitude 6.9 event had 3,000 victims. In both events, a vast population was homeless, and the economy was widely disaggregated. It was, for him, more than a science pursuit. It was a duty for him to bring his scientific career in understanding earthquakes to eventually minimize the disaster generated by these events. Therefore, studying earthquakes melts together the passion for science with the wish to be useful to society.

CD was born in Feltre, Italy, at the foot of the Dolomites in the Southern Alps. He turned his considerable academic talents toward the study of geology at the University of Ferrara. After obtaining his doctoral degree in 1981, CD spent the next decade working with professors at Ferrara to publish numerous studies on the structural geology of the Dolomites, along with several sole-author papers on unifying models for thrust belts and plate tectonics. During this period, CD completed a post-doc at the University of Basel and served as a visiting researcher at Oxford and Rice Universities. These collaborations beyond the Italian Alps inspired him to construct an integrated and dynamic earth model from field, subsurface and geophysical observations.

In 1992, CD became Associate Professor at Bari University. Adding studies of the Apennines and western Mediterranean to his laboratory, he expanded on his theory that there is a polarity to global tectonics, and that a westward drift of the lithosphere relative to the underlying mantle governs plate motions and provides recognizable, coherent tectonic patterns. An eloquent summary entitled “Geological evidence for a global tectonic polarity” was published in the Journal of the Geological Society, London (1993). After three years as Full Professor at University of Basilicata (Potenza), CD moved to Rome in 1997 to become Professor of Geodynamics, Sapienza University. As a teacher, he continued to solve local and global tectonic puzzles while he supervised numerous masters’ theses and sixteen PhD dissertations. He and his students researched everything from ancient outcrops to active volcanoes and deep ocean basins (as a member of ODP Leg 161 in 1995). CD augmented his intense knowledge of Italian rocks with field excursions throughout the northern hemisphere, from Japan to El Salvador, and visits to Rice and Columbia Universities. In recent years he has expanded his research to address the mechanism of earthquakes.

CD has served in over two dozen commissions, committees, editorial boards, panels and university leadership positions, including two tours as an AAPG Distinguished Lecturer and President of the Italian Geological Society from 2009 to 2014. He has received more than a dozen major awards, including the EAGE Alfred Wegener Award, and was elected at the Accademia dei Lincei (a prestigious academic institution founded in 1603) in 2009 and the Accademia dei XL (founded in 1782) in 2011. Since 2005 he was also appointed in the Academy of Europe. In 2016, CD was named President of the National Institute of Geophysics and Volcanology (INGV), where he has continued his fight to understand the restless earth and bring fact-based science to the public. As he looks to the future, CD hopes to stimulate research on the environment and new energy resources for Geosciences. His ability to create a holistic model from disparate observations served as an example to a large number of students and colleagues all over the world.

Unsatisfied with developing a fresh view of plate tectonics, CD has turned his attention in this millennium to new areas of research, communication and service. Since 1982, CD has authored or co-authored over 200 peer-reviewed research papers. Google Scholar notes that his papers have been cited over 13,400 times – 5,300 since 2015. As head of INGV, his news interviews and open-forum discussions inform the public and positively impact seismicity research.

According to CD, in Italy there are two mountain belts, the Alps and Apennines, but they

are so different. The Alps are higher, involve deep-seated metamorphic rocks, thick-skinned tectonics is dominant, they have two shallow foredeeps, a thick crust and lithosphere, no back-arc basin and a shallow subduction zone. The Apennines are exactly the contrary, having low topography, one single deep foredeep, the accretionary prism is mostly composed by sedimentary rocks, i.e., dominant thin-skinned tectonics, a widespread back-arc basin and a steep westerly directed subduction zone. In his publications, these asymmetries mimic the differences between the eastern (e.g., Cordilleras, Andes) and the western Pacific subduction zones (Aleutians, Marianas, etc.). All this agrees with the global tectonic polarity, i.e., the westward drift of the lithosphere relative to the underlying asthenospheric mantle detected in any hotspot reference frame and manifested by what he named as 'tectonic equator' that is about 28 degrees inclined with respect to the geographic equator. These observations highlight a mainstream of plate motions. According to the candidate, the Gutenberg-Richter law shows how seismicity is globally controlled; therefore, there must be a force at the planet scale fuelling plate tectonics. This supports that mantle convection acts contemporaneously with an astronomical engine and geodynamics is a self-organized chaotic system in which several forces work together.

To put it another way, CD said the Earth is forever restless and there needs to be a constant vigil on watching and recording that restlessness. "Everything in our environment is controlled by gradients, any type of gradients, e.g., pressure, temperature, electric, chemical, economic, societal, etc. The Earth is alive because it steadily regenerates gradients or is controlled by gradients, either internal or external, maintaining the active system. It is essential to fully understand and quantify those interdependent gradients." Since August 2024 is President of the Physical Sciences Class of the Accademia dei Lincei and Vice-President of the Academy.