



Europass Curriculum Vitae

Personal information

Surname / First name

Telephone

Personal Email

Nationality

De Marchi Fabrizio

Italian

Work experience

Dates

Occupation or position held

Main activities and responsibilities

Name and address of employer

Oct. 2021 - now

Postdoctoral researcher

The radioscience experiments: analysis by semianalytical models, numerical simulations and geomorphology of Mercury and Ganymede surfaces.

Department of mechanical and aerospace engineering. University of

Dates

Occupation or position held

Main activities and responsibilities

Name and address of employer

Oct. 2020 - Sept. 2021

Postdoctoral researcher

Numerical simulations and analysis for the gravity experiment of the VERITAS mission: by simulating the joint analysis of Doppler tracking data and tie points provided by the onboard synthetic aperture radar, we show that VERITAS would provide strong constraints on the interior structure of the planet. In particular we show that VERITAS would provide accuracies in the estimates of the tidal Love number k_2 to 3.9×10^{-4} , its tidal phase lag to 0.04° and the moment of inertia factor to 1.4×10^{-3} (0.4% of the expected value). VERITAS has been definitely approved on June 2nd, 2021

Department of mechanical and aerospace engineering. University of

Dates

Occupation or position held

Main activities and responsibilities

Name and address of employer

Oct. 2019 - Sept. 2020

Postdoctoral researcher

The radioscience experiments MORE and 3GM onboard BepiColombo and JUICE missions: analysis by semianalytical models, numerical simulations and geomorphology of Mercury and Ganymede surfaces. The semianalytical model for the covariance analysis of MORE (see below for details) has been improved in order to deal with several mission at the same time. Regarding 3GM experiment onboard JUICE, I quantified the gravity anomalies generated by different materials (clean or dirty ice) on the Ganymede's surface.

Department of mechanical and aerospace engineering. University of

Dates

Occupation or position held

Sept. 2018 - Oct. 2019

postdoctoral researcher

Main activities and responsibilities	The radioscience experiment MORE onboard BepiColombo: analysis by semianalytical models and numerical simulations. I investigated the potentialities to test the General Relativity theory of two interplanetary missions to Mercury (BepiColombo and MESSENGER). The semianalytical model I developed for BepiColombo during my postdoc at Pisa (see below) has been optimized and other effects have been included (e.g. massive graviton). Again, uncertainties on ephemerides have been taken into account.
Name and address of employer	Department of mechanical and aerospace engineering. University of
Dates	Oct. 2016 - Sep. 2018
Occupation or position held	Postdoctoral researcher
Main activities and responsibilities	Simulations of the geodesy measurements with the VERITAS mission to Venus. We developed a method to estimate the crustal thickness of a planet and we applied it to Venus. The gravity field anomalies of the planet are assumed to be due to the combined effect of topography and relief on the crust-mantle interface. We calculated a map of the crustal thickness of Venus and compared our results with those predicted by previous work and with the global distribution of main geological features (e.g. rift zones, tesserae, coronae). Moreover, we developed an accurate error budget for the Doppler measurements to be used in simulations for the determination of the gravity field of Venus.
Name and address of employer	Department of mechanical and aerospace engineering. University of
Dates	Sept. 2015 - Aug. 2016
Occupation or position held	Postdoctoral researcher
Main activities and responsibilities	Orbit determination for space probes in the Jupiter and Saturn systems by global updating of planetary ephemerides. The work was focused on the ESA mission JUICE. We developed an hydrostatic model for the interior of Ganymede, satellite of Jupiter which is supposed to have a liquid ocean below the crust, and we performed simulations for the determination of the gravity field and the rotational state of the satellite.
Name and address of employer	Department of mechanical and aerospace engineering. University of
Dates	May 2013 - April 2015
Occupation or position held	Postdoctoral researcher
Main activities and responsibilities	The radioscience experiments of BepiColombo and JUNO missions. The Relativity experiment of BepiColombo will be a modern version of the traditional tests of General Relativity, based upon Mercury's perihelion advance and the relativistic light propagation near the Sun. We define the mathematical methods to be used to extract from the data of the BepiColombo mission the best constraints on the post-Newtonian parameters β , γ and the Nordtvedt parameter η , but also the gravitational oblateness of the Sun $J_{2\odot}$, the preferred frame parameters α_1 , α_2 and the rate of change in time (ζ) of the Sun's GM. We have performed a full cycle simulation of the BepiColombo radio science experiments, including this Relativity experiment, with the purpose of assessing in a realistic way the accuracy achievable on each parameter of interest. Moreover, I developed an analytical model to quantify the effects of the uncertainties on the gravitational parameters of planets and asteroids on the results of the Relativity experiment.
Name and address of employer	Department of mathematics. University of
Dates	Oct. 2011 - April 2013

Occupation or position held Main activities and responsibilities	Postdoctoral researcher Geodesic motion with a double pendulum (PETER): Lagrangian model and disturbance estimation. In preparation for the flight of LISA-Pathfinder, a torsion pendulum is a useful tool to understand and characterize all possible sources of spurious noise that can affect the free fall of a test mass in geodesic motion. PETER is a double torsion pendulum where force-free motion has to be achieved simultaneously in two different degrees of freedom. I developed, with a Lagrangian approach, a dynamical model that describes the most significant oscillations modes of PETER and its forced motion caused by magnetic damping, tilt noise, seismic disturbances, etc.
Name and address of employer	Department of physics
Dates	April - Sept. 2011
Occupation or position held Main activities and responsibilities	Postdoctoral researcher Optimization of the LISA (Laser Interferometer Space Antenna) rendez-vous. The purpose was to semi-analytically optimize the orbital parameters of the LISA constellation in order to minimize the perturbations coming from the Earth-LISA interaction. Including non-autonomous perturbations, an estimate of Doppler shift and breathing as a function of the trailing angle have been provided. Both LISA and NGO (New Gravitational wave Observatory) configurations have been analyzed.
Name and address of employer	Department of physics. University of
Dates	March 2009 - March 2011
Occupation or position held Main activities and responsibilities	Postdoctoral researcher Data analysis for LISA. I developed a MATLAB code to calculate the force and torque on the test mass (LISA Pathfinder mission) as a function of the time, taking into account input voltages and a Poissonian model of charge accumulation.
Name and address of employer	Department of physics. University of
Dates	Oct. 2008 - Feb. 2009
Occupation or position held Main activities and responsibilities	Postdoctoral researcher Perturbations on the LISA orbits due to the Earth-Moon system. We calculate analytically, with a perturbative approach, the effect of the Earth-Moon system on the free-fall motion of LISA test masses. We obtain that a few harmonics of the Earth-Moon gravitational potential can be detected in the Doppler data collected by the LISA space mission and we conclude that the Earth-Moon system gravitational near field could provide an additional crosscheck to the calibration of LISA.
Name and address of employer	Department of physics. University of
Dates	Feb. - Sept. 2008
Occupation or position held Main activities and responsibilities	Fellow Preservation of Lascaux cave. Data from high precision thermometers, hygrometers and dew-point sensors placed into the Lascaux cave (France) have been analyzed in order to describe the stability of the microclimatic conditions of the Paleolithic paintings site.
Name and address of employer	nstitute of Atmospheric Sciences and Climate (ISAC) of the Italian National Research Council (CNR)

Education and training

Dates	March 2013
Title of qualification awarded	MASTER: "Space science and technology" (Scienza e tecnologia spaziale)
Principal subjects/Occupational skills covered	The Master provides a highly qualified preparation on the scientific issues of the space exploration. The master aim at the formation of a successful professional with a polyhedric preparation on the many aspects and interaction between the research and the business worlds.
Name and type of organization providing education and training	Department of Mathematics. University of
Level in national or international classification	2nd level Master (Italian classification)

Dates	May 23, 2008
Title of qualification awarded	Ph.D. in Astronomy.
Principal subjects	My PhD thesis presents the analysis of a large sample of photometric data relative to the super metal-rich open clusters NGC6791 and NGC6253. The main goal of the surveys was the search for extrasolar planets using the transits method. I contributed to the extrasolar planet search by making numerical simulations in order to estimate the number of expected transiting planets. Moreover, I analyzed the entire sample of light curves in order to find variable stars. I discovered 260 new variable stars in the field of NGC6791 and 597 in the field of NGC6253. The classification of all variables is presented and discussed in this work.
Name and type of organization providing education and training	Department of Astronomy, University of .

Dates	July 22, 2004
Title of qualification awarded	Master's degree in Astronomy. Mark: 106/110
Principal subjects	Photometric data for 216 clusters were collected from the literature and 2782 blue stragglers stars (BSS) candidates were extracted from 76 of them. I found that the anticorrelation of BSS frequency vs. total magnitude identified in similar studies conducted on Galactic globular clusters extends to the open cluster regime: clusters with smaller total magnitude tend to have higher BSS frequencies. Moreover, a clear correlation between the BSS frequency and the age of the clusters was found. A simple model is developed here to try to explain this last and new result. The model allows us to ascertain the important effect played by mass loss in the evolution of open clusters.
Name and type of organization providing education and training	Department of Astronomy, University of .

Dates	July 1997
Title of qualification awarded	High school graduation
Name and type of organization providing education and training	Scientific High School

Mother tongue
Other language(s)

*Self-assessment
European level^(*)*

Italian

English, French

Understanding		Speaking		Writing
Listening	Reading	Spoken interaction	Spoken production	

English

French

C1 Proficient user	C2 Proficient user	C1 Proficient user	C1 Proficient user	C1 Proficient user
B2 Independent user	C2 Proficient user	B2 Independent user	B2 Independent user	B2 Independent user

(*) Common European Framework of Reference (CEF) level

Technical skills and competences

Lagrangian mechanics, celestial mechanics (perturbation theory, orbit determination). Data analysis: nonlinear least squares, signal extraction from time series data, frequency-domain analysis. Analysis of astronomical (photometric) data.

Computer skills and competences

Very good knowledge of computer programming languages Fortran 77/90 usage. Good knowledge of MATLAB usage. Excellent knowledge of *Mathematica* software usage.

Driving licence(s)

Category B. Motor vehicles.

Teaching experiences

Dates

Feb. 2010 - Jul. 2010

Position held

Graduate teaching assistant

Course

General Physics 1 at the Faculty of Engineering (Laurea Triennale Civile e Ambientale) of

Dates

Oct. 2008 - Jan. 2009

Position held

Teaching fellow

Course

Calculus (Analisi Matematica 1) at the Faculty of Agriculture Sciences

Dates

Mar. - Jun. 2007

Position held

Graduate teaching assistant

Course

Course: General Physics 1 at the Faculty of Agriculture Sciences

Additional information

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citations

579

Documents by author

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Meetings and conferences

BepiColombo first annual Science Team Meeting - Pasadena, USA. November 9-11 2022.

44th COSPAR Scientific Assembly - Athens, Greece. July 16-24, 2022.

XVII Congresso Nazionale di Scienze Planetarie - Napoli, Italy. June 20-24, 2022.

EGU General Assembly 2022 - Vienna, Austria, 23–27 May 2022.

2021 AGU Fall Meeting - New Orleans, USA, 13-17 December 2021.

Second European Physical Society Conference on Gravitation: measuring gravity - online conference. July 5-7, 2021.

Public conference. Department of Physics Univ. Tor Vergata - Roma, Italy. June 4, 2020.

Online interview. TV3 Baiano - Roma, Italy. May 11, 2020.

Public conference. Associazione Tuscolana Astronomia - Roma, Italy. March 31, 2020.

XVI Congresso Nazionale di Scienze Planetarie - Padova, Italy, 3-7 Feb. 2020.

Public conference. Gruppo Astronomico Tradatese - Tradate (VA), Italy. May 20, 2019.

XV Congresso Nazionale di Scienze Planetarie - Firenze, Italy, 4-8 Feb. 2019.

5th IEEE International workshop on Metrology in Aerospace - Roma, Italy. June 20-22, 2018.

Public conference. I cieli di Brera - Milano, Italy. June 13, 2018.

2017 AGU Fall Meeting - New Orleans, USA, 11-15 December 2017.

PSG Cassini Meeting - Pasadena, USA, 11-15 September 2017.

BepiColombo 14th Science Working Team Meeting - Tokyo, Japan, 7-10 November 2016.

V Italian-Pakistani workshop on Relativistic Astrophysics - Lecce, Italy, 22-23 July 2016.

XII Congresso Nazionale di Scienze Planetarie - Bormio (SO) Italy, 2 - 6 February 2-6, 2015.

Complex Planetary Systems - IAU Symposium - University of Namur, Belgium. July 7-11, 2014.

JUNO Science Team Meeting - Boulder (CO), USA, 24-28 March 2014.

CELMEC VI - The Sixth International Meeting on Celestial Mechanics. San Martino al Cimino, Viterbo (Italy). September 1-7, 2013.

First AstroNet-II Training School: "Astrodynamics of natural and artificial satellites: from regular to chaotic motions". January, 14-17 2013, University of Roma "Tor Vergata".

9th LISA Symposium. May 21-25, 2012, BnF-Paris.

38th COSPAR Scientific Assembly. 18-25 July 2010, in Bremen, Germany.

CELMEC V - The Fifth International Meeting on Celestial Mechanics. San Martino al Cimino, Viterbo (Italy). September 6-12, 2009.

Scuola Nazionale di Astrofisica: "Oggetti compatti e Pulsar - Scienza con ALMA". Cagliari, May 20-26, 2007.

Scuola Nazionale di Astrofisica: "Ammassi di galassie - Plasmi astrofisici". Trieste October 1-6, 2006.

Summer School: "Physics of the Interstellar Medium". International Max Planck Research School for Astronomy and Cosmic Physics at the University of Heidelberg. September 25-29, 2006

Scuola Nazionale di Astrofisica: "Dinamica delle galassie - Nuclei galattici attivi". Bertinoro (Italy). May 7-12, 2006

December 1st, 2022