

PERSONAL INFORMATION

<i>First Name</i>	Elisa Maria	<i>Citizenship</i>	Italian
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<i>Date of birth</i>	April 19, 1981	<i>E-mail Address</i>	em.alessi@ifac.cnr.it

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EDUCATION

09/2007 – 10/2010 **Ph.D. cum laude in Applied Mathematics**, funded by Marie Curie fellowship
 Universitat de Barcelona (Spain)
 “The Role and Usage of Libration Point Orbits in the Earth – Moon System”
Supervisors: Prof. G. Gómez and J.J. Masdemont

10/2005 – 07/2007 **Master’s Degree in Applied Mathematics**
 Universitat de Barcelona (Spain)
 “Numerical approximation of invariant tori”, Prof. À. Jorba
 “Leaving and reaching the Moon from a libration point orbit”, Prof. G. Gómez

10/1999 – 03/2005 **Master’s Degree in Physics**
 Università degli Studi di Padova (Italy)
 “Low-energy transfers in the Elliptic Restricted Three-Body Problem”
Supervisor: Dr. S. Casotto

09/2003 – 04/2004 **Visiting student**
 University of California Los Angeles (U.S.A.)

EXPERIENCE

09/2016 – 08/2019 **Researcher**, funded by ReDSHIFT H2020 project
 Istituto di Fisica Applicata Nello Carrara - CNR (Italy).
Space debris dynamics: special emphasis on the design of passive end-of-life disposal trajectories, perturbation modeling and effects

12/2015 – 05/2016 **Maternity Leave**

12/2012 – 08/2016 **Research Fellow**, funded by SPARC EU project
 Istituto di Fisica Applicata Nello Carrara - CNR (Italy)
Space debris and asteroids dynamics: end-of-life disposal trajectories, environmental analysis, impact dynamics on rocky bodies

07/2013 – 08/2013 **Visiting Researcher at IMCCE**
 IMCCE – Laboratoire d’astronomie de Lille (France)
Luni-solar perturbation effects on MEO

11/2010 – 12/2012 **Research Fellow**, funded by ASI
 Department of Mathematics, Università degli Studi di Pisa (Italy)
Orbit determination for the radioscience experiment of the BepiColombo mission

09/2007 – 10/2010 **Early Stage Researcher, AstroNet – Marie Curie RTN**
 Institut d’Estudis Espacials de Catalunya, Barcelona (Spain)
Dynamical systems tools applied to astrodynamics, numerical integration methods and their application to Solar System dynamics

10/2009 – 01/2010 **Trainee at ESA–ESOC**
 Darmstadt (Germany)
Gravitational capture at Callisto for the Laplace mission

Teaching Activities

10/2012 – 09/2015 Teaching Assistant in Spacecraft Orbital Dynamics and Control
Master's degree in Aerospace Engineering
Alma Mater Studiorum – Università di Bologna (Italy)

Referee for International Journals

Acta Astronautica, Advances in Space Research, Astrophysics and Space Science, Celestial Mechanics and Dynamical Astronomy, Communications in Nonlinear Science and Numerical Simulation, Journal of Spacecraft and Rockets, Part G: Journal of Aerospace Engineering, The Journal of the Astronautical Sciences.

Computer skills

Operating systems Linux, Mac OS X, Windows.
Programming languages Fortran, C, L^AT_EX.
Software Matlab, Mathematica, Office, Gimp.

Languages

Italian mother tongue.
English & Spanish excellent command of spoken and written language.
French & Catalan basic knowledge.

PARTICIPATION & COORDINATION IN RESEARCH PROJECTS

2016 – 2019 **ReDSHIFT: Revolutionary Design of Spacecraft through Holistic Integration of Future Technologies**, European Commission H2020-PROTEC-2015, PROTEC-1-2015 - Passive means to reduce the impact of Space Debris.
Technical coordinator in WP3 “Dynamics” and WP6 “Software” for the CNR unit.

2016 – 2018 **Environmental aspects of passive de-orbiting devices**, ESA.

2015 – 2016 **Improved NEO Data Processing Capabilities (P2-NEO-II)**, ESA.

2013 – 2015 **Disposal strategies analysis for MEO orbits**, ESA/GSP.

2013 – 2015 **Fragmentation consequence analysis for LEO and GEO orbits**, ESA/GSP.

2013 – 2014 **End-of-life disposal concepts for Lagrange-Point and Highly Elliptical Orbit Missions**, ESA/GSP.
Technical coordinator for the SpaceDyS unit.

2012 – 2014 **SPARC: Space Awareness for Critical Infrastructure**, European Union-Cips.

2009 – 2014 **Mercury Orbiter Radioscience Experiment (MORE)**, ASI.

2006 – 2011 **Métodos locales y globales en Sistemas Dinámicos. Aplicaciones**, Ministerio de Educación y Ciencia (Spain).

2009 – 2010 **Dinámica, atractores y no linealidad: caos y estabilidad**, Ministerio de Ciencia e Innovación (Spain).

2007 – 2010 **The Astrodynamics Network “AstroNet”**,
Marie Curie Research Training Network: MCRTN FP6 CT-2006-03515.

2007 – 2008 **Efficient Usage of Self Validated Integrators for Space Applications**,
ESA – The Advanced Concept Team. Ariadna Study 20783/07/NL/CB.

HONORS & AWARDS

- Daquin, Rosengren, Alessi, Deleflie, Valsecchi and Rossi, CMDA (2016) nominated by Springer Nature as **one of the 180 groundbreaking articles that could help change the world**, 2017.
- **The asteroid (78309) 2002 PV65 has been designed “Alessielisa”**, 2014.
- **Founding member of SpaceDyS s.r.l., spin-off from the University of Pisa (Italy)**, 2011.

- **Marie Curie Early Stage Researcher Grant:** Marie Curie Research Training Network MCRTN FP6 CT-2006-03515 – the Astrodynamics Network “AstroNet”, 2007–2010.
- **Ph.D. with European Mention** from the University of Barcelona (Spain), 2010.
- **Travel Grant of ESA** to attend the International Astronautical Conference IAC-08, 2008.
- **Best presentation award at four international conferences:** IAC-10, IAC-11, 1st IAA Conference on DYNAMICS AND CONTROL OF SPACE SYSTEMS 2012, IAC-13, IAC-17.
- **Membership:** Società Italiana di Meccanica Celeste e Astrodinamica (SIMCA), International Astronomical Union, DANCE-NET: dinamica, atractores y no linealidad, caos y estabilidad.

INVITED TALKS

- Research seminar: “Passive End-of-Life Solutions for Low Earth Orbits”, Royal Melbourne Institute of Technology, Melbourne, Australia, 09/10/2017.
- Conference talk: “Dynamical mapping of the LEO region for passive disposal design”, International Astronautical Congress, Adelaide, Australia, 26/09/2017.
- Conference talk: “On the semi-analytical formulation for the third-body perturbation at the boundary of the sphere of influence”, KePASSA, ESTEC, Noordwijk (Netherlands), 26/07/2017.
- Workshop talk: “Earth’s reentry solutions for LPO missions: design and application”, CCT ORB, CNES, Toulouse (France), 04/07/2017.
- Conference talk: “Resonant Dynamics in the LEO Regions”, Barcelona Mathematical Days, Societat Catalana de Matemàtiques, Barcelona (Spain), 28/04/2017.
- Lecture at international advanced school: “Environmental Criticality of LEO Objects”, Third STAR-DUST Training School, Santander (Spain), 09/07/2015.
- Research seminar: “End-of-Life Disposal Concepts for Libration Point Orbit & Highly Elliptical Orbit Missions”, Observatoire de Paris, 13/01/2014.
- Research seminar: “Orbit determination and parameter estimation for the Radio Science Experiment of the BepiColombo mission to Mercury”, Universitat de Barcelona (Spain), 07/03/2012.
- Public lecture: “Alla scoperta di Mercurio”, Planetario di Padova (Italy), 28/10/2011.
- Research seminar: “On the dynamics in the neighborhood of the collinear points in the CR3BP”, Università degli Studi di Milano (Italy), 26/09/2011.
- Research seminar: “On the dynamics in the neighborhood of the collinear points in the CR3BP”, Università degli Studi di Pisa (Italy), 07/12/2010.
- Research seminar: “LEO–Lissajous transfers in the Earth–Moon system and refinement to JPL ephemerides”, Universitat de Barcelona (Spain), 07/04/2010.
- Public lecture: “Caos nel Sistema Solare”, Gabinetto di Lettura e Società di Incoraggiamento, Padova (Italy), 05/03/2010.
- Research seminar: “Gravitational Capture at Callisto”, Universitat de Barcelona (Spain), 10/02/2010.
- Lecture at international advanced school: “Numerical Integration Methods Applied to Astrodynamics and Astronomy”, First AstroNet Training School, Barcelona (Spain), 17/09/2008.

PUBLICATIONS

Peer-Review

- E.M. Alessi, G. Tommei, I. Holbrough, G. Beck, “Dynamical uncertainty and demisability occurrence for the atmospheric reentry of SOHO”, *Advances in Space Research*, under review.
- E.M. Alessi, G. Schettino, A. Rossi, G.B. Valsecchi, “Natural Highways for End-of-Life Solutions in the LEO Region”, *Celestial Mechanics and Dynamical Astronomy*, under review.
- G.B. Valsecchi, E.M. Alessi, A. Rossi, “Cartography of the b -plane of a close encounter. I. Semimajor axes of post-encounter orbits”, *Celestial Mechanics and Dynamical Astronomy*, (2018) in press.
- E.M. Alessi, G. Schettino, A. Rossi, G.B. Valsecchi, “Solar radiation pressure resonances in Low Earth Orbits”, *Monthly Notices of the Royal Astronomical Society*, 473 (2018), 2407–2414.

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- C. Bombardelli, E.M. Alessi, A. Rossi, G.B. Valsecchi, “Environmental effect of space debris repositioning”, *Advances in Space Research* 60 (2017), 28–37.
 - A.J. Rosengren, J. Daquin, E.M. Alessi, K. Tsiganis, F. Deleflie, A. Rossi, G.B. Valsecchi, “Galileo disposal strategy: stability, chaos and predictability”, *Monthly Notices of the Royal Astronomical Society* 464 (2016), 4063–4073.
 - E.M. Alessi, F. Deleflie, A.J. Rosengren, A. Rossi, G.B. Valsecchi, J. Daquin, K. Merz, “A Numerical Investigation on the Eccentricity Growth of GNSS Disposal Orbits”, *Celestial Mechanics and Dynamical Astronomy* 125 (2016), 71–90.
 - J. Daquin, A.J. Rosengren, E.M. Alessi, F. Deleflie, G.B. Valsecchi, A. Rossi, “The dynamical structure of the MEO region: long-term stability, chaos, and transport”, *Celestial Mechanics and Dynamical Astronomy* 124 (2016), 335–366.
 - S. Cicalò, G. Schettino, S. Di Ruzza, E.M. Alessi, G. Tommei, “The BepiColombo MORE gravimetry and rotation experiments with the ORBIT14 software”, *Monthly Notices of the Royal Astronomical Society* 457 (2016), 1507–1521.
 - G.B. Valsecchi, E.M. Alessi, A. Rossi, “An analytical solution for the swing-by problem”, *Celestial Mechanics and Dynamical Astronomy* 123 (2015), 151–166.
 - E.M. Alessi, J.P. Sánchez Cuartielles, “Semi-analytical Approach for Distant Encounters in the Spatial Circular Restricted Three-Body Problem”, *Journal of Guidance Control and Dynamics* 39 (2015), 351–359.
 - A. Rossi, G.B. Valsecchi, E.M. Alessi, “The Criticality of Spacecraft Index”, *Advances in Space Research* 56 (2015), 449–460.
 - E.M. Alessi, “The Reentry to Earth as a Valuable Option at the End-of-Life of Libration Point Orbit Missions”, *Advances in Space Research* 55 (2015), 2914–2930.
 - A.J. Rosengren, E.M. Alessi, A. Rossi, G.B. Valsecchi, “Chaos in navigation satellite orbits caused by the perturbed motion of the Moon”, *Monthly Notices of the Royal Astronomical Society* 449 (2015), 3522–3526.
 - A. Rossi, G.B. Valsecchi, E.M. Alessi, “Ranking in-orbit fragmentations and space objects”, *Proceedings of the International Astronomical Union – Symposium 310*, 9 (2014), 118–125.
 - C. Colombo, E.M. Alessi, W. van der Weg, S. Soldini, F. Letizia, M. Vetrivano, M. Vasile, A. Rossi, M. Landgraf, “End-of-life disposal trajectories for libration point and highly elliptical orbit missions”, *Acta Astronautica* 110 (2014), 298–312.
 - G.B. Valsecchi, E.M. Alessi, A. Rossi, “The geometry of impacts on a synchronous planetary satellite”, *Celestial Mechanics and Dynamical Astronomy* 119 (2014), 257–270.
 - E.M. Alessi, A. Rossi, G.B. Valsecchi, L. Anselmo, C. Pardini, C. Colombo, H.G. Lewis, J. Daquin, F. Deleflie, M. Vasile, F. Zuiani, K. Merz, “Effectiveness of GNSS Disposal Strategies”, *Acta Astronautica* 99 (2014), 292–302.
 - E.M. Alessi, G. Gómez, J.J. Masdemont, “A Methodology for the Computation of Constrained Orbits and its Application to the Design of Solar System Trajectories”, *Journal of the Astronautical Sciences*, 59 (2012), 477–501.
 - P. Pergola, E.M. Alessi, “Libration Point Orbits Characterisation in the Earth-Moon System”, *Monthly Notices of the Royal Astronomical Society*, 426 (2012), 1212–1222.
 - E.M. Alessi, S. Cicalò, A. Milani, G. Tommei, “Desaturation Manoeuvres and Precise Orbit Determination for the BepiColombo Mission”, *Monthly Notices of the Royal Astronomical Society* 423 (2012), 2270–2278.
 - E.M. Alessi, P. Pergola, “Two options for the Callisto’s exploration”, *Acta Astronautica* 72 (2012), 185–197.
 - E.M. Alessi, G. Gómez, J.J. Masdemont, “Further Advances on Low – Energy Lunar Impact Dynamics”, *Communications in Nonlinear Science and Numerical Simulation* 17 (2012), 854–866.
 - E.M. Alessi, “The Role and Usage of Libration Point Orbits in the Earth – Moon System”, Ph.D. Dissertation, Universitat de Barcelona (2010).
 - E.M. Alessi, G. Gómez, J.J. Masdemont, “Low-energy transfers in the Earth–Moon system”, *Non-linear Science and Complexity – Vol. II*, Springer (2010), 107–114.
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- E.M. Alessi, G. Gómez, J.J. Masdemont, “A Motivating Exploration on Lunar Craters and Low-Energy Dynamics in the Earth–Moon System”, *Celestial Mechanics and Dynamical Astronomy* 107 (2010), 187–207.
- E.M. Alessi, G. Gómez, J.J. Masdemont, “Two-manoevres transfers between LEOs and Lissajous orbits in the Earth-Moon system”, *Advances in Space Research* 45 (2010), 1276–1291.
- E.M. Alessi, G. Gómez, J.J. Masdemont, “Leaving the Moon by means of invariant manifolds of libration point orbits”, *Communications in Nonlinear Science and Numerical Simulation* 14 (2009), 4153–4167.

Conference Proceedings

- E.M. Alessi, G. Schettino, A. Rossi, G.B. Valsecchi, “Dynamical mapping of the LEO region for passive disposal design”, *International Astronautical Congress IAC-17* (2017).
- G. Schettino, E.M. Alessi, A. Rossi, G.B. Valsecchi, “Characterization of Low Earth Orbit dynamics by perturbation frequency analysis”, *International Astronautical Congress IAC-17* (2017).
- E.M. Alessi, G. Tommei, I. Holbrough, G.Beck, “On the reentry design for the SOHO mission”, *7th European Conference on Space Debris* (2017).
- E.M. Alessi, G. Schettino, A. Rossi, G.B. Valsecchi, “LEO mapping for passive dynamical disposal”, *7th European Conference on Space Debris* (2017).
- A. Rossi, E.M. Alessi, et al., “A quantitative evaluation of the environmental impact of the mega constellations”, *7th European Conference on Space Debris* (2017).
- A. Rossi, E.M. Alessi, et al., “MEO dynamics and GNSS disposal strategies”, *7th European Conference on Space Debris* (2017).
- A. Rossi, E.M. Alessi, et al., “The H2020 Project ReDSHIFT”, *7th European Conference on Space Debris* (2017).
- A. Rossi, E.M. Alessi, et al., “The effect of the GNSS disposal strategies on the long-term evolution of the MEO region”, *International Astronautical Congress IAC-16* (2016).
- C. Colombo, E.M. Alessi, et al., “Characterisation of the dynamical structure of the circumterrestrial space for passive debris mitigation”, *International Astronautical Congress IAC-16* (2016).
- F. Deleflie, J. Daquin, E.M. Alessi, et al., “Long term evolution of the eccentricity in the MEO region: extraction of the most significant terms from the potential expression”, *AIAA/AAS Astrodynamics Specialist Conference, Long Beach, California* (2016).
- A.J. Rosengren, J. Daquin, E.M. Alessi, G.B. Valsecchi, A. Rossi, F. Deleflie, “Galileo disposal strategy: resonance, chaos, and stability”, *25th International Symposium on Space Flight Dynamics ISSFD2015* (2015).
- J.P. Sánchez Cuartielles, C. Colombo, E.M. Alessi, “Semi-analytical perturbative approach to third body resonant trajectories”, *International Astronautical Congress IAC-15* (2015).
- F. Deleflie, J. Daquin, E.M. Alessi, A. Rossi, “Long term evolution of the eccentricity in the MEO region: semi-analytical and analytical approach”, *AAS/AIAA Astrodynamics Specialist Conference, Vail, Colorado* (2015) AAS 15-798.
- A.J. Rosengren, E.M. Alessi, A. Rossi, G.B. Valsecchi, “Dynamical instabilities in Medium Earth Orbits: chaos induced by overlapping lunar resonances”, *AAS/AIAA Space Flight Mechanics Meeting, Williamsburg, Virginia* (2015) AAS 15-435.
- E.M. Alessi, J.P. Sánchez Cuartielles, “MOID-increasing disposal strategies for LPO missions”, *International Astronautical Congress IAC-14* (2014).
- A. Rossi, G.B. Valsecchi, E.M. Alessi, “An evaluation index for the ranking of LEO objects”, *International Astronautical Congress IAC-14* (2014).
- E.M. Alessi, C. Colombo, M. Landgraf, “Re-entry disposal analysis for libration point orbit missions”, *24th International Symposium on Space Flight Dynamics ISSFD2014* (2014).
- C. Colombo, F. Letizia, S. Soldini, H.G. Lewis, E.M. Alessi, A. Rossi, M. Vetrivano, W. van der Weg, M. Vasile, M. Landgraf, “End-of-life disposal trajectories for libration point and highly elliptical orbit missions”, *2nd IAA Conference on DYNAMICS AND CONTROL OF SPACE SYSTEMS* (2014).

- C. Colombo, F. Letizia, E.M. Alessi, M. Landgraf, “End-of-life Earth re-entry for highly elliptical orbits: the INTEGRAL mission”, *AAS/AIAA Space Flight Mechanics Meeting, Santa Fe, New Mexico* (2014) AAS 14-156.
- E.M. Alessi, C. Colombo, J.P. Sánchez Cuartielles, “Out-of-plane extension of resonant encounters for escape and capture”, *International Astronautical Congress IAC-13* (2013).
- E.M. Alessi, A. Rossi, G. Valsecchi, L. Anselmo, C. Pardini, C. Colombo, H.G. Lewis, F. Deleflie, M. Vasile, K. Merz, “Effectiveness of GNSS disposal strategies”, *International Astronautical Congress IAC-13* (2013).
- J.P. Sánchez Cuartielles, E.M. Alessi, D. García Yárnoz, C.R. McInnes, “Earth resonant gravity assists for asteroid retrieval missions”, *International Astronautical Congress IAC-13* (2013).
- C. Colombo, H.G. Lewis, F. Letizia, E.M. Alessi, A. Rossi, L. Dimare, M. Vasile, M. Vetrivano, W. van der Weg, C. McInnes, M. Landgraf, “End-of-life disposal trajectories for libration point and highly elliptical orbit missions”, *International Astronautical Congress IAC-13* (2013).
- F. Deleflie, A. Bourgoïn, E.M. Alessi, J. Daquin, A. Vienne, V. Morand, D. Hautesserres, A. Rossi, M. Fouchard, “Exploration of the structure of the web of the commensurabilities within the MEO and GTO regions”, *AAS/AIAA Astrodynamics Specialist Conference 2013, Hilton Head, South Carolina* (2013) AAS 13-778.
- C. Colombo, E.M. Alessi, M. Landgraf, “End-of-life disposal of spacecraft in highly elliptical orbits by means of luni-solar perturbations and Moon resonances”, *Proceedings of Sixth European Conference on Space Debris* (2013).
- J.P. Sánchez, D. García Yárnoz, E.M. Alessi, C.R. McInnes, “Gravitational Capture Opportunities for Asteroid Retrieval Missions”, *Proceedings of International Astronautical Conference IAC-12* (2012).
- E.M. Alessi, S. Cicalò, A. Milani, “Accelerometer Data Handling for the BepiColombo Orbit Determination”, *Advances in the Astronautical Sciences* 145 (2012) AAS 12-309, 1st IAA Conference on DYNAMICS AND CONTROL OF SPACE SYSTEMS.
- P. Pergola, E.M. Alessi, “Libration Point Orbits Characterization in the Earth–Moon System for Scientific Applications”, *Advances in the Astronautical Sciences* 145 (2012) AAS 12-332, 1st IAA Conference on DYNAMICS AND CONTROL OF SPACE SYSTEMS.
- E.M. Alessi, S. Cicalò, A. Milani, G. Tommei, “Desaturation maneuvers and precise orbit determination for the BepiColombo mission”, *Proceedings of International Astronautical Conference IAC-11* (2011).
- E.M. Alessi, P. Pergola, “Strategy to achieve gravitational capture at Callisto”, *Proceedings of International Astronautical Conference IAC-10* (2010).
- E.M. Alessi, G. Gómez, J.J. Masdemont, “Transfer orbits in the Earth–Moon system and refinement to JPL ephemerides”, *Proceedings of the 21st International Symposium on Space Flight Dynamics ISSFD2009* (2009).
- E.M. Alessi, A. Farrés, A. Vieiro, À. Jorba, C. Simó, “Jet transport and applications to NEOs”, *Proceedings of the 1st IAA Planetary Defense Conference: Protecting Earth from Asteroids* (2009).
- E.M. Alessi, G. Gómez, J.J. Masdemont, “LEO–Lissajous transfers in the Earth–Moon system”, *Proceedings of International Astronautical Conference IAC-08* (2008).
- E.M. Alessi, G. Gómez, J.J. Masdemont, “Leaving and reaching the Moon from a libration point orbit”, *Proceedings in Applied Mathematics and Mechanics* 7 (2008), 1030911–1030912.