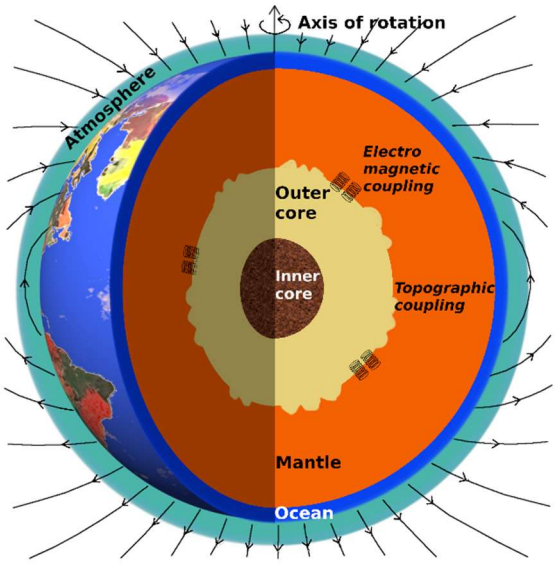
Véronique DEHANT

NARRATIVE GENERAL OVERVIEW

Véronique Dehant works at the Royal Observatory of Belgium, where she is Senior Researcher in the Operational Directorate "Reference Systems and Planetology". She is also Emeritus Professor at the Catholic University of Louvain (UCLouvain). She is an Academician (Member of the Royal Academy of Belgium, Science Class) since 2010, Foreign Member of the Paris Academy of Sciences since 2016 and has been awarded several prizes including the Descartes Prize of the European Union in 2003 and the De Leeuw-Damry-Bourlart Prize, Prize in Fundamental Exact Sciences among the five FNRS research excellence prizes, in 2020. In 2015, she obtained an ERC Advanced Grant from the European Research Council for her project RotaNut: Rotation and Nutation of a wobbly Earth; and in 2019, an ERC Synergy Grant for her project GRACEFUL (GRavimetry, mAgnetism, rotation, and CorE FLow). The GRACEFUL project, led by Dehant, Mandea, and Cazenave, combines magnetic, gravitational, and rotational data with advanced models to reveal how Earth's core dynamics influence not only its deep interior but also the entire Earth system, including climate, through interconnected fluid and solid layers. Dehant is also involved in processing data from instruments in several space missions, in particular of the RISE experiment (Rotation and Interior Structure Experiment) on board the InSight mission (Interior Exploration using Seismic Investigations, Geodesy and Heat Transport) hibernating on the surface of Mars since 2023. She is working on a new ESA (European Space Agency) mission, GENESIS, that will improve reference frame precision and improve climate change and positioning results.



Five representative publications related to the Crafoord prize citation

(Cit. in Google Scholar)

1. Le Maistre S. et al., Dehant V. Spin state and deep interior structure of Mars from InSight radio tracking. Nature, 619, DOI: 10.1038/s41586-023-06150-0, **2023**. (33 cit.)
This study uses NASA's Mars InSight mission radio science data. By analyzing planetary rotation, it led to the pioneering discovery of a substantial liquid core.
2. Dehant V., Campuzano S.A., De Santis A., van Westrenen W., Structure, materials and processes in the Earth's core and mantle. Surv. Geophys., 43, DOI: 10.1007/s10712-021-09684-y, **2022**. (19 cit.)
This paper reviews the Earth's core and deep mantle, examining the impact of core flows on global observations and processes at the core-mantle boundary. It laid the foundation for the GRACEFUL project.
3. Dehant V. and Mathews P.M., Precession, Nutation, and Wobble of the Earth", book, Cambridge Press, 536 pages, ISBN: 9781107092549, **2015**.
This comprehensive volume provides an in-depth exploration of Earth's precession, nutation, and wobble, focusing on their geophysical implications. The book has served as a foundational resource, helping scientists to better understand these phenomena and laying the groundwork for advancing precision in their study.

4. Dehant V., Defraigne P., and Wahr J.M., Tides for a convective Earth. J. Geophys. Res., 104, DOI: 10.1029/1998JB900051, **1999**. (459 cit.)
This influential paper presents tidal surface displacements and mass redistribution, using an Earth model that incorporates mantle convection and boundary deformations, successfully reproducing the observed free core nutation period and global dynamical flattening.
5. Dehant V., Tidal parameters for an inelastic Earth. Phys. Earth planet. Inter., 49, DOI: 10.1016/0031-9201(87)90134-8, **1987**. (266 cit.)
This paper calculates tidal gravimetric factors for an elliptical, rotating Earth with an inelastic mantle, resulting in a few percent increase in their values. These findings have been incorporated into a conventional model still advocated by the Earth Rotation and Reference Frame Service (IERS) Conventions.

TABLE OF CONTENTS

1. ACADEMIC CV

PROFESSIONAL PRESENT INFORMATION

Véronique M. Dehant
Royal Observatory of Belgium (ROB)
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B 1180 Brussels, Belgium

More details:
http://homepage.oma.be/veroniq/
Tel: +32 2 373 02 66
Cellular: +32 475 575953
Born 24 July 1959

HISTORY OF EMPLOYMENT

Graduate Research Assistant at UCL, 1981-1982
Graduate Research Assistant at Fonds National de la Recherche Scientifique (FNRS), 1982-1986
Post-doctoral Researcher at FNRS, 1986-1990; Research Associate at FNRS, 9/1990-3/1993
Work Leader at ROB, 4/1993-4/2013
Senior Research Scientist (SW4), 5/2013-present
Head of Section at ROB, 12/1997-12/2014; Head of Service at ROB, 1/1/2015-2024
Responsible of the Operational Directorate "Reference Systems and Planetology", 2/2010-2024
+ Invited Lecturer at UCLouvain, 1991-1998; Part time Lecturer at UCLouvain, 1998-2000; Part time Professor at UCLouvain, 2000-2009; and Extraordinary Professor at UCLouvain, 2009-2024
+ Part time Lecturer (Maître de Conférence) at Université de Liège, Belgium, 2007-2024
+ Lecturer at Collège Belgique (Royal Academy) of Belgium and at Collège de France.

DEGREES

Degree in Mathematics 1981, Université Catholique de Louvain (UCLouvain)
Master 1982, Université Catholique de Louvain (UCLouvain)
Ph.D. 1986, Université Catholique de Louvain (UCLouvain)
Tenure 1992, Université Catholique de Louvain (UCLouvain)

RESEARCH INTERESTS

V. Dehant's primary research interest lies in geodesy and geophysics, with a focus on the rotation, precession-nutation, and interior modeling of Earth and Mars, as well as gravity studies of Earth, Mars, and Venus. She explores the influence of Earth's internal structure, free oscillations, internal convection, rheology, and external fluids (atmosphere and oceans) on its rotation and deformation. The goal is to improve models of Earth's rotation, precession-nutation, and the realization of terrestrial and celestial reference frames, while advancing our understanding of the physics of Earth's interior, particularly the core. Extending this research to other celestial bodies, she studies the rotation and internal dynamics of Mars, Venus, Mercury, and icy satellites, proposing radio-science experiments and applying similar methodologies to these planets and moons.

RESEARCH TRACK RECORD

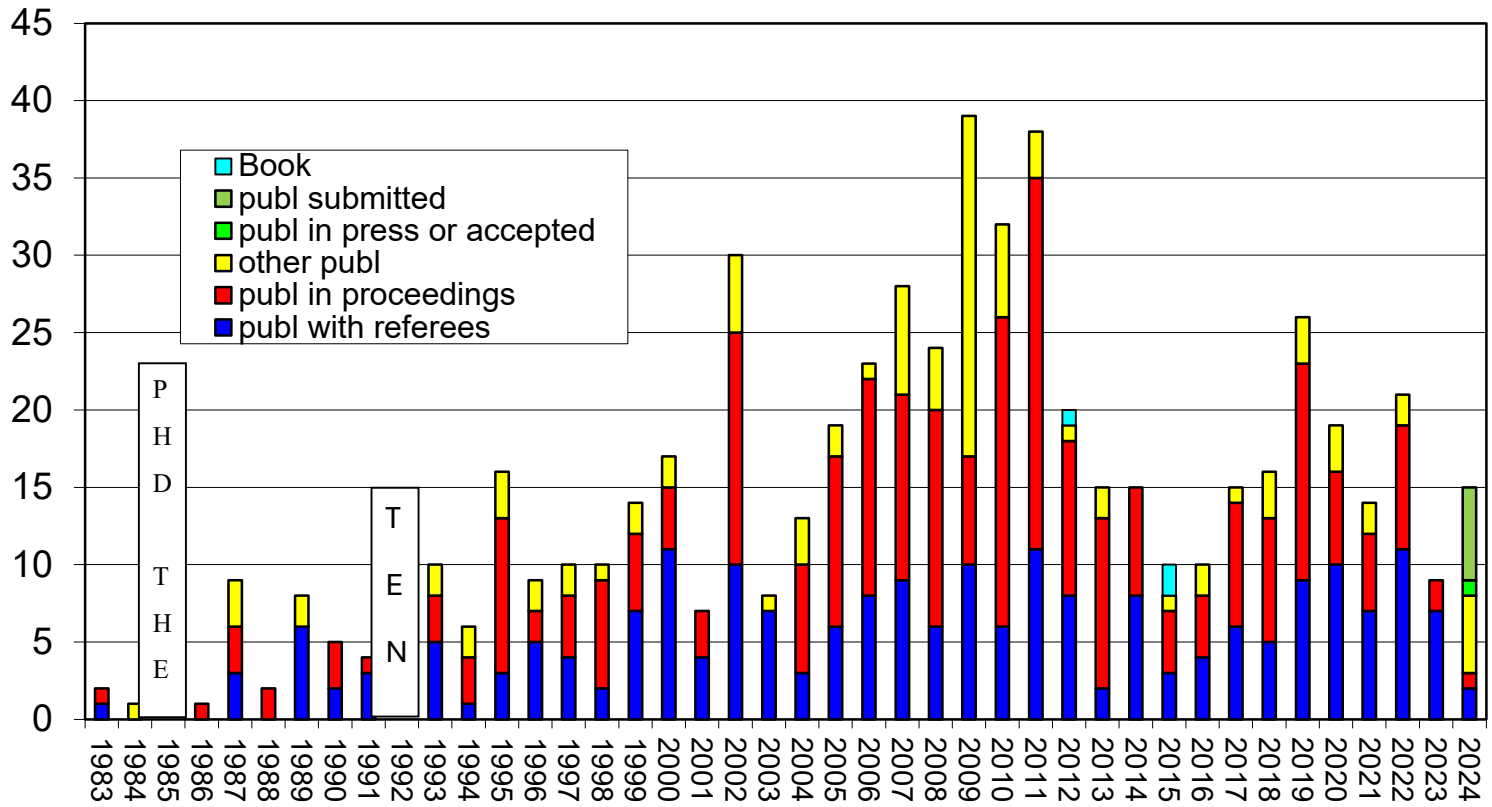
Authored of 215 refereed publications (+ 1 in press, 5 submitted), 264 publications in un-refereed proceedings, 101 other publications, i.e. 580 published publications all together (without abstracts of conferences except extended abstracts) (January 2025).
H-index of 55 in Google Scholar, with 10804 citations; 44 in Scopus (January 2025).
Authored of a book on "Precession, Nutation and Wobble of the Earth", Dehant and Mathews, Cambridge University Press, 536 pages, April 2015, ISBN: 9781107092549.

Authored of a book on “Habiter sur Mars?”, Publ. Royal Acad. Belgium, 96 pages, Académie en poche, January 2012.

Authored of a book on “Habiter sur une lune du système solaire?”, Publ. Royal Acad. Belgium, 141 pages, Académie en poche, September 2015.

Editor of three book-proceedings, in 2002, 2018 and 2022.

Authored of 1338 oral or poster presentations at the present date (January 2025).



AWARDS AND HONORS

1988 Award Charles Lagrange, prix quadriennal de la Classe des Sciences de l'Académie Royale des Sciences, des Lettres et des Beaux-Arts

1999 IAG Fellow, 1991. Bomford Prize of IAG

1999 Member of the Academia Europaea

2003 Vening Meinesz Medal of the European Geophysical Society (EGU)

2003 Descartes Prize of the European Union

2007 American Geophysical Union (AGU) Fellow

2008 Membre Correspondant of the BdL (Bureau des Longitudes)

2008 Bronze Medal for Apophis Mission Design from the Planetary Society

2010 Member of the Royal Academy of Belgium, Sciences Class

2011 Honorary Member of BeWiSe (Belgian Women in Science)

2014 Doctor Honoris Causa of the Observatoire de Paris

2015 Membre Etranger of the Académie des Sciences de Paris

2016 Membre Correspondant of the Air and Space Academy of Toulouse

2016 Whitten Medal of the American Geophysical Union (AGU)

2016 Commandeur de l'Ordre de Léopold II, nomination by the King of Belgium

2019 Bowie Lecture of the AGU – Geodesy Section

2020 De Leeuw-Damry-Bourlart Prize, FNRS Quinquennial Prize in Fundamental Exact Sciences
2021 NASA Certificate of Achievement for exemplary performance by the InSight Support Team
2023 International Member of the US National Academy of Sciences (NAS)
2023 Grand Officier de l'Ordre de la Couronne, nomination by the King of Belgium
2023 Member of the European Academy of Sciences
2024 Jean Dominique Cassini Union Medal of European Geosciences Union (EGU)
2024 Honorary Member of the European Geosciences Union (EGU)

TEACHING, SUPERVISOR OF PHD STUDENTS AND POSTDOCS

Professor teaching at UCLouvain, Belgium, 1998-2024: (1) Astronomy and Geophysics at Bachelor level, (2) Internal Geophysics of the Earth and Planets at Master level, and (3) Space Geodesy at Master level.

Lecturer at Université de Liège, Belgium, 2007-2024: Geophysics of the Earth and Planets

Lecturer at 8 Summer Schools

Invited for 52 Seminars at universities and scientific institutions

Supervisor of 25 PhD theses since 1995: P. Defraigne 1995, F. Roosbeek 1998, O. de Viron 1999, M. Yseboodt 2003, J. Duron 2007, L. Koot 2009, G. Pfyffer 2010, R.M. Baland 2011, A. Rivoldini 2012, L.B. Pham 2012, A. Hees 2012, S. Le Maistre 2013, A. Coyette 2018, G. Lopez Rosson 2018, A. Trinh 2019, E. Gloesener 2019, D. Vincent 2020, Li Fuzhen 2022 joined with UCAS, M.J. Péters 2023, M. Noeker 2023, N. Yoshida 2023 joined with TohokuU, L. Ruiz Lozano 2023, V. Fortier 2023, S.A. Shih 2024, S. Koyama 2025 joined with TohokuU

Supervisor of 8 still in the pipeline (A. Caldiero 2025, V. Filice 2025, H. Sert 2025, A. Krishnan 2025, F. Seuren 2025, M. Goli 2026?, J. Martinez 2027?, G. Chicot 2027?)

Where are these PhD students at present? 10 at the Royal Observatory of Belgium: Defraigne, Roosbeek, Yseboodt, Baland, Rivoldini, Pham, Le Maistre, Rosson, Trinh, Ruiz Lozano; 9 in other Universities or Research Institutes: de Viron at ULaRochelle, Coyette at UNamur, Gloesener at ULilles, Fuzhen at UCAS, Yoshida & Koyama at TohokuU, Fortier at UMontpellier, Shih at IES Taiwan, Hees at Obs. Paris; 1 in High School teaching: Koot at HE2B; 1 in the German Space Agency (DLR): Noeker; 3 in the private sector: Duron at SARSAT, Pfyffer at CISART, Vincent at SEALAB; 1 as data scientist at the SPF Finances: Péters.

48 Postdocs under V. Dehant's leadership and under contract at the Royal Observatory of Belgium: Baland Rose-Marie, Borisov Stanislav (UCLouvain), Benck Sylvie (UCLouvain), Bergeot Nicolas, Bertrand Bruno, Beuthe Mikael, Bizouard Christian, Bultel Benjamin (UCLouvain), Coyette Alexis, de Viron Olivier, Defraigne Pascale, Degryse Karin, Deleflie Florent, Duron Julien, Folgueira Marta, Frede Valérie, Gilman Cédric, Gloesener Elodie, Hees Aurélien, Huang ChengLi, Karatekin Özgür, Koot Laurence, Kudryashova Maria, Laguerre Raphael, Lainey Valery, Lambert Sébastien, Legrand Juliette, Lemaistre Sébastien, Metivier Laurent, Mitrovic Michel, Ncono Colin, Noack Lena, Pfyffer Gregoire, Pham Lê Binh San, Pottiaux Eric, Rambaux Nicolas, Rekier Jeremy, Rivoldini Attilio, Robert Vincent , Roosbeek Fabian, Rosenblatt Pascal, Triana Santiago Andres, Trinh Aantony, Verhoeven Olivier, Witasse Olivier, Yseboodt Marie, Zhu Ping

+ 4 Postdocs under V. Dehant's leadership and under contract at UCLouvain: Sylvie Benck, Bodranghien Florian, Borisov Stanislav, Gloesener Elodie

COORDINATOR OF PROJECTS

2020-**present** Coordinator of the ERC Synergy Grant of the EU, project GRACEFUL (GRavimetrie, mAgnetisme and CorE Flow), end in August 2025 (>35 researchers)
2018-2023 UCLouvain PI (Principal Investigator) of the EOS (Excellence Of Science) ET-HOME "Evolution and Tracers of the Habitability Of Mars and Earth" (>35 researchers)
2017-2022 Founder and Coordinator of Louvain4Space at UCLouvain (>80 researchers)
2014-2020 Coordinator of the ERC Advance Grant RotaNut (Rotation and Nutation of a wobbly Earth) (~15 researchers)
2012-2017 Coordinator of the Inter-University Attraction Pole (IUAP) Planet TOPERS (Planets: Tracing the Transfer, Origin, Preservation, and Evolution of their ReservoirS) (>40 researchers)

EXPERTISE, NATIONAL AND INTERNATIONAL FUNCTIONS

Functions in international unions (non-exhaustive list)

1987-**present** Member of the International Astronomical Union (IAU) since 1987, of the International Union of Geodesy and Geophysics (IUGG) since 1988, of the International Association of Geodesy (IAG) since 1988, of the European Geosciences Union (EGU) since 1989, of the American Geophysical Union (AGU) since 1989
2003-2007 President of Commission 3 "Geodynamics and Earth Rotation" of IAG
2003-2006 President of Commission 19 "Earth Rotation" of IAU
2002-2004 President (2000-2002 President-elect) of "Geodesy" Section of AGU

Functions in national committees and at the royal academy of Belgium (non-exhaustive list)

2025-**present** Vice-Director of Science Class of the Royal Academy of Belgium
2006-2008 President of the Belgian National Committee of Geodesy and Geophysics

Scientific responsibilities (non-exhaustive list)

2018-**present** Member of the Space Situational Awareness (SSA) Advisory Group of ESA (European Space Agency)
2006-**present** PI 2006-2020 & Deputy PI (>2020) of the Lander Radioscience experiment (LaRa)
2005-**present** Co-I of Mercury Orbiter Radio-science Experiment (MORE) and of BepiColombo Laser Altimeter (BeLA) in the frame of the ESA BepiColombo mission to Mercury
2003-**present** Co-I of the MarsExpress Radio Science experiment (MaRS) in the frame of the ESA MarsExpress mission
2012-**present** Team Member of the JUICE (JUpiter ICy moons Explorer) experiment, Gravity and Geophysics of Jupiter and the Galilean Moons (3GM)
2020-2023 Lead Co-I (co-Investigator) of Rotation and Interior Structure Experiment (RISE) in the frame of the InSight (Interior exploration using Seismic Investigations, Geodesy, and Heat Transport), mission in hibernation since 2023
2019-2021 Vice-President of the Board of Trustees of the International Space Science Institute (ISSI)
2017-2022 Member of the Scientific Committee of Helmholtz-Centre Potsdam - GFZ German Research Centre for Geosciences (Germany)
2014-2024 Director of the Center for Space Radiations (CSR) at UCLouvain
2004-2014 Co-I of the VenusExpress (VEX) Radio science experiment (VeRa) in the frame of the ESA VenusExpress mission
2000-2003 Chairperson of the IAU Commission 19 WG "Non-Rigid Earth Nutation Theory"
1998-2016 Head (1998-2002) and Member (2003-2016) of "Special Bureau for the Core" of the IERS (Earth Rotation and Reference Frame Service)
1994-2000 Chairperson of the joint IAU/IUGG WG "Non-Rigid Earth Nutation Theory"

1991-1997 President of the Working Group “Theoretical Tidal Model”, WG of the Earth Tide Permanent Commission of the IAG (International Association of Geodesy)

Expertise (non-exhaustive list)

2019-**present** Member of ERC Panel PE10 (2024 President of ERC Starting Grant Panel PE10)
2012-**present** Member of the Management Council of FRS-FNRS (Fonds de la Recherche Scientifique)
2012-2014 Member of “Space Science Advisory Committee (SSAC)” of ESA
2010-2013 Member of the Scientific Committee of International Space Science Institute (ISSI)
2010-2013 and 2004-2007 Member of the Scientific Council of Institut de Physique du Globe de Paris (IPGP)
2010-2011 Member of “Solar System Exploration Working Group (SSEWG)” of ESA
2009-2014 Member of the Comité des Programmes Scientifiques (CPS) of CNES (Centre National d’Etudes spatiales)
2006-2009 Member of “Exploration, Science and Technology Advisory Group (ESTAG)” of ESA
2005-2009 Member of the High Scientific Committee (Haut Comité Scientifique, HCS) of the Observatoire de Paris

EDITION

2024 Co-author of Chapter 2 “Mars in Short: Past and Present Geology and Climate”, of the book “Mars and the Earthlings: a realistic view on Mars exploration and settlement.”, Eds. C. Verseux, M. Gargaud, K. Lehto, and M. Viso
2023 Editor of the ISSI Topical Collection Book on “Probing Earth’s Deep Interior using Space Observations Synergistically.”, Surveys in Geophysics, 43(1)
2000 First author of the chapter “Earth's rotation: theory” of the Encyclopedia of Astronomy and Astrophysics, Ed. P. Murdin
2018 Editor of the ISSI Topical Collection Book on “High Performance Clocks with Special Emphasis on Geodesy and Geophysics and Applications to Other Bodies of the Solar System.”, Space Science Reviews, 214(1)
2015 & 2000 First author of a chapter of the Treatise of Geophysics, Chapter 10.3.10. “Earth Rotation Variations”, Ed. G. Schubert, ISBN: 9780444538024, eBook ISBN: 9780444538031, 1st Edition 2000; 2nd Edition 2015
2015 Author of a book entitled “Habiter sur une lune de glace ?”, Collection *L’Académie en poche* – ebook of the Royal Academy of Belgium
2015 First author of a book entitled “Precession, Nutation, and Wobble of the Earth”, Cambridge University Press, second author P.M. Mathews, April 2015, 536 pages.
2014 Author of two chapters of the Encyclopedia of the Solar System, first author of Chapter 8 “Rotation of Planets”, and second author of Chapter 55 “Probing the Interiors of Planets with Geophysical Tools”, Eds. T. Spohn, D. Breuer, and T. Johnson, ISBN: 9780124158450
2014-2016 Associate Editor of Journal of Space Weather and Space Climate (SWSC)
2012-2017 Scientific responsible Editor of the publications “l’Académie en poche”
2012 Author of a book entitled “Habiter sur Mars ?”, Collection *L’Académie en poche* – ebook of the Royal Academy of Belgium
2002 Editor of the Book “Core Dynamics, Structure and Rotation”, AGU Geophysical Monograph, publication end
2000-2002 Member of the Publication Committee of AGU (American Geophysical Union)
1998-2014 Member of the Editorial Board of the “IERS Conventions 2000”, 1998-2003, and sporadically until 2014

OUTREACH

72 conferences for the public including at Collège de France (e.g., 2013, 2014) and Collège Belgique (2009, 2011, 2012a, 2012b, 2014, 2015a, 2015b, 2017, 2019, 2022, 2023)

Numerous interviews in written press, radios, and televisions

Several press releases

Participation in open-doors events (e.g., at ESA or at the Royal Observatory or at UCLouvain)

Participation in science festivals

Participation in events for students such as “Printemps des Sciences”, “Switch to Space”, etc.

2. MAJOR ACCOMPLISHMENTS

Leader in Geodesy and Planetary Science

Véronique Dehant has established an exceptional international reputation as a pioneering scientist in geodesy and planetary sciences. At 65, she is a Senior Research Scientist at the Royal Observatory of Belgium, where she recently served as Head of Service for the Operational Directorate "Reference Systems and Planetology," managing a team of over 50 professionals. In addition to her research, she taught at UCLouvain (Université catholique de Louvain) and was named Emeritus Professor in 2024.

Her groundbreaking work has centered on the Earth's rotation, precession-nutation (motions of the Earth's rotation axis in space, as illustrated in Figure 1), and modeling of the planet's interior. These contributions have positioned her among the foremost scientists globally in these fields. Dehant's expertise lies in space geodesy, where she has pioneered models of the Earth's response to lunisolar forces, such as Earth tides and nutations. Her PhD work laid the foundation for models still widely used today, including in the International Earth Rotation and Reference Frame Service (IERS) Conventions. She has advanced understanding of mantle inelasticity, resonances in the liquid core, and lateral mantle heterogeneities, and in the 1990s, she developed the first integrated model to analyze motion equations across the Earth's layers. This innovation enabled a holistic study of couplings between the core, mantle, and inner core (see Figure 2).

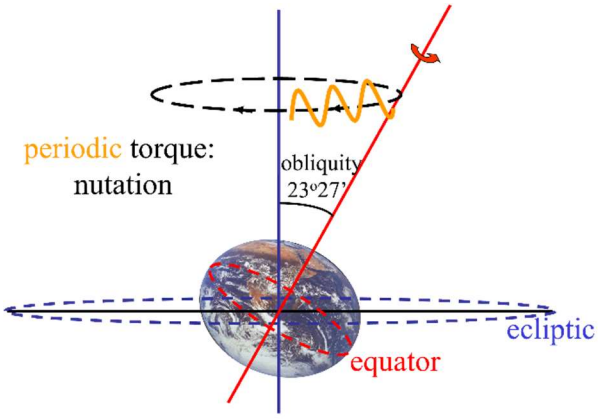


Figure 1. Periodic variations of the rotation axis in space.

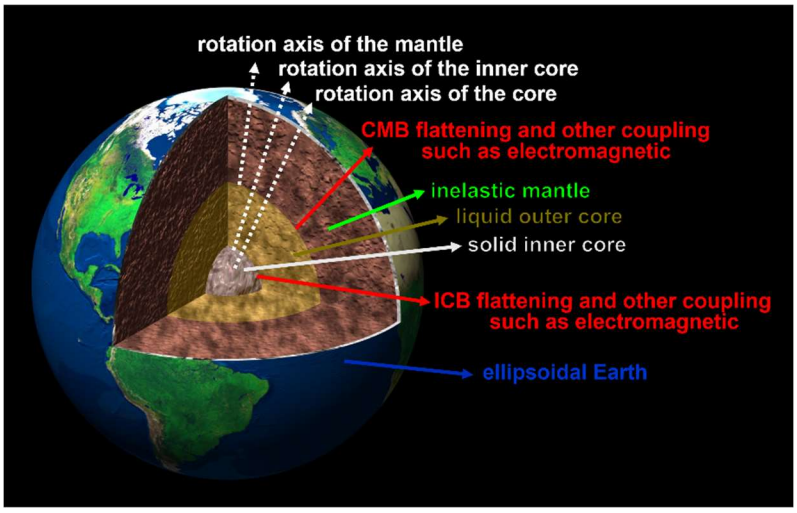


Figure 2. Characteristics of the Earth model used for computing tides and nutations.

Her significant contributions to core dynamics, including studies on nutations and atmospheric effects, led to her appointment as Head of the Special Bureau for the Core within the IERS. Her leadership within international organizations such as the International Astronomical Union (IAU) and the International Union of Geodesy and Geophysics (IUGG) was pivotal in developing a new nutation model critical for both astronomy and geodesy. This model has informed applications ranging from basic research to technological advances like GALILEO, Europe's GPS equivalent. Her team's accomplishments earned them the prestigious Descartes Prize from the European Union in 2003.

Since 1999, Dehant has extended her research to planetary bodies, focusing on their interiors through tides and nutations. She led the development of the LaRa (Lander radioscience) instrument for ESA's ExoMars mission, serving as Principal Investigator (PI) since 2006. This instrument has been integral to advancing understanding of Mars' interior. Her planetary research also encompasses Venus, Mercury,

and icy moons such as Europa and Titan, uncovering phenomena such as liquid cores and subsurface oceans critical to these bodies' habitability. Her expertise has also contributed to missions like VenusExpress, BepiColombo, and JUICE (Jupiter Icy Moons Explorer).

Dehant's research has yielded transformative insights into planetary rotation and internal dynamics. For example, NASA's InSight mission, which landed on Mars in 2018, revealed through nutation analysis that Mars' core is liquid, with a radius of 1,835 ± 55 km and a mean density lower than expected. This finding relied on the amplification of nutation amplitudes near resonance with Mars' Free Core Nutation (FCN), a rotational mode that exists only if the core is liquid and flattened (see Figure 3 and Figure 4).

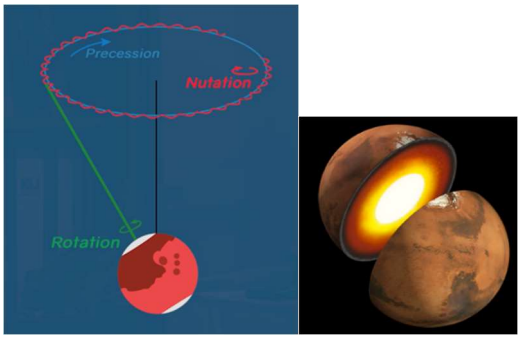


Figure 3. By observing Mars' nutations (observing the FCN resonance), it becomes evident that the core is liquid.

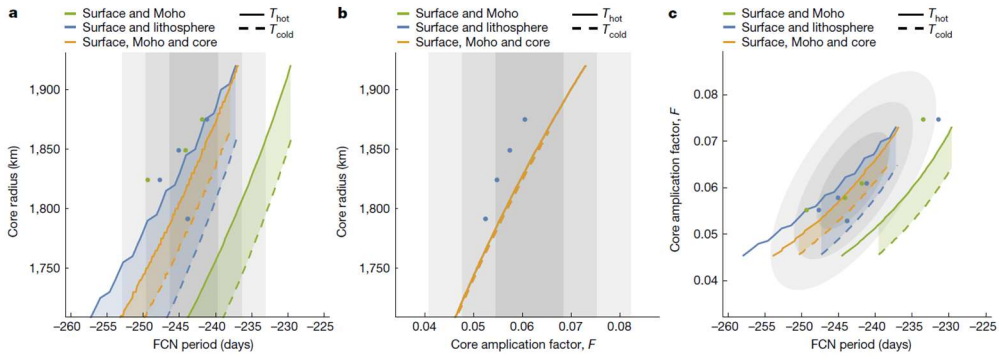


Figure 4. (a) Core radius versus τ_{FCN} period of the FCN in space, (b) core radius versus amplification factor F, (c) τ_{FCN} period of the FCN in space versus amplification factor F, for models based on Yoshizaki & McDonough (2020) mantle composition (coloured areas) and models with a stable magma layer at the bottom of the mantle (circles). Colours differentiate models with one internal load at the Moho (green), one internal load at the bottom of the lithosphere (blue) or two internal loads, located at the Moho and at the bottom of the mantle (orange). In b, blue and green lines are hidden behind the orange lines. Solid and dashed lines represent the hot and cold end-member mantle-temperature models, respectively. Grey shaded areas represent 1σ, 2σ and 3σ uncertainties.

In 2015, Dehant was awarded an ERC Advanced Grant for the RotaNut project (Rotation and Nutation of a wobbly Earth), which identified resonances in core fluid fluxes affecting nutations. Her team developed the numerical model KORE, which integrates the dynamics of core flows, including core modes, tidal forcing, and a background magnetic field, with fully coupled inner core-core-mantle interactions (see Figure 5). This work demonstrated the influence of inertial waves on nutations, magneto-Coriolis and torsional Alfvén waves on Length-of-Day variations, and magneto-Coriolis waves on polar motion when a stably stratified layer is present in the liquid core (see Figure 6).

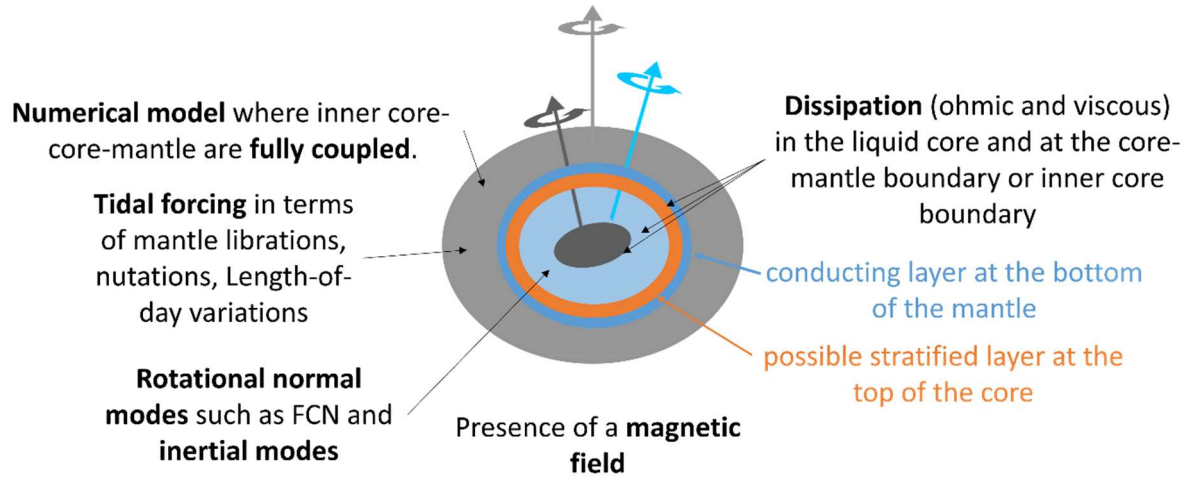


Figure 5. Representation of the characteristics of KORE software for computing core flows.

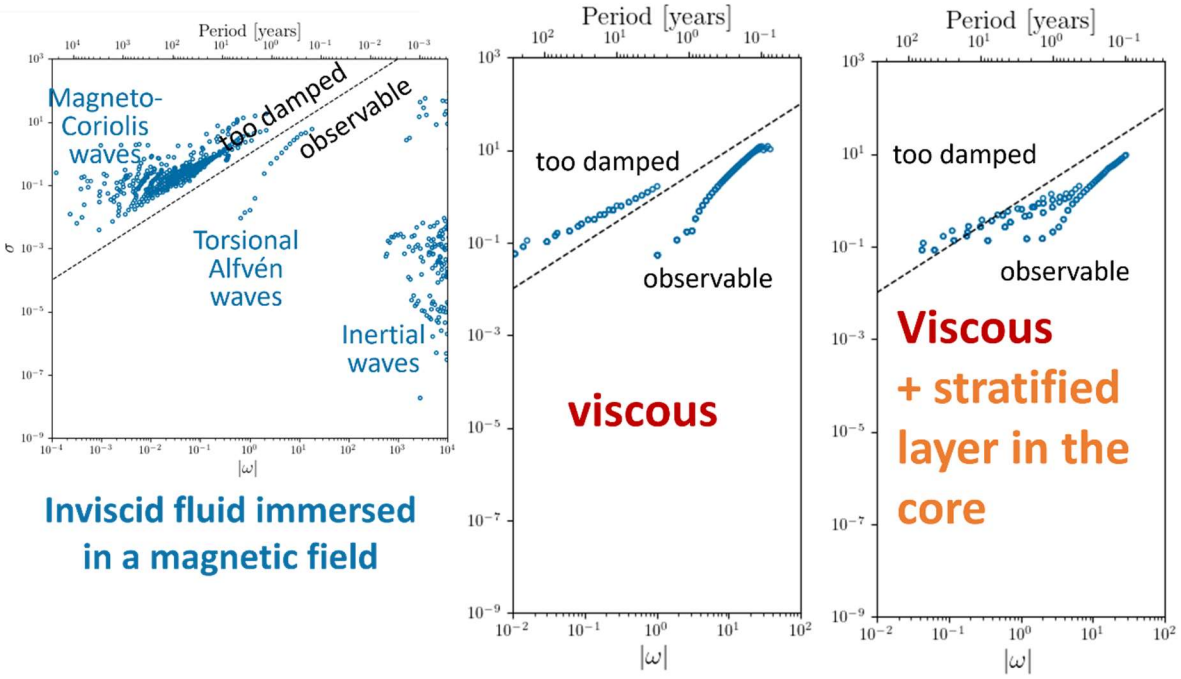


Figure 6. Core mode frequencies $|\omega|$ in cycle/year (or periods in years) and damping σ are shown for the different categories: Magneto-Coriolis waves, torsional Alfvén waves, and inertial waves. The dashed line represents the line above which modes are critically damped (decaying before completing a full cycle). See Seuren et al. (2025)

Building on these achievements, in 2020, Dehant, Mandea, and Cazenave were awarded an ERC Synergy Grant to collaborate with a large team on a visionary project entitled GRACEFUL (GRavimetry, mAgnetism, Rotation, and CorE FLow) to unravel the processes shaping Earth's deep interior and its evolution, particularly the dynamics of the fluid, iron-rich outer core. By combining satellite and ground-based observations, their goal was to overcome the limitations of each method and achieve a holistic understanding of core dynamics.

- The time-dependent magnetic field, primarily generated in the core, provides invaluable insights into fluid motions at the core's surface over decadal and subdecadal timescales.

- Time-dependent gravity field variations reveal changes in Earth's mass distribution, offering glimpses into the core's flow, though surface contributions like water cycle changes and land ice loss often dominate these signals.
- Earth's rotation changes, such as variations in the length of day, polar motion, and nutations, are strongly linked to core fluid motions through angular momentum exchange between the core and mantle.

The GRACEFUL project leverages the synergy of these diverse datasets—magnetic, gravitational, and rotational—to explore core dynamics in unprecedented detail. By developing cutting-edge algorithms and sophisticated numerical models, the team has advanced our understanding of core fluid motions and the complex mechanisms at the core-mantle boundary. This innovative approach is revolutionizing geophysical research and has revealed an unexpected insight: these processes not only influence Earth's deep interior but also have profound impacts on the entire Earth system, from the core to the climate, confirming the intricate interconnection between the planet's fluid layers and its solid components.

Dehant is also deeply involved in developing the VLBI (Very Long Baseline Interferometry) Transmitter instrument for the Earth GENESIS mission, set to launch in 2028. This mission aims to achieve millimeter-level precision in Earth's spatial references, addressing UN recommendations for sustainable development and enhancing applications in climate monitoring and GNSS accuracy (see Figure 7).

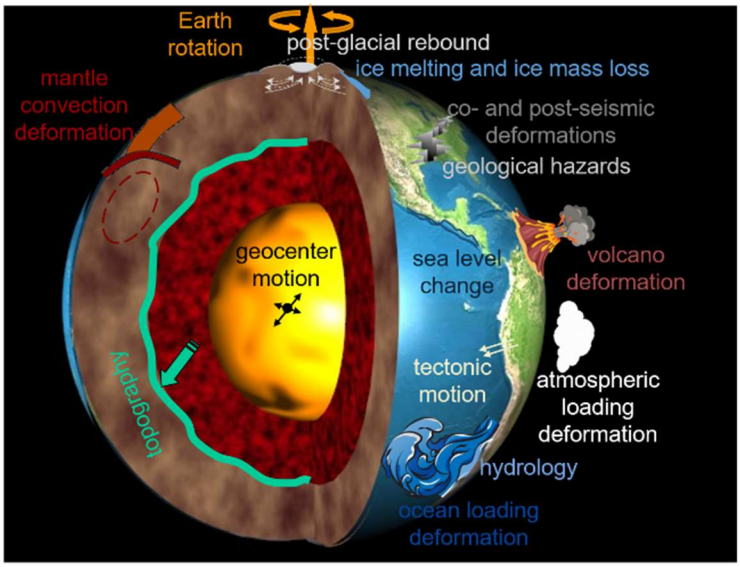
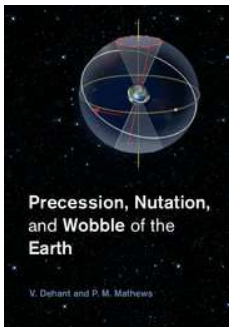


Figure 7. Geophysical phenomena that require observation precision at the mm-level.

Dehant's leadership extends beyond research. She has held prominent roles in organizations such as the American Geophysical Union (AGU), where she served as President-elect of the Geodesy Section, and in advisory capacities for ESA and CNES. These achievements highlight her unparalleled contributions to geodesy and planetary sciences, cementing her legacy as a trailblazer in the field.

3. BIBLIOGRAPHY (FULL LIST OF PUBLICATIONS)

Book Publications:



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