

# CV Ariadna Farrés

## Contact

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## Personal Information

Date of Birth: 3 September 1981  
Place of Birth: Barcelona  
Citizenship: Spanish  
Current Job: Researcher

## Education

**PhD in Mathematics** with European Mention by the Universitat de Barcelona (October 2009). Thesis: *Contributions to the Dynamics of a Solar Sail in the Earth - Sun System*. Advisor: Àngel Jorba.

**Diploma d'Estudis Avançats (D.E.A.)** by the Universitat de Barcelona (September 2005).

**Degree in Mathematics** by the Universtat Autònoma de Barcelona (July 2003).

## Profesional Experience

**Post-Doctoral Researcher** at the *Institut de Matemàtiques Universitat de Barcelona* (IMUB), from March 2016 to October 2016.

**Beatriu de Pinos Post-Doctoral Researcher** at the *Departament de Matemàtica Aplicada i Anàlisi*, University of Barcelona, from October 2013 to September 2015.

**Post-Doctoral Researcher** at the *Institute de Mathématique de Bourgogne*, University of Bourgogne (France), from September 2012 to August 2013.

**Marie Curie Post-Doctoral Researcher** at the *Institute de Mécanique Céleste et Calcul des Éphémérides* (France), from October 2010 to August 2012.

**Assistant professor** (Ajudant LOU) at the University of Barcelona, from September 2006 to September 2010.

**Scholar Researcher** at the Department of Applied Mathematics and Analysis, University of Barcelona. Supported by the grant *Beca de Formació en la Recerca i Docència*, from January 2004 to September 2006.

## Certifications

**Acreditació de Recerca** by the Agency for the Quality of the University System in Catalonia (AQU), 7 october 2013.

**Acreditació Professor Lector** by the Agency for the Quality of the University System in Catalonia (AQU), 31 january 2011.

## Awards

**Outstanding Paper Awards for a Young Scientist** for the manuscript entitled: *On the Station Keeping of a Solar Sail in the elliptic Sun-Earth system*. Prize by the COSPAR Scientific Commission, July 2012. (<http://cosparhq.cnes.fr/Awards/awards.htm>)

**Evarist Galois Prize** by the Catalan Society of Mathematics for the work *Solar Sailing en el Sistema Terra - Lluna*, April 2006.

## Personal Grants

**Beatriu de Pinós Grant (BP-DGR)**: postdoctoral fellowship at the University of Barcelona, from the program Beatriu de Pinós BP-2011 by la Generalitat de Catalunya. From October 2013 to October 2015.

**Postdoctoral fellowship** by the Conseil Régional de Bourgogne, on “Contrôle optimal en Mécanique Spatiale”. From September 2012 to August 2013.

**Postdoctoral fellow by a Marie Curie Initial Training Network**: GTS-Next towards the next generation Geological Time Scale for the last 100 million years. From October 2010 to August 2012.

**BE 2007 2n termini**. Grant by la Generalitat de Catalunya for a stage in a research centre outside Catalunya. For a 2 month stage at the University of Strathclyde, Glasgow. From 7 January to 7 February and 16 June to 18 July 2007.

**9th Student Participation Programme for the 58th IAC in Hyderabad by ESA**, grant to attend and participate in the IAC07 conference in Hyderabad, India.

**Beca de Formació en la Recerca i Docència** grant by the University of Barcelona to fulfill the doctoral studies in the Department of Applied Mathematics and Analysis. From January 2004 to September 2006.

**Grant for the inscription to the RTNS winter schools**: RTNS2004 by la Caixa “Sa Nostra” and RTNS2005 by D.A.N.C.E.

## Short Research Stays

1 week visit at JAXA’s Institute of Space and Astronautical Science (Japan). Joint work with Stefania Soldini and Yuchi Tsuda (January 2016). Project: *Harnessing solar radiation pressure perturbations for trajectory design of solar sail mission at Trojan asteroids*.

4 month internship at NASA’s Goddard Space Flight Centre (Greenbelt, USA). Under the supervision of David Folta (May 2016 - September 2016). Project: *Advanced techniques for the control and use of solar sails with respect to advanced modelling of solar radiation pressure*.

2 weeks doctoral visit to Prof. Colin R. McInnes at the Department of Mechanical Engineering, Strathclyde University, Glasgow, United Kingdom (September 2008). Project: *Reduction to the Central Manifold for a Solar sail in the Earth - Sun system*.

2 weeks doctoral visit to Prof. H.W. Broer at the Department of Dynamical Systems and Mathematical Physics at the Institute of Mathematics and Computing Science, University of Groningen, Groningen, The Netherlands (September 2016). Project: *Reduction to the Central Manifold for a Solar sail in the Earth - Sun system.*

2 months doctoral internship at the Department of Mechanical Engineering, Strathclyde University, Glasgow, United Kingdom. Under the supervision by Prof. Colin R. McInnes (February-March 2008). Project: *Station Keeping strategies for a solar sail around an equilibrium point and periodic orbits.*

## Participation in Research Contracts for Technology Transfer

Ariadna Study, ESA/ESTEC, Contract Number: 20783/07/NL/CB.  
Project: *Efficient Usage of Validated Integrators for Space Applications.*  
Duration: 6 months. Starting: February 2008, Ending: July 2008.

## Participation in Competitive Research Projects

- Name of the project:** Dinamica y Aplicaciones de Variedades Invariantes  
**Funding:** Ministerio de Economia y Competitividad **Reference:** MTM2015-67724-P  
**Duration:** 01/01/2016 - 31/12/2018 **Principal Investigator:** Àngel Jorba
- Name of the project:** Ajut per a Grups de Recerca Consolidats  
**Funding:** Generalitat de Catalunya **Reference:** CIRIT n 2014SGR-1145  
**Duration:** 2014 - 2016 **Principal Investigator:** Àngel Jorba
- Name of the project:** Metodos constructivos en sistemas dinamicos y aplicaciones  
**Funding:** Ministerio de Economia y Competitividad **Reference:** MTM2012-32541  
**Duration:** 01/01/2013 - 31/12/2015 **Principal Investigator:** Àngel Jorba
- Name of the project:** Dinàmica, atractores y no linealidad: caos y estabilidad  
**Funding:** Ministerio de Innovacion **Reference:** MTM2011-13793-E  
**Duration:** 01/01/2012 - 31/12/2012 **Principal Investigator:** Llus Alseda i Soler
- Name of the project:** Variedades Invariantes, Bifurcaciones, Orbitas Recurrentes y Aplicaciones  
**Funding:** Ministerio de Ciencia y Tecnologia **Reference:** MTM2009-09723  
**Duration:** 2010 - 2013 **Principal Investigator:** Àngel Jorba
- Name of the project:** Dinàmica, atractores y no linealidad: caos y estabilidad  
**Funding:** Ministerio de Ciencia y Tecnologia **Reference:** MTM2010-10554-E  
**Duration:** 16/12/2010 - 15/12/2011 **Principal Investigator:** Àngel Jorba
- Name of the project:** Dinàmica, atractores y no linealidad: caos y estabilidad  
**Funding:** Ministerio de Ciencia y Tecnologia **Reference:** MTM2009-06507-E  
**Duration:** 01/01/2010 - 01/08/2011 **Principal Investigator:** Carmen Nuñez
- Name of the project:** Ajut per a Grups de Recerca Consolidats  
**Funding:** Generalitat de Catalunya **Reference:** CIRIT n 2009SGR-67  
**Duration:** 2009 - 2012 **Principal Investigator:** Àngel Jorba

9. **Name of the project:** Red Temática DANCE  
**Funding:** Proyecto Ingenio Matemática (I-MATH) **Reference:** SAIRT-C4-0189  
**Duration:** 01/01/2009 - 31/12/2010 **Principal Investigator:** Àngel Jorba
10. **Name of the project:** Dinámica, atractores y no linealidad: caos y estabilidad  
**Funding:** Ministerio de Ciencia e Innovación **Reference:** MTM2008-01396-E  
**Duration:** 01/01/2009 - 01/08/2010 **Principal Investigator:** Carmen Nuñez
11. **Name of the project:** Dinámica, atractores y no linealidad: caos y estabilidad  
**Funding:** Ministerio de Educación y Ciencia **Reference:** MTM2007-29352-E  
**Duration:** 01/01/2008 - 31/12/2008 **Principal Investigator:** Àngel Jorba
12. **Name of the project:** Dinámica, atractores y no linealidad: caos y estabilidad  
**Funding:** Ministerio de Educación y Ciencia **Reference:** MTM2006-27481-E  
**Duration:** 01/01/2007 - 31/12/2007 **Principal Investigator:** Amadeu Delsams
13. **Name of the project:** Dinámica, atractores y no linealidad: caos y estabilidad  
**Funding:** Ministerio de Educación y Ciencia **Reference:** MTM2005-23972-E  
**Duration:** 01/01/2006 - 31/12/2006 **Principal Investigator:** Amadeu Delsams
14. **Name of the project:** Dinámica, atractores y no linealidad: caos y estabilidad  
**Funding:** Ministerio de Educación y Ciencia **Reference:** MTM2006-26626-E  
**Duration:** 01/01/2006 - 31/12/2006 **Principal Investigator:** Jorge Galán Vioque
15. **Name of the project:** Ingenio Matemàtica (I-MATH)  
**Funding:** MEC (Consolider - Ingenio 2010) **Reference:** CSD2006-00032  
**Duration:** 2006 - 2011 **Principal Investigator:** Enrique Zuazua
16. **Name of the project:** Dinámica Recurrente, objetos invariantes, bifurcaciones y aplicaciones  
**Funding:** Ministerio de Educación y Ciencia **Reference:** MTM2006-11265  
**Duration:** 2006 - 2009 **Principal Investigator:** Àngel Jorba
17. **Name of the project:** Ajut per a grups de recerca consolidats 2005  
**Funding:** Generalitat de Catalunya **Reference:** CIRIT 2005SGR-01028  
**Duration:** 2005 - 2008 **Principal Investigator:** Àngel Jorba
18. **Name of the project:** Dinàmica, atractores y no linealidad: chaos y estabilidad  
**Funding:** Ministerio de Educación y Ciencia **Reference:** MTM2004-20977-E  
**Duration:** 01/01/2005 - 31/12/2005 **Principal Investigator:** Lluís Alseda i Soler
19. **Name of the project:** Dinamica Recurrente y Aplicaciones  
**Funding:** Ministerio de Ciencia y Tecnología **Reference:** BFM2003-07521-C02-01  
**Duration:** 2003 - 2006 **Principal Investigator:** Àngel Jorba

# Teaching Experience

During the academic years 2003/04 to 2009/10 and 2013/14 to 2014/15 I was member of the Department of Applied Mathematics and Analysis, at the University of Barcelona, where I actively collaborated with the teaching duties in the department. Here is a list of all the courses I have participated:

## **Course 2003 / 2004:**

*Mètodes Numèrics*: problemes i pràctiques (1er Matemàtiques, sem.tardor / 4.5 de 10.5 crèdits)

## **Course 2004 / 2005:**

*Anàlisi Matemàtica I*: grup de pràctiques (1er Matemàtiques, sem.tardor / 1.5 de 12 crèdits)

*Mètodes Numèrics*: problemes i pràctiques (1er Matemàtiques, sem.tardor / 4.5 de 10.5 crèdits)

## **Course 2005 / 2006:**

*Informàtica*: grup de pràctiques (1er Matemàtiques, sem.tardor / 3 de 12 crèdits)

*Mètodes Numèrics*: problemes i pràctiques (1er Matemàtiques, sem.tardor / 4.5 de 10.5 crèdits)

## **Course 2006 / 2007:**

*Informàtica*: grup de pràctiques (1er Matemàtiques, sem.tardor, / 3 de 12 crèdits)

*Mètodes Numèrics*: grup de pràctiques (1er Matemàtiques, sem.tardor, / 1.5 de 10.5 crèdits)

*Informàtica*: grup de pràctiques (1er Matemàtiques, sem.primavera / 3 de 12 crèdits)

*Mètodes Numèrics*: grup de pràctiques (1er Matemàtiques, sem.primavera / 1.5 de 12 crèdits)

## **Course 2007 / 2008:**

*Mètodes Numèrics*: grup de pràctiques (1er Matemàtiques, sem.tardor / 1.5 de 10.5 crèdits)

*Informàtica*: problemes i pràctiques (1er Matemàtiques, sem.primavera / 6 de 12 crèdits)

## **Course 2008 / 2009:**

*Anàlisi Matemàtica I*: grup de pràctiques (1er Matemàtiques, sem.tardor / 3 de 12 crèdits)

*Mètodes Numèrics*: grup de pràctiques (1er ETIS, sem.tardor / 3 de 7.5 crèdits)

## **Course 2009 / 2010:**

*Programació Científica*: grup de pràctiques (1er Matemàtiques, sem.tardor / 3 de 6 crèdits)

*Mètodes Numèrics*: grup de pràctiques (1er ETIS, sem.tardor / 3 de 7.5 crèdits)

## **Course 2013 / 2014:**

*Calcul II*: Teoria i problemes (1er Enginyeria Química, sem.primavera / 6 de 6 crèdits)

## **Course 2014 / 2015:**

*Mètodes Numèrics II*: problemes (3er Matemàtiques, sem.tardor / 2 de 6 crèdits)

*Calcul II*: Teoria i problemes (1er Enginyeria Química, sem.primavera / 6 de 6 crèdits)

## **Mentoring de TFG**

Tutor of the Treball de Final de Grau “Construcció d’eines didàctiques per a l’estudi de problemes de mecànica celeste” by Laura Marimon (Notable Alt) June 2010.

## **Mentoring PhD Thesis**

Since January 2014 I am codirecting the Thesis of Marc Jorba-Cuscó, “Dynamics of Solar Sails in the Earth-Moon system”.

# Research Activities

## Publications in peer-reviewed Journals

1. **Farrés, A.**; Jorba, À.; *Dynamics, Geometry and Solar Sails*, Indagationes Mathematicae, Volume 27, Issue 5, pp. 1245-1264, December 2016.
2. **Farrés, A.**; Jorba, À.; *Station keeping of a solar sail around a Halo orbit*, Acta Astronautica Volume 94, Issue 1, pp. 527-539, January - February 2014.
3. **Farrés, A.**; Laskar, J.; Blanes, S.; Casas, F.; Makazaga, J.; Murua, M.; *High precision Symplectic Integrators for the Solar System*, Celestial Mechanics and Dynamical Astronomy, Volume 116, Issue 2, pp. 141-174, June 2013.
4. Blanes, S.; Casas, F.; **Farrés, A.**; Laskar, J.; Makazaga, J.; Murua, A.; *New families of symplectic splitting methods for numerical integration in dynamical astronomy*, Applied Numerical Mathematics, Volume 68, pp. 58-72, June 2013.
5. **Farrés, A.**; Jorba, À.; *On the Station Keeping of a Solar Sail in the Elliptic Sun - Earth system*, Advances in Space Research, Volume 48, Issue 11, pp. 1785-1796, December 2011.
6. Laskar, J.; Gastineau, M.; Delisle, J.-B.; **Farrés, A.**; Fienga, A.; *Strong chaos induced by close encounters with Ceres and Vesta*, Astronomy & Astrophysics, Vol. 532 L4, August 2011.
7. **Farrés, A.**; Jorba, À.; *Dynamics of a Solar Sail Near a Halo Orbit*, Acta Astronautica, Volume 67, pp. 979-990, October - November 2010.
8. **Farrés, A.**; Jorba, À.; *On the High Order Approximation of the Centre Manifold for ODEs*, Discrete and Continuous Dynamical Systems - Serie B, Vol.14:3, pp. 977-1000, October 2010.
9. **Farrés, A.**; Jorba, À.; *Periodic and Quasi - Periodic Motion of a Solar Sail close to SL1 in the Earth-Sun System*, Celestial Mechanics and Dynamical Astronomy, Volume 107, num. 1-2, pp. 233-253, June 2010.
10. **Farrés, A.**; Jorba, À.; *Solar Sail Surfing Along Families of Equilibrium Points*, Acta Astronautica, Volume 63, Issues 1-4, pp. 249-257, July-August 2008.
11. **Farrés, A.**; Jorba, À.; *A Dynamical System Approach for the Station Keeping of a Solar Sail*, The Journal of the Astronautical Science, Volume 56, Number 2, pp. 199-230, April-June 2008.

## Books and Chapters

1. **Farrés, A.**; Jorba, À.; *Artificial Equilibria in the RTBP for a Solar Sail and Applications*, Astrodynamics Network AstroNet-II, Volume 44 of the series Astrophysics and Space Science Proceedings. Publisher: Springer, Editors: G. Gómez and J. Masdemont, pp 73-89, 2016.
2. **Farrés, A.**; Jorba, À.; *Station Keeping Strategies for a Solar Sail in the Solar System*, In book: Recent Advances in Celestial and Space Mechanics, Chapter: 3, Publisher: Springer, Editors: B. Bonnard and M. Chyba, pp. 83-115, April 2016.

3. Caillau, J.-B.; **Farrés, A.**; *On local optima in minimum time control of the restricted three-body problem*, In book: Recent Advances in Celestial and Space Mechanics, Chapter: 7, Publisher: Springer, Editors: B. Bonnard and M. Chyba, pp. 209-302, April 2016.
4. **Farrés, A.**; Jorba, À.; Mondelo, J-M.; Villac, B.; *Periodic Motion for an Imperfect Solar Sail near an Asteroid*, Advances in Solar Sailing, Part of the Springer Praxis Books series, Publisher: Springer Berlin Heidelberg, Editor: M. Macdonald, pp. 885-898, February 2014.

## Technical Reports

1. Alessi, E.M., **Farrés, A.**, Vieiro, A., Jorba, À., Simó, C., *Efficient Usage of Self Validated Integrators for Space Applications*, Ariadna Final Report, Contract Number: 20783/07/NL/CB, June 2008. <http://www.esa.int/gsp/ACT/publications/pub-inf.htm>

## Preprints

1. **Farrés, A.**; Jorba, À.; *Transfer orbits to  $L_4$  with a solar sail in the Earth-Sun system*, (under review Acta Astronautica).
2. **Farrés, A.**; Jorba, À.; Mondelo, J-M.; *Numerical study of the geometry of the phase space of the AH3BP* (under review Celestial Mechanics and Dynamical Astronomy).
3. Jorba-Cusco, M.; **Farrés, A.**; Jorba, À.; *Families of periodic orbits for a solar sail in the Earth-Moon system:  $L_3, L_4$  and  $L_5$* .
4. Jorba-Cusco, M.; **Farrés, A.**; Jorba, À.; *Families of periodic orbits for a solar sail in the Earth-Moon system:  $L_1$  and  $L_2$* .

## Proceedings

1. **Farrés, A.**; Soldini, S.; Tsuda, Y.; *JAXA's Trojan Asteroids Mission: Trajectory Design of the Solar Power Sail and its Lander*, Proceedings of the 4th International Symposium on Solar Sailing, Kyoto, Japan, 17-20 January 2017.
2. **Farrés, A.**; *Catalogue on the Dynamics of a Solar Sail around  $L_1$  and  $L_2$* , Proceedings of the 4th International Symposium on Solar Sailing, Kyoto, Japan, 17-20 January 2017.
3. Jorba-Cusco, M.; **Farrés, A.**; Jorba, À.; *Periodic and Quasi-Periodic motion for a Solar Sail in the Earth-Moon system*, Proceedings of the 67th International Astronautical Congress, Guadalajara, Mexico, 26-30 September 2016.
4. **Farrés, A.**; Jorba, À.; *Solar Sailing with invariant manifolds in the Earth-Sun system*, Proceedings of the 66th International Astronautical Congress, Jerusalem, Israel, 12-16 October 2015.
5. Jorba-Cusco, M.; **Farrés, A.**; Jorba, À.; *A study on the effect of solar radiation pressure on the stability region near the Earth-Moon triangular points*, Proceedings of the 66th International Astronautical Congress, Jerusalem, Israel, 12-16 October 2015.
6. **Farrés, A.**; Jorba, À.; *Dynamical System Tools to Navigate in the Earth-Sun System*, Proceedings of the XXIV congress on differential equations and applications, Cadiz, Spain, 8-12 June 2015.

7. Jorba-Cusco, M.; **Farrés, A.**; Jorba, À.; *On the Solar Sail periodic orbits near the Earth-Moon libration points*, Proceedings of the XXIV congress on differential equations and applications, Cadiz, Spain, 8-12 June 2015.
8. **Farrés, A.**; Jorba, À.; Mondelo, J-M.; *Orbital dynamics for a non-perfectly reflecting Solar sail close to an asteroid*, Proceedings of the 2nd IAA Conference on Dynamics and Control of Space System, Rome, Italy, 24-26 March 2014.
9. **Farrés, A.**; Jorba, À.; *Periodic Motion for an Imperfect Solar Sail Near an Asteroid*, Proceedings of the 3rd International Symposium on Solar Sailing, Glasgow, United Kindom, 11-13 July 2013. (*selected for publication in Advances in Solar Sailing*)
10. **Farrés, A.**; Jorba, À.; *Orbital Dynamics of a Solar Sail near L1 and L2 in the Elliptic Hill problem*, Proceedings of the 63rd International Astronautical Congress, Naples, Campania, Italy, 1-5 October 2012.
11. **Farrés, A.**; Ceriotti, M.; *Solar sail station keeping of high-amplitude vertical Lyapunov orbits in Sun-Earth system*, Proceedings of the 63rd International Astronautical Congress, Naples, Campania, Italy, 1-5 October 2012.
12. Villac, B.; Ribalta, G.; **Farrés, A.**; Jorba, À.; Mondelo, J-M; *Using Solar Arrays for Orbital Control Near Small Bodies. Trade-offs Characterization*, Proceedings of the AIAA/AAS Astrodynamics Specialist Conference, 13-16 August 2012, Minneapolis, Minnesota, 2012.
13. **Farrés, A.**, Jorba, À., *Station Keeping of a Solar Sail around a Halo Orbits*, Proceedings of the 1st IAA Conference on Dynamics and Control of Space System, Porto, Portugal, 19-21 March 2012. (*selected for the special issue at Acta Astronautica*).
14. **Farrés, A.**, Jorba, À., *Station Keeping of a Solar Sail in the Solar System*, Proceedings of the 62nd International Astronautical Congress, Cape Town, South Africa, October 2011.
15. **Farrés, A.**, Jorba, À., *Sailing Between the Earth and the Sun*, Proceedings of the Second International Symposium on Solar Sailing. New York, USA, 20-22 July 2010. Ed: R.Ya. Kezerashvili, pp. 177-182.
16. **Farrés, A.**, Jorba, À., *Dynamics of a Solar Sail Near a Halo Orbit*, Proceedings of the 60th International Astronautical Congress, Daejon, Republic of Korea, October 2009. (*selected for the special issue of Acta Astronautica*)
17. Alessi, E.M., **Farrés, A.**, Vieiro, A., Jorba, À., Simó, C., *Jet Transport and Applications to NEO's*, Proceedings of the 1st IAA Planetary Defense Conference, Granada, Spain, April 2009.
18. **Farrés, A.**; Jorba, À.; *Solar Sail Surfing Along Families of Equilibrium Points*, Proceedings of the 58th International Astronautical Conference, Hyderabad, India, September 2008. (*selected for the special issue of Acta Astronautica*)
19. **Farrés, A.**, Jorba, À., *Periodic and Quasi-Periodic Motions of a Solar Sail on the Sun-Earth System.*, Proceedings of the AAS/AIAA Astrodynamics Specialist Conference, Honolulu, Hawaii, August 2008.



20. **Farrés, A.**, Jorba, À., *Station Keeping Close to Unstable Equilibrium Points with a Solar-Sail*, Proceedings of the AAS/AIAA Astrodynamics Specialist Conference, Mackinac Island, Michigan, August 2007.
21. **Farrés, A.**, Martinsson, H., Ofstad, B., Pereverzyev, S., Purrucker, M., Schmitz Abe, K.E., Stiel, D., Strautins, U., *Frequency Filtering in Telecommunications*, Proceedings of the 17-th ECMI Modelling Week, 2005.

## Communications and Posters in scientific conferences

1. Communication: “JAXA’s Trojan Asteroids Mission: Trajectory Design of the Solar Power Sail and its Lander”, 4th International Symposium on Solar Sailing, Kyoto, Japan, 17-20 January 2017.
2. Communication: “Catalogue on the Dynamics of a Solar Sail around L1 and L2”, 4th International Symposium on Solar Sailing, Kyoto, Japan, 17-20 January 2017.
3. Communication: “Periodic Motion for a Solar Sail close to an Astroid”, Computational perturbative methods for Hamiltonian systems - Applications in physics and astronomy, Athens, Greece, 11-13 July 2016.
4. **Invited talk**: “Solar sails: a new way to travel through space”, 1st Workshop on Dynamical Systems in the Real Life (RDS2016), Castelló de la Plana, Spain, 7-8 July 2016.
5. Communication: “Dynamics and Control of a Solar Sail in the RTBP”, 1st BSMath Junior Meeting, Barcelona, Catalunya, 11 December 2015.
6. Communication: “Solar Sailing with invariant manifolds in the Earth-Sun system”, Proceedings of the 66th International Astronautical Congress, Jerusalem, Israel, 12-16 October 2015.
7. Communication: “Surfeando con una vela Solar en el sistema Tierra - Luna”, Congreso de Jóvenes Investigadores de la RSME, Murcia, Spain, 7-11 September 2015.
8. **Invited talk**: “Solar Surfing the Earth-Sun RTBP”, Tossa de Mar, Spain, Astronet-II International Final Conference, 15-19 June 2015.
9. Communication: “Dynamical System Tools to Navigate in the Earth-Sun System”, Cadiz, Spain, XXIV Congress on Differential Equations and Applications (CEDYA’15), 8-12 June 2015.
10. Poster: “Surfing of Invariant Manifolds”, Workshop 3: Geometric control and related fields, RICAM Special Semester on New Trends in Calculus of Variations, Linz, Austria 17-21 November 2014.
11. **Invited talk**: “On the Dynamics of the Augmented Hill 3 Body Problem”, 10th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Madrid, Spain, 07-11 July 2014.
12. **Invited talk**: “Symplectic Splitting Methods for Dynamical Astronomy”, 10th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Madrid, Spain, 7-11 July 2014.
13. Communication: “Controlling a Solar Sail in the Solar System”, Conference on Hamiltonian Systems and Celestial Mechanics 2014 (HAMSYS2014), Barcelona, Spain, 2-6 June 2014.

14. Communication: “Orbital Dynamics for a non-perfectly reflecting solar sail close to an Asteroid”, 2nd IAA Conference on Dynamics and Control of Space Systems, Rome, Italy, 24-26 March 2014.
15. **Invited Talk:** “Splitting Methods for High-Precision Integration in Dynamical Astronomy”, 2013 International Conference on Scientific Computation and Differential Equations (SciCADE13), Valladolid, Spain, 16-20 Setembre 2013.
16. **Invited Talk:** “Controlling Solar Sails using Invariant Manifolds”, XXIII Congreso de Ecuaciones Diferenciales y Aplicaciones (XXIII CEDYA), Castellon, Spain, 9-13 Setembre 2013.
17. Poster: “Families of Periodic and Quasi-Periodic motion for imperfect Solar Sails around asteroid”, 6th International Meeting of Celestial Mechanics (CELMEC VI), San Martino al Cimino, Italia, 1-7 Setembre 2013.
18. Communication: “Low-Thrust minimum time Earth-Moon transfer”, 6th International Meeting of Celestial Mechanics (CELMEC VI), San Martino al Cimino, Italia, 1-7 Setembre 2013.
19. Communication: “Periodic motion for an imperfect Solar Sail near an asteroid”, 3rd International Symposium on Solar Sailing, Glasgow, Regne Unit, 11-13 Juny 2013.
20. **Invited Talk:** “Sur les minima locaux des transferts temps min dans les Trois Corps Restreints”, Journee de Contrôle Geometrique et Transport, Nice, France 4 Juny 2013.
21. Communication: “Solar Sail Dynamics near an Asteroid”, 14me Journees de l’Ecole Doctorale, Dijon, France, 30-31 Maig 2013.
22. Communication: “Orbital Dynamics of a Solar Sail near L1 and L2 in the Elliptic Hill problem”, 63rd International Astronautical Congress. Naples, Campania, Italy, 1-5 October 2012.
23. Communication: “Solar sail station keeping of high-amplitude vertical Lyapunov orbits in Sun-Earth system”, 63rd International Astronautical Congress. Naples, Campania, Italy, 1-5 October 2012.
24. Communication: “Stability of the long period terms in the La2011 astronomical solution”. EGU, Vienna, Austria, 22-27 April 2012.
25. Communication: “Station Keeping of a Solar Sail around a Halo Orbits”, 1st IAA Conference on Dynamics and Control of Space System. Porto, Portugal, 19-21 March 2012.
26. **Invited Talk:** “Navegant amb veles solars pel sistema Terra - Sol.”, Segona Jornada SCM de Joves Investigadors en Matemàtiques. Barcelona, Spain 14 October 2011.
27. Communication: “Station Keeping of a Solar Sail in the Solar System.”, 62nd International Astronautical Congress, Cape Town, South Africa, 3-7 October 2011.
28. **Invited Talk:** “Long-term N-Body integrations for the Solar System.”, IMAC Symposium on Dynamical Systems, Trends and Perspectives. Castellón, Spain 14-16 September 2011.
29. **Invited Talk:** “Control Strategies for Solar Sails.”, Congrès SMAI 2011, 5eme Biennale Franais des Mathématiques Appliquées et Industrielles. Guidel, Bretagne 23-27 May 2011.
30. Communication: “Sailing between the Earth an the Sun.”, 2nd International Symposium on Solar Sailing, New York, USA, 20-22 July 2010.

31. Communication: “Control con una vela solar alrededor de una orbita Halo.”, NoLineal 2010, Cartagena, 8 - 11 June 2010.
32. **Invited talk:** “Dynamical Systems Tools for Solar Sail.”, Emerging topics in Dynamical Systems and Partial Differential Equations (DSPDES’10), Barcelona, 31 May - 4 June 2010.
33. Communication: “Dynamics of a Solar Sail Near a Halo Orbit.”, 60th International Astronautical Congress. Daejeon, Republic of Korea, 12-16 October 2009.
34. Poster: “Dynamics of a Solar Sail close to the SL1 point of the Earth-Sun system.”, 5th International Meeting of Celestial Mechanics (CELMEC V), San Martino al Cimino, Italia, 6-12 September 2009.
35. Communication: “High Order Approximations for the Centre Manifold and Applications.”, 2009 International Conference on Scientific Computational and Differential Equations (SciCADE09), Beijing, 25-29 May 2009.
36. Poster: “Jet Transport and Applications to NEO’s.”, 1st IAA Planetary Defense Conference, Granada, 27-30 April 2009.
37. Communication: “Normally Hyperbolic Invariant Manifolds and Solar Sails.”, Bifurcations, Mathematical & Quantum Aspects & Applications (BIFUR08), Tres Cantos, Madrid, 9-12 December 2008.
38. **Invited talk:** “Nonlinear Dynamics Near Equilibrium Points for a Solar Sail.”, Workshop on Stability and Instability in Mechanical Systems: Applications and Numerical Tools, Barcelona, 1-5 December 2008.
39. Communication: “Aproximaciones de la Variedad Central para una Vela Solar en el Sistema Tierra - Sol.”, Ddays 2008, El Escorial, Madrid, 22-24 October 2008.
40. Communication: “Solar Sails and Dynamical Systems.”, Astronet Meeting at the Glasgow IAC, Glasgow, UK, October 2008.
41. Communication: “Periodic and Quasi-Periodic Motions of a Solar Sail on the Sun-Earth system.”, 2008 AAS/AIAA Astrodynamics Specialist Conference, Honolulu, Hawaii, 18-21 August 2008.
42. Communication: “Approximating Centre Manifolds on a Model for a Solar Sail.”, Fourth International Conference on Applications of Computer Algebra, Linz, Austria, 27-30 July 2008.
43. Communication: “Solar Sail Surfing Along Families of Equilibrium Points.”, 58th International Astronautical Congress, Hyderabad, India, 24-28 September 2007.
44. Communication: “A Dynamical Systems Approach for the Station Keeping of a Solar Sail Near an Unstable Point.”, 2007 AAS/AIAA Astrodynamics Specialist Conference, Michigan, 19-23 August 2007.
45. Communication: “Nonlinear Dynamics for a Solar Sail Near an Equilibrium Point of the Sun-Earth System.” Chaos, Complexity and Transport: Theory and Application, Marseille, 4-8 June 2007.

46. Communication: “A Dynamical Systems Approach to Solar Sailing.”, Second Czech-Catalan Conference in Mathematics, Barcelona, 21-23 September 2006.
47. Communication: “Solar Sailing Near a Collinear Point.”, in AIMS’ Sixth International Conference on Dynamical Systems, Differential Equations and Applications, Poitiers, 25-28 June 2006.

## Seminars

1. “Orbital Dynamics and Control for Solar Sails around Libration Points”, 11 January 2017, at JAXA Institute of Space and Astronautical Science, Sagamihara.
2. “Orbital Dynamics and Control for Solar Sails”, 27 June 2016, at NASA Goddard Space Flight Centre, Maryland.
3. “High-Order Symplectic Splitting Methods for Dynamical Astronomy”, 18 February 2015, at the Seminar of the UB-UPC Dynamical System group, Barcelona.  
<http://www.maia.ub.es/ssd.shtml>
4. “Gravity: realitat o ficció?”, 16 December 2013, at the *Seminari Informal de Matemàtiques de Barcelona (SIMBa)*, Universitat de Barcelona. <http://www.ub.edu/simba/>
5. “Cómo simular de forma precisa el movimiento de nuestro Sistema Solar”, 25 April 2013, at the *Seminario IMAC de Análisis numérico y dinámica computacional* organised by the Department of Mathematics ESTCE at the Universitat Jaume I, Castelló.  
<http://www.imac.uji.es/activities/conferences.php>
6. “Symplectic Methods for Long-Term Integration of the Solar System”, 22 April 2013, at the *Seminari Informal de Matemàtiques de Barcelona (SIMBa)*, Universitat de Barcelona.  
<http://www.ub.edu/simba/>
7. “Solar Sails the Earth - Sun System”, 5 October 2012, at the Séminaire étudiants IMB, Université de Bourgogne. <http://math.u-bourgogne.fr/spip.php?rubrique59>.
8. “Station Keeping Strategies for Solar Sails”, 4 July 2012, at the Seminar of the UB-UPC Dynamical System group, Barcelona. <http://www.maia.ub.es/ssd.shtml>
9. “Solar Sails: una nova manera de navegar per l’espai”, 8 May 2012, at the *Seminari Informal de Matemàtiques de Barcelona (SIMBa)*, Universitat de Barcelona.  
<http://www.ub.edu/simba/>
10. “High Order Symplectic Integrators for Long-Term Integrations of the Solar System (State of the Art)”, 25 January 2012, at the Departament of Computational Science and Artificial Intelligence in the Universidad del País Vasco in San Sebastian.
11. “High Order Symplectic Integrators for Long-Term Integrations of the Solar System”, 3 November 2011, at the *Séminaires 2011/2012 Astronomie et Systèmes Dynamiques* organised by Alain Albouy, Alain Chenciner and Jacques Laskar in the IMCCE.  
<https://www.imcce.fr/langues/en/formations/seminaires/ASD/>
12. “Solar Sailing in the Earth-Sun system”, 21 February 2011, at the Seminar *Temps & Espace* in the IMCCE. [http://www.imcce.fr/hosted\\_sites/tempsespace/Seminaires-TE.html](http://www.imcce.fr/hosted_sites/tempsespace/Seminaires-TE.html)

13. “Periodic and quasi-periodic motions for a Solar sail”, 23 November 2010 at the Thematic Seminars of the *i-Math DocCourse: Computational Methods in Dynamical Systems and Applications* in the IMUB. [www.imub.ub.es/doc10](http://www.imub.ub.es/doc10)
14. “On the dynamics of a Solar Sail near  $L_1$ ”, 6 May 2009, at the Seminar of the Dynamical System UB - UPC group. <http://www.maia.ub.es/ssd.shtml>
15. “The Circular Restricted 3 Body Problem (CRTBP): Part III”, 20 March 2009, at the Working Seminar of the Dynamical Systems group in Barcelona. <http://www.maia.ub.es/dsg/wsem/index.html>
16. “Efficient Usage of Self Validated Integrators for Space Applications (II)”, 14 November 2008, at the Working Seminar of the Dynamical Systems group in Barcelona. <http://www.maia.ub.es/dsg/wsem/index.html>
17. “A dynamical system approach for Solar Sails”, 20 February 2008, at Strathclyde University, Glasgow.
18. “Solar Sailing en el Sistema Terra-Lluna”, 21 October 2005, at the Working Seminar of the Dynamical Systems group in Barcelona. <http://www.maia.ub.es/dsg/wsem/index.html>

## Other Merits

**Referee** since 2010 for the journals: *Acta Astronautica*; *Celestial Mechanics and Dynamical Astronomy*; *Journal of Guidance, Control and Dynamics*; *Advances in Space Research*.

**Referee** at the Special Issue *Solar Sailing: Concepts, Technology and Missions*.

**Co-organiser of the “Informal Seminar in Dynamical Systems”** (session of seminars given by the PhD students at the UB-UPC Dynamical System group with the aim to explain in a more distended environment the research done by the students) during the academic courses 2004-2005, 2005-2006, 2008-2009, 2009-2010. (<http://www.maia.ub.es/dsg/wsem/>)

**Member of the organising committee:** “Advanced Course on Long Term Integrations” held at the Institut de Matemàtiques de la Universitat de Barcelona (IMUB) 3-9 September 2007. (<http://www.imub.ub.es/lti07>)

**Member of the organising committee:** “Advanced Course on Numerical Linear Algebra” held at the Institut de Matemàtiques de la Universitat de Barcelona (IMUB) 2-6 July 2007. (<http://www.imub.ub.es/nla07>)

## Outreach and Scientific Divulcation

Participation in the **2a Festa de la Ciència** organised by La UB divulga, with the activity “Caos en sistemes dinàmics”, 30 april 2016. (<http://www.ub.edu/laubdivulga/festacienciaub/>)

Participation in the **1a Festa de la Ciència** organised by La UB divulga, with the activity “Caos en sistemes dinàmics”, 22 may 2015. (<http://www.ub.edu/laubdivulga/festacienciaub/>)

Participation to the programme of **MOBILE EXPLORERS CLUB 2015**, with a three hour workshop session entitled ‘Programming - Design and Editing’ delivered to group of children aged between 8 and 15 years old, during the Mobile World Congress 2015 at Fira Gran Via on 4 March 2015.

Participation in “L’Espai Ciència del Saló de l’Ensenyament” in collaboration with La UB divulga, editions March 2014, 2015.

Invited Talk “Space Debris, un problema real!” at MateFest-InfoFest, 26 March 2014.  
([http://mat.ub.edu/futurs\\_ub/activitats/Matefest/conferencies.php](http://mat.ub.edu/futurs_ub/activitats/Matefest/conferencies.php))

Co-organiser and teacher of the summer-school: “Introduction to astrodynamics, astrophysics and space mission design” at the Estades d’Estiu de Ciència per la Caixa Catalunya (E2C3) in the **Program Joves i Ciència de Caixa Catalunya**, in the editions: July 2009, 2010 and 2011.  
(<http://jovesciencia.catalunyacaixa.es/>)

Participated in the **8a edició de la Fira de Recerca en Directe** organised by the Parc Científic de Barcelona, 20, 21 and 22 of April 2010.

Press article selected by Atomium Culture: E.M. Alessi, **A. Farrés**, À. Jorba, C. Simó and A. Vieiro. “*The hammer of God*” *The eventuality of a collision of an asteroid with the Earth*. Published in The Irish Times (07/08/2011).

Collaboration with different **Xerrades - Tallers** organised by the Mathematics Faculty at the University of Barcelona from 2004 to 2009. **Workshops**: ‘Cryptography’, ‘When you play you do mathematics?’, ‘Noncooperative game theory’, ‘Graphs’, ‘Scientific 3D data visualisation’, ‘Quizzical Statistics’, ‘Robot Eyes’, ‘Fractals’, ‘Artificial Intelligence: the last frontier’, ‘Maps and Mathematics’. (<http://www.ub.edu/futursinousestudiants/ubicat/xerrades.htm>)