Francisco López Jiménez

Ann and H.J. Smead Aerospace Engineering Sciences
3775 Discovery Drive, AERO 355
Boulder, CO 80303

Phone: (303) 492 1047
Email: Francisco.LopezJimenez@colorado.edu
https://www.colorado.edu/faculty/lopezjimenez/

Education

California Institute of Technology, Pasadena, CA
Ph.D. in Aeronautics, 2011.
Advisor: Sergio Pellegrino

California Institute of Technology, Pasadena, CA
M.Sc. in Aerospace Engineering, 2007.

University of Seville, Seville, Spain
B.Sc. in Mechanical Engineering, 2006.

Research Interests

Composite materials and lightweight structures.
Aerospace structures.
Nonlinear mechanics and instabilities.
Mechanics of soft solids.

Professional Experience

Smead Department of Aerospace Engineering Sciences, CU Boulder, Boulder, CO.
Assistant Professor, January 2017 - present

Elasticity, Geometry and Statistics Laboratory, MIT, Cambridge, MA.
Postdoctoral Associate, November 2013 - November 2016

Laboratoire de Mécanique des Solides, École Polytechnique, Palaiseau, France.
Postdoctoral Associate, October 2011 - October 2013.

Space Structures Laboratory, California Institute of Technology, Pasadena, CA.
Postdoctoral Associate, April 2011 - August 2011.
Research Assistant, September 2007 - March 2011.

Deployable Structures Laboratory, University of Cambridge, Cambridge, UK.
Visiting Researcher, June 2007 - August 2007.

Department of Aeronautical and Vehicle Engineering, Royal Institute of Technology (KTH), Stockholm, Sweden.
M.Sc. Thesis Research, March 2005 - December 2005

Teaching Experience and Outreach

Smead Department of Aerospace Engineering Sciences, CU Boulder, Boulder, CO.
ASEN 3112 Structures, Fall 2017, Fall 2018, Fall 2019
ASEN 4018/4028 Senior Design Projects, Academic Years 17/18, 18/19, 20/21.
ASEN 5519 Deployable and Lightweight Structures, Spring 2017.
ASEN 4218/5218 Large Space Structure Design, Spring 2020. ASEN 5212 Composite Structures and Materials, Spring 2021.

California Institute of Technology, Pasadena, CA.
Teaching Assistant, Space Structures (Ae221), April 2008 - June 2008, April 2009 - June 2009, January 2011 - March 2011.

California Institute of Technology, Pasadena, CA.
Science instructor, Caltech Classroom Connection, November 2007 - June 2010.

Journal Articles

[J19] B.Y. Dharmadasa, M.W. McCallum, S. Mierunalan, S.P. Dassanayake, C.H.M.Y. Mallikarachchi, and F. López Jiménez, *Formation of plastic creases in thin polyimide films*, 2020, J. Appl. Mech., 87(5), 051009.

[J18] H.E. Fowler, B.R. Donovan, J.M. McCracken, F. López Jiménez, and T.J. White, *Localizing genesis in polydomain liquid crystal elastomers*, 2020, Soft Matter, 16, 330.

[J17] F. López Jiménez, *Variations in the distribution of local strain energy within different realizations of a representative volume element*, 2019, Composites Part B, 176, 107111.

[J16] R. Al-Rashed, F. López Jiménez, J. Marthelot, and P.M. Reis, *Buckling patterns in biaxially pre-stretched bilayer shells: wrinkles, creases, folds and fracture-like ridges*, 2017, Soft Matter, 13(43), 7969-7978.

[J15] J. Marthelot, F. López Jiménez, A. Lee, J.W. Hutchinson, and P.M. Reis, *Buckling of a pressurized hemispherical shell subjected to a probing force*, 2017, J. Appl. Mech., 84(12), 121005.

[J14] J. Marthelot, P.-T. Brun, F. López Jiménez, and P.M. Reis, *Reversible patterning of spherical shells through constrained buckling*, 2017, Phys. Rev. Matt., 1(2), 025601

[J13] F. López Jiménez, J. Marthelot, A. Lee, J.W. Hutchinson, and P.M. Reis, *Knockdown Factor for the Buckling of Spherical Shells Containing Large-Amplitude Geometric Defects*, 2017, J. Appl. Mech., 84(3), 034501.

[J12] F. López Jiménez, P. Upadhyaya, J. Liljenherte, P.M. Reis, and S. Kumar, *Soft optical composites for tunable transmittance*, 2016, Extr. Mech. Lett., 9, 297'303

[J11] A. Lee, F. López Jiménez, J. Marthelot, J.W. Hutchinson, and P.M. Reis, *The geometric role of precisely engineered imperfections on the critical buckling load of spherical elastic shells*, 2016, J. Appl. Mech., 83(11), 111005.

[J10] F. López Jiménez, N. Stoop, R. Lagrange, J. Dunkel, and P.M. Reis, *Curvature-controlled defect localization in elastic surface crystals*, 2016, Phys. Rev. Lett., 116(10):104301

[J9] R. Lagrange, F. López Jiménez, D. Terwagne, M. Brojan and P.M. Reis, *From wrinkling to global buckling of a ring on a curved substrate*, 2016, J. Mech. Phys. Solids, 89, 77-95.

[J8] F. López Jiménez , S. Kumar, and P.M. Reis, *Soft color composites with tunable optical transmittance*, 2016, Adv. Opt. Mater., 4, 620-626

[J7] F. López Jiménez, *On the isotropy of randomly generated representative volume elements for fiber-reinforced elastomers*, 2016, Composites Part B, 87, 33-39.

[J6] P.M. Reis, F. López Jiménez, and J. Marthelot, *Transforming architectures inspired by origami*, 2015, Proc. Natl. Acad. Sci., 112.40, 12234-12235.

[J5] F. López Jiménez, *Modeling of soft composites under three-dimensional loading*, 2014, Composites Part B, 59, 173-180.

[J4] F. López Jiménez, and N. Triantafyllidis, *Buckling of rectangular and hexagonal honeycomb under combined axial compression and transverse shear*, 2013, Int. J. Solids. Struct., 50, 3934-3946.

[J3] F. López Jiménez, and S. Pellegrino, *Failure of carbon fibers at a crease in a fiber-reinforced silicone sheet*, 2013, J. Appl. Mech., 80, 353-360.

[J2] F. López Jiménez, and S. Pellegrino, *Constitutive modeling of fiber composites with a soft hyperelastic matrix*, 2012, Int. J. Solids. Struct., 49, 635-647.

[J1] F. López Jiménez, and S. Pellegrino, *Folding of fiber composites with a hyperelastic matrix*, 2012, Int. J. Solids. Struct., 49, 395-407.

Conference Proceedings

[C11] B.Y. Dharmadasa and F. López Jiménez, *Modeling the Effect of Creases in an Unfolding Membrane*, AIAA SciTech Forum, 2021. AIAA 2021-1258.

[C11] A.H. Sharma, R. Perez, N.W. Bearns T.J. Rose, and F. López Jiménez, *Some Considerations Involving Testing Guidelines for Large Curvature Bending of High Strain Composites using the Column Bending Test*, AIAA SciTech Forum, 2021. AIAA 2021-0196.

[C10] F. López Jiménez, *Numerical Modeling of Stress Concentration Around Failed Fibers in Unidirectional Composites*, AIAA SciTech Forum, 2021. AIAA 2021-0087.

[C9] G. De Luca, and F. López Jiménez, *Shear stiffening in the microbuckling of fiber composites*, AIAA SciTech Forum, Orlando, FL, 2020. AIAA 2020-0691.

[C8] A.H. Sharma, S.A. Hill, R. Perez, T.J. Rose, and F. López Jiménez, *Tensile fiber failure on High Strain Composites*, AIAA SciTech Forum, Orlando, FL, 2020. AIAA 2020-0208.

[C7] B.Y. Dharmadasa, M.W.McCallum, and F. López Jiménez, *Characterizing and modeling the viscoplastic behavior of creases in Kapton polyimide films*, AIAA SciTech Forum, Orlando, FL, 2020. AIAA 2020-2165.

[C6] T. J. Rose, J. Calish, and F. López Jiménez, *Modeling of Viscoelasticity in Thin Flexible Composites using Coincident Element Method*, AIAA SciTech Forum, Orlando, FL, 2020. AIAA 2020-0693.

[C5] S. Brachthauser Balcells and F. López Jiménez, *Using Non-Linear Homogenization to Model Fiber Microbuckling in the Bending of Soft Composites*, AIAA SciTech Forum, San Diego, CA, 2019. AIAA-2019-2025.

[C4] A. H. Sharma, T. J. Rose, A. Seamone, T.W. Murphey, and F. López Jiménez, *Analysis of the Column Bending Test for Large Curvature Bending of High Strain Composites*, AIAA SciTech Forum, San Diego, CA, 2019. AIAA-2019-1746.

[C3] T.J. Rose, A. Sharma, A. Seamone, F. López Jiménez, and T. Murphey, *Carbon Unidirectional Composite Flexure Strength Dependence on Laminate Thickness*, ASC 33rd Annual Technical Conference, Seattle, WA, 2018.

[C2] B.Y. Dharmadasa, H. M. Y. C. Mallikarachchi, and F. López Jiménez, *Characterizing the Mechanics of Fold-lines in Thin Kapton Membranes*, AIAA SciTech Forum, Kissimmee, FL, 2018. AIAA-2018-0450.

[C1] F. López Jiménez, and S. Pellegrino, *Folding of Thin Composite Structures with a Soft Matrix*, 50th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Palm Springs, CA, 2009. AIAA-2009-2633.

Invited Talks

[I14] **Pattern formation in bilayer systems through substrate pre-stretching**
Workshop on Mathematical Models for Pattern Formation, Center for Nonlinear Analysis, Carnegie Mellon University, March 2019.

[I13] **Instabilities in thin elastic shells: Buckling, dimpling and wrinkling**
Department of Mechanical Engineering, Graduate Seminar, CU Boulder, April 2017.

[I12] **Mechanics of soft composites: From deployable structures to instability-driven pattern formation**
Department of Mechanical Science and Engineering, University of Illinois at Urbana–Champaign, April 2016.

[I11] **Mechanics of soft composites: From deployable structures to instability-driven pattern formation**
Department of Mechanical and Aerospace Engineering, University of California San Diego, April 2016.

[I10] **Control of defect localization in crystalline wrinkling by curvature and topology**
Invited Session at American Physical Society Mach Meeting, Baltimore, MD, March 14-18 2016.

[I9] **Mechanics of soft composites: From deployable structures to self-organized patterns**
Department of Aerospace Engineering Sciences, University of Colorado Boulder, Feb 2016.

[I8] **Mechanics of soft composites: From deployable structures to self-organized patterns**
Department of Mechanical and Industrial Engineering, Northeastern University, February 2016.

[I7] **Mechanics of soft composites: From deployable structures to self-organized patterns**
Department of Mechanical Engineering, École polytechnique fédŕale de Lausanne (EPFL), Switzerland, February 2016.

[I6] **Mechanics of flexible composites: From deployable structures to tunable materials**
Department of Mechanical Engineering and Mechanics, Drexel University, May 2015.

[I5] **Mechanics of flexible composites: From deployable structures to tunable materials**
Department of Mechanical and Aerospace Engineering, University of California Los Angeles, April 2015.

[I4] **Mechanics of flexible composites: From deployable structures to tunable materials**
Department of Mechanical Engineering, City College of New York, March 2015.

[I3] **Instabilities in flexible composites and lightweight materials: From failure to function**
Department of Civil Engineering, Johns Hopkins University, March, 2015.

[I2] **Mechanics of flexible composites: From deployable structures to tunable materials**
Daniel Guggenheim School of Aerospace Engineering, Georgia Institute of Technology, February 2015.

[I1] **Instabilities in flexible composites and lightweight materials**
Aerospace Engineering Department, University of Michigan, February , 2014.

Conference Presentations

[P17] F. López Jiménez, T.J. Rose, N.W. Bearns, and A. Sharma, *Failure of flight laminates under Column Bending Test*, AIAA Spacecraft Structures Technical Committee Summer Meeting, 2020.

[P16] F. López Jiménez, S.A. Hill, R. Perez, and A. Sharma, *Modeling the tensile failure of high strain composites* , AIAA Spacecraft Structures Technical Committee Summer Meeting, Pasadena, CA, 2019.

[P15] F. López Jiménez, A. Sharma, A. Seamone, T.J. Rose, and T.W. Murphey, *Micromechanics and failure properties of High Strain Composites*, Society of Engineering Science Conference, Madrid, Spain, 2018.

[P14] F. López Jiménez, A. Sharma, A. Seamone, T.J. Rose, and T.W. Murphey, *Analysis of the Column Bending Test*, AIAA Spacecraft Structures Technical Committee Summer Meeting, Hampton, VA, 2018.

[P13] F. López Jiménez, A. Sharma, A. Seamone, and T.J. Rose, *Micromechanics of High Strain Composites*, US National Congress on Theoretical and Applied Mechanics, Chigao, IL, 2018.

[P12] B.Y. Dharmadasa, M. McCallum, H. M. Y. C. Mallikarachchi, and F. López Jiménez, A. Sharma, A. Seamone, T.J. Rose, *Structural response of thin folded membranes*, APS March Meeting, Los Angeles, CA, 2018.

[P11] F. López Jiménez, J. Marthelot, A. Lee, and P.M. Reis, *Buckling of Hemispherical Shells Subject to Combined Pressure Loading and Probing Forces*, ASME 2017 International Mechanical Engineering Congress and Exposition, Tampa, FL, 2017.

[P10] F. López Jiménez, R. Al-Rashed, and P.M. Reis, *Surface instabilities in pre-stressed elastic bilayers*, Society of Engineering Science, 53rd Annual Meeting, University of Maryland, MD, 2016.

[P9] F. López Jiménez, P. Upadhyaya, J. Liljenhjerte, s. Kumar, and P.M. Reis, *Soft color-composites for optical switching and dimming*, APS March Meeting, San Antonio, TX, 2015.

[P8] F. López Jiménez, P. Upadhyaya, J. Liljenhjerte, S. Kumar, and P.M. Reis, *Soft color-composites for optical switching and dimming*, 9th European Solids Mechanics Conference, Madrid, Spain, 2015.

[P7] F. López Jiménez, R. Lagrange, and P. M. Reis, *Buckling of a thin film on a curved soft substrate*, ASME 2014 International Mechanical Engineering Congress and Exposition, Montreal, Canada, 2014.

[P6] F. López Jiménez, R. Lagrange, and P. M. Reis, *Wrinkling of curved surfaces*, 17th US National Congress on Theoretical and Applied Mechanics, East Lansing, MI, 2014.

[P5] F. López Jiménez, and N. Triantafyllidis, *Buckling of honeycomb under combined axial compression and transverse shear*, 17th US National Congress on Theoretical and Applied Mechanics, East Lansing, MI, 2014.

[P4] F. López Jiménez, M. C. Rice, and P. M. Reis, *Healing of defects in granular crystals*, 12th Annual Northeastern Granular Materials Workshop, Providence, RI, 2014.

[P3] F. López Jiménez, and N. Triantafyllidis, *Buckling of rectangular and hexagonal honeycomb under combined axial compression and transverse shear*, ASME 2013 International Mechanical Engineering Congress and Exposition, San Diego, CA, 2013.

[P2] F. López Jiménez, and N. Triantafyllidis, *Onset-of-instability in axially compressed rectangular and hexagonal honeycomb*, Congrès Français de Mécanique (CFM), Bordeaux, France, 2013.

[P1] F. López Jiménez, and S. Pellegrino, *Folding and Strain Softening of Carbon Fiber Composites with an Elastomeric Matrix*, 8th European Solid Mechanics Conference, Graz, Austria, 2012.

Research Grants

Electromagnetic properties of carbon fiber composites. Ball Aerospace, 1/2021 to 12/2025. CU Boulder PI: Francisco López Jiménez. CU Boulder funds: $550,643

High Precision Thermally Stable Flexures for Large Deployable Antennas in SmallSats. JPL SURP, 9/2020 to 8/2023. CU Boulder PI: Francisco López Jiménez. CU Boulder funds: $52,000 for first year

Shear Stabilization Based Framework for the Failure Testing and Analysis of High Strain Composites - Phase II. AFRL STTR, partnership with Roccor, 12/2018 to 3/2021. CU Boulder PI: Francisco López Jiménez. CU Boulder funds: $250,551

Shear Stabilization Based Framework for the Failure Testing and Analysis of Hhigh Strain Composites - Phase I. AFRL STTR, partnership with Roccor, 01/2018 to 05/2018. CU Boulder PI: Francisco López Jiménez. CU Boulder funds: $37,000

Student Supervision - Graduate

Mokhtarzadeh Khanegahi Mohammad, CU Boulder, Ph.D. student, Aerospace Engineering Sciences, co-advised with Prof. Kurt Maute, January 2021 - present.

Melvin Colorado Escobar, CU Boulder, Ph.D. student, Materials Science and Engineering, co-advised with Prof. Tim White, August 2020 - present.

Celestine Ananda, CU Boulder, Ph.D. student, Aerospace Engineering Sciences, August 2020 - present.

Thomas J. Rose, CU Boulder, Ph.D. student, Aerospace Engineering Sciences, January 2018 - present.

Buwaneth Yasara Dharmadasa, CU Boulder, Ph.D. student, Aerospace Engineering Sciences, August 2017 - present.

Ajay Harihara Sharma, CU Boulder, Ph.D. student, Aerospace Engineering Sciences, August 2017 - present.

Kensei Kitsu Iglesias, CU Boulder, M.Sc. thesis, Aerospace Engineering Sciences, August 2018 - present.

Arpan Kumar Sahoo, CU Boulder, M.Sc. thesis, Aerospace Engineering Sciences, September 2017 - December 2019.

Savina Brachthauser Balcells, CU Boulder, M.Sc. thesis, Aerospace Engineering Sciences, January 2017 - May 2018.

Student Supervision - Undergraduate

Zoe Bloomfield, CU Boulder, Undergraduate Discovery Learning Apprenticeship, August 2020 - present.

Hannah Johnson, CU Boulder, research student, August 2019 - present.

Jon Weidner-Sheridan, CU Boulder, Undergraduate Discovery Learning Apprenticeship, August 2019 - May 2020.

Riley Perez, CU Boulder, Summer Undergraduate Research Program, June 2019 - present.

Guillaume De Luca, visiting student at CU Boulder, May 2019 - August 2019.

Seth A. Hill, CU Boulder, Undergraduate Discovery Learning Apprenticeship, August 2018 - present.

Matthew W. McCallum, CU Boulder, Undergraduate Discovery Learning Apprenticeship, October 2017 - present.

Andrew Seamone, CU Boulder, Undergraduate Discovery Learning Apprenticeship, August 2017 - May 2019.

Caleb Beavers, CU Boulder, Summer Undergraduate Research Program, May 2018 - December 2018.

Marie C. Rice, MIT senior student, Mechanical Engineering Department, senior thesis, November 2013 - May 2014.

Ryan A. McDermott, MIT junior student, Mechanical Engineering Department, Undergraduate Research Opportunity, November 2013 - February 2014.

Honors and Awards

2019 AIAA Spacecraft Structures Best Paper, *Analysis of the Column Bending Test for Large Curvature Bending of High Strain Composites*, 2019 AIAA SciTech Forum and Exposition, Orlando, FL.

Young Researcher Award for the best oral presentation, 8th European Solid Mechanics Conference (ESMC), Graz, Austria, 2012.

Graduate Student Fellowship, Keck Institute for Space Studies, California Institute of Technology. February 2009 - September 2010.

Earl K. Seals Fellowship, California Institute of Technology. September 2009 - June 2010.

Fellowship from the Agency of Innovation and Development of Andalusia, IDEA, Spain. September 2006 - June 2007.

Professional Service

Member of the organizing committee of the Instabilities session at the ASME Congress Expo (2019-present).

Member of the Spacecraft Structures Technical Committee of the AIAA (2018-present).

Panelist at the Graduate Women in Aerospace Conference (2018)

Focus session organizer: *Morphable Structures* (APS March Meeting, 2018), *Extreme Mechanics of Shells* (APS March Meeting, 2017)

Chair of several sessions at conferences such as: ASME Congress Expo, APS March Meeting, USNCTAM, SES.

Journal reviewer: Physical Review Letters, Physical Review Applied, International Journal of Solids and Structures, Journal of Applied Mechanics, Soft Matter, Physical Review-E, Composites Part B, Journal of Composites, Proceedings of the Royal Society A, AIAA Journal, Thin-Walled Structures, Acta Astronautica, European Solid Mechanics Journal, Mechanics of Time-Dependent Materials.

Professional Memberships

American Institute of Aeronautics and Astronautics (AIAA)
American Physical Society (APS)
American Society of Mechanical Engineers (ASME)

Last updated: January 27, 2021