Antonio Luis Sánchez

PRESENT POSITION

Professor
Department of Mechanical and Aerospace Engineering
University of California, San Diego
La Jolla, California 92093-0411
Phone: (858) 822-3790 Fax: (858) 534-7078
email: alsp@ucsd.edu

EDUCATION

Doctor of Philosophy in Engineering Sciences (Engineering Physics), June 1995, University of California, San Diego. PhD Advisor: **Forman A. Williams**

Master of Science in Engineering Sciences (Aerospace Engineering), June 1993, University of California, San Diego.

Aeronautical Engineer (six-year program), July 1991, Escuela Tecnica Superior de Ingenieros Aeronáuticos (Universidad Politécnica de Madrid).

International Diploma in Aeronautical Engineering, June 1990: Imperial College (University of London).

PROFESSIONAL DATA

Academic and Professional Positions

Professor, Department of Mechanical and Aerospace Engineering
University of California, San Diego, Nov 2014– Present.

Professor, Dept. of Thermal and Fluids Engineering
Universidad Carlos III de Madrid, Sep 2002– Oct 2014.

Visiting Project Scientist, Dept. of Mechanical and Aerospace Engineering
University of California, San Diego, Jul 2012 – Jun 2013.

Associate Professor, Dept. of Mechanical Engineering
Universidad Carlos III de Madrid, May 1998 – Sep 2002.

Assistant Professor, Dept. of Mechanical Engineering
Universidad Carlos III de Madrid, Oct 1995 – May 1998.

Maitre de Conférence, Institut de Recherche sur les Phénomènes Hors Equilibre
Universites d'Aix-Marseille I & II, Marseille, France, Apr-Jul 1996.

Graduate Research with Professor Forman A. Williams
Department of AMES, University of California, San Diego, Sep 1992 – Jun 1995.

1st Lieutenant
Royal Spanish Airforce Headquarters, Sep 1991 – Sep 1992.

Engineer, SENER Ingeniería y Sistemas, Madrid, Sep. 1990 – July 1991.

University Service

Adjunt ViceChancellor for Undergraduate Studies
Universidad Carlos III de Madrid, Jun 2007–Jun 2011.

Chairman of the Dept. of Thermal and Fluids Engineering
Universidad Carlos III de Madrid, June 2004–June 2006.

Academic Honors

Award of the Universidad Politécnica de Madrid for most Outstanding Academic Progress in the first three years of studies, Nov. 1988.

Award to the Highest-Ranking Aeronautical Engineer, presented by the Spanish Aeronautical Engineering Asociation, Dec. 1991.

National Award to the Highest-Ranking Aeronautical Engineer, presented by the Ministry of Education and Science, Feb. 1992.

Graduate Teaching Award, Department of AMES, University of California, San Diego, Winter 1994.

Award of the Social Council of the Universidad Carlos III for Outstanding Research Accomplishments, May 2009 & May 2011.

External Professional Activities

Assistant Scientific Officer for Mechanical, Naval, and Aerospace Engineering, National Science Foundation of the Spanish Ministry of Science, Nov 2004 Jan 2008

Main Scientific Officer for Mechanical, Naval, and Aerospace Engineering, National Science Foundation of the Spanish Ministry of Science, Feb 2008 Sep 2011.

External Reviewer and Project Scientific Monitor for the European Commission (FP5, Technological Hazards; FP7, Energy)

External Reviewer for Netherlands Organization for Scientific Research, Israel Science Foundation

External Reviewer for: Journal of Fluid Mechanics, Physics of Fluids, European Journal of Mechanics-B/Fluids, Combustion Theory and Modelling, Combustion and Flame, Proceedings of the Combustion Institute, Proceedings (A) of the Royal Society, SIAM J. Appl. Math., International Journal of Hydrogen Energy, Journal of Hazardous Materials.

Member of the European Fluid Mechanics Conference Committee (EFMCC) for a period of six years from January 1, 2011 to December 31, 2016.

PUBLICATIONS

1. A. L. Sánchez, A. Liñán and F. A. Williams, A Bifurcation Analysis of High-Temperature Ignition of H_2–O_2 Diffusion Flames, *Proceedings of the Combustion Institute*, **25**, 1529-1537 (1994)

2. A. L. Sánchez, A. Liñán, F. A. Williams and G. Balakrishnan, Theory of Structures of Hydrogen-Oxygen Diffusion Flames, *Combustion Science and Technology*, **110–111**, 277-301 (1995)

3. A. L. Sánchez, G. Balakrishnan, A. Liñán and F. A. Williams, Relationships Between Bifurcation and Numerical Analyses for Ignition of Hydrogen-Air Diffusion Flames, *Combust. Flame*, **105**, 569-590 (1996)

4. A. L. Sánchez, A. Liñán and F. A. Williams, A Generalized Burke-Schumann Formulation for Hydrogen-Oxygen Diffusion Flames Maintaining Partial Equilibrium of the Shuffle Reactions, *Combust. Sci. and Tech.*, **123**, 317-345 (1997)

5. A. L. Sánchez, A. Liñán and F. A. Williams, A WKB Analysis of Radical Growth in the Hydrogen-Air Mixing Layer, *Journal of Engineering Mathematics*, **31**, 119-130 (1997)

6. A. L. Sánchez, Nonpremixed Spontaneous Ignition in the Laminar Wake of a Thin Splitter Plate, *Phys. Fluids*, **9**, 2032-2044 (1997)

7. A. L. Sánchez, I. Iglesias and A. Liñán, An Asymptotic Analysis of Chain-Branching Ignition in the Laminar Wake of a Splitter Plate Separating Streams of Hydrogen and Oxygen, *Combustion Theory and Modeling*, **2**, 259–271 (1998)

8. M. Bollig, A. Liñán, A. L. Sánchez and F. A. Williams, A Simplified Approach to the Numerical Description of Methane-Air Diffusion Flames, *Proceedings of the Combustion Institute*, **27**, 595–603 (1998)

9. A. L. Sánchez, A. Liñán and F. A. Williams, Chain-Branching Explosions in Mixing Layers, *SIAM J. Appl. Math.*, **59**, 1335–1355 (1999)

10. L. L. Bonilla, A. L. Sánchez and M. Carretero, The Description of Homogeneous Branched-Chain Explosions with Slow Radical Recombination by Self-Adjusting Time Scales, *SIAM J. Appl. Math.*, **61**, 528–550 (2000)

11. J. D. Mellado, A. L. Sánchez, J. S. Kim and A. Liñán, Branched-Chain Ignition in Strained Mixing Layers, *Combust. Theory Modelling*, **4**, 265–288 (2000)

12. A. L. Sánchez, A. Lépinette, M. Bollig, A. Liñán and B. Lázaro, The Reduced Kinetic Description of Lean Premixed Combustion, *Combust. Flame*, **123**, 436–464 (2000)

13. A. L. Sánchez, M. Carretero, P. Clavin and F. A. Williams, One-Dimensional Overdriven Detonations with Branched-Chain Kinetics, *Phys. Fluids*, **13**, 776–792 (2001)

14. A. Revuelta, A. L. Sánchez and A. Liñán, Laminar Mixing in Diluted and Undiluted Fuel Jets Upstream from Lifted Flames, *Combust. Flame*, **128**, 199–210 (2002)

15. A. Revuelta, A. L. Sánchez and A. Liñán, Confined Axisymmetric Laminar Jets with Large Expansion Ratios, *J. Fluid Mec.*, **456**, 319–352 (2002)

16. A. Revuelta, A. L. Sánchez and A. Liñán, The Virtual Origin as a First-Order Correction for the Far-Field Description of Laminar Jets, *Phys. Fluids*, **14**, 1821–1824 (2002)

17. A. L. Sánchez, J. L. Jiménez-Alvarez and A. Liñán, The Coupling of Motion and Conductive Heating of a Gas by Localized Energy Sources, *SIAM J. Appl. Math.*, **63**, 937–961 (2003)

18. J. D. Mellado, M. Kindelán and A. L. Sánchez, A Simplified Formulation for Heterogeneous Catalytic Combustion in Stagnation-Point Flows, *Combust. Flame*, **132**, 596–599 (2003)

19. V. Kurdyumov, A. L. Sánchez and A. Liñán, Heat Propagation from a Concentrated External Energy Source in a Gas, *J. Fluid Mec.*, **491**, 379–410 (2003)

20. A. Revuelta, C. Martínez-Bazán, A. L. Sánchez and A. Liñán, Laminar Craya-Curtet Jets, *Phys. Fluids*, **16**, 208–211 (2004)

21. V. Kurdyumov, J. Blasco, A. L. Sánchez and A. Liñán, On the Calculation of the Minimum Ignition Energy, *Combust. Flame*, **136**, 394–397 (2004)

22. A. Revuelta, A. L. Sánchez and A. Liñán, The Quasi-Cylindrical Description of Submerged Laminar Swirling Jets, *Phys. Fluids*, **16**, 848–851 (2004)

23. A. Revuelta, A. L. Sánchez and A. Liñán, Confined Swirling Jets with Large Expansion Ratios, *J. Fluid Mec.*, **508** 89–98 (2004)

24. G. del Alamo, F. A. Williams and A. L. Sánchez, Hydrogen-Oxygen Induction Times Above Crossover Temperatures, *Combust. Sci. Tech.*, **176** 1599-1626 (2004)

25. J. Rodríguez- Rodríguez, A. L. Sánchez and C. Martínez-Bazán, The Boundary-Layer Flow Induced by a Flat Plate Emerging Normally to a Wall, *Heat and Mass Transfer*, **40** 959–962 (2004)

26. A. Lépinette, A. Liñán, B. Lázaro and A. L. Sánchez, Reduced Kinetics and Coupling Functions for Calculating CO and NO Emissions in Gas-Turbine Combustion, *Combust. Sci. Tech.*, **177** 907 - 931 (2005)

27. A. Liñán, E. Fernández-Tarrazo, M. Vera and A. L. Sánchez, Lifted Laminar Jet Diffusion Flames, *Combust. Sci. Tech.*, **177** 933 - 953 (2005)

28. I. Iglesias, M. Vera, A. L. Sánchez, A. Liñán, Simulations of Starting Gas Jets at Low Mach Numbers *Phys. Fluids*, **17** 038105 (2005)

29. M. Sánchez-Sanz, A. L. Sánchez, A. Liñán, Fronts in High-Temperature Laminar Gas Jets *J. Fluid Mec.*, **547** 257 - 266 (2006)

30. A. L. Sánchez, M. Vera, A. Liñán, Exact Solutions for Transient Mixing of Two Gases of Different Density, *Phys. Fluids*, **18** 078102 (2006)

31. E. Fernández-Tarrazo, A. L. Sánchez, A. Liñán, F. A. Williams, A Simple One-Step Chemistry Model for Partially Premixed Hydrocarbon Combustion *Combust. Flame*, **147** 32–38 (2006)

32. W. Coenen, A. Sevilla, A. L. Sánchez, Absolute Instability of Light Jets Emerging from Circular Injector Tubes *Phys. Fluids*, **20** 074104 (2008)

33. D. Fernández-Galisteo, A. L. Sánchez, A. Liñán, F. A. Williams, One-step reduced kinetics for lean hydrogen-air deflagration *Combust. Flame*, **156** 985–996 (2009)

34. D. Fernández-Galisteo, A. L. Sánchez, A. Liñán, F. A. Williams, The hydrogen-air burning rate near the lean flammability limit *Combust. Theory Modelling*, **13** 741–761 (2009)

35. M. Sánchez-Sanz, M. Rosales, A. L. Sánchez, The Hydrogen Laminar Jet, *Int. J. Hydrogen Energy*, **35** 39193927 (2010)

36. M. Sánchez-Sanz, A. L. Sánchez, A. Liñán, Variable-density jet flows induced by concentrated sources of momentum and energy, *Theor. Comput. Fluid Dyn.*, **25** 281–292 (2011)

37. E. Fernández-Tarrazo, A. L. Sánchez, A. Liñán, F. A. Williams, The structure of lean hydrogen-air flame balls, *Proc. Combust. Institute*, **33** 1203–1210 (2011)

38. P. Boivin, C. Jiménez, A. L. Sánchez, F. A. Williams, An explicit reduced mechanism for H_2-air combustion, *Proc. Combust. Institute*, **33** 517–523 (2011)

39. P. Boivin, C. Jiménez, A. L. Sánchez, F. A. Williams, A four-step reduced mechanism for syngas combustion, *Combust. Flame*, **158** 1059–1063 (2011)

40. J. Arrieta-Sanagustín, A. L. Sánchez, A. Liñán, F. A. Williams, Sheath vaporization of a monodisperse fuel-spray jet, *J. Fluid Mec.*, **675** 435–464 (2011)

41. P. Boivin, A. L. Sánchez, F. A. Williams, Explicit analytic prediction for hydrogen-oxygen ignition times at temperatures below crossover, *Combust. Flame*, **159** 748-752 (2012).

42. E. Fernández-Tarrazo, A. L. Sánchez, A. Liñán, F. A. Williams, Flammability conditions for ultra-lean hydrogen premixed combustion based on flame-ball analyses, *Int. J. Hydrogen Energy*, **37** 1813-1825 (2012)

43. W. Coenen, A. Sevilla, A. L. Sánchez, Viscous stability analysis of parallel flows with discontinuous base profiles, *Eur. J. Mech. B/Fluids.*, **36** 128–138 (2012)

44. I. Iglesias, M. Vera, A. L. Sánchez, A. Liñán, Numerical analyses of deflagration initiation by a hot jet, *Combust. Theory Modelling*, **16** 994–1010 (2012)

45. A. Liñán, V. Kurdyumov, A. L. Sánchez, Initiation of reactive blast waves by external energy sources, *C. R. Mecanique*, **340** 829–844 (2012)

46. A. L. Sánchez, E. Fernández-Tarrazo, P. Boivin, A. Liñán, F. A. Williams, Ignition time of hydrogen-air diffusion flames, *C. R. Mecanique*, **340** 882–893 (2012)

47. P. Boivin, A. L. Sánchez, F. A. Williams, Four-step and three-step systematically reduced chemistry for wide-range H_2-air combustion problems, *Combust. Flame*, **160** 76–82 (2013)

48. J. Arrieta-Sanagustín, A. L. Sánchez, A. Liñán, F. A. Williams, Coupling-function formulation for monodisperse spray diffusion flames with infinitely fast chemistry, *Fuel Process. Technol.*, **107** 81–92 (2013)

49. J. Carpio, I. Iglesias, M. Vera, A. L. Sánchez, A. Liñán, Critical radius for hot-jet ignition of hydrogen-air mixtures, *Int. J. Hydrogen Energy*, **38** 3105–3109 (2013)

50. E. Fernández-Tarrazo, A. L. Sánchez, F. A. Williams, Hydrogen-air mixing-layer ignition at temperatures below crossover, *Combust. Flame*, **160** 1981–1989 (2013)

51. M. J. Gollner, A. L. Sánchez, F. A. Williams, On the heat transferred to the air surrounding a semi-infinite inclined hot plate, *J. Fluid Mec.*, **732** 304–315 (2013)

52. C. Huete, A. L. Sánchez, F. A. Williams, Theory of interactions of thin strong detonations with turbulent gases, *Phys. Fluids*, **25** 076105 (2013)

53. D. Martínez-Ruiz, J. Urzay, A. L. Sánchez, A. Liñán, F. A. Williams, Dynamics of thermal ignition of fuel sprays in mixing layers, *J. Fluid Mec.*, **734** 387–423 (2013)

54. A. L. Sánchez, E. Fernández-Tarrazo, F. A. Williams, The chemistry involved in the third explosion limit of H_2-O_2 mixtures, *Combust. Flame*, **161** 111–117 (2014)

55. A. L. Sánchez, F. A. Williams, Recent advances in understanding of flammability characteristics of hydrogen, *Prog. Energy Combust. Sci.*, **41** 1–55 (2014)

56. C. Huete, A. L. Sánchez, F. A. Williams, Linear theory for the interaction of small-scale turbulence with overdriven detonations, *Phys. Fluids*, **26** 116101 (2014)

57. A. L. Sánchez, J. Urzay, A. Liñán, The role of separation of scales in the description of spray combustion, *Proc. Combust. Institute*, **35** 1549–1577 (2015)

58. A. Liñán, M. Vera, A. L. Sánchez, Ignition, lift-off, and extinction of gaseous diffusion flames, *Ann. Rev. Fluid Mech.*, **47** 293–314 (2015)

59. A. Liñán, D. Martínez-Ruiz, A. L. Sánchez, J. Urzay, Regimes of spray vaporization and combustion in counterflow configurations, *Combust. Sci. Tech.*, **187** 103–131 (2015)

60. C. Huete, A. L. Sánchez, F. A. Williams, J. Urzay, Diffusion-flame ignition by shock-wave impingement on a supersonic mixing layer, *J. Fluid Mec.*, **784** 74–108 (2015)

61. C. Huete, J. Urzay, A. L. Sánchez, F. A. Williams, Weak-shock interactions with transonic laminar mixing layers of fuels for high-speed propulsion, *AIAA J.*, **54** 962–975 (2016)

62. E. Fernández-Tarrazo, M. Sánchez-Sanz, A. L. Sánchez, F. A. Williams, A multipurpose reduced chemical-kinetic mechanism for methanol combustion, *Combust. Theory Modelling*, **20** 613–631 (2016).

63. D. Moreno-Boza, W. Coenen, A, Sevilla, J. Carpio, A. L. Sánchez, A. Liñán, Diffusion-flame flickering as a hydrodynamic global mode, *J. Fluid Mec.*, **798** 997–1014 (2016)

64. E. Fernández-Tarrazo, M. Sánchez-Sanz, A. L. Sánchez, F. A. Williams, Minimum ignition energy of methanol-air mixtures, *Combust. Flame*, **171** 234–236 (2016)

65. M. Sánchez-Sanz, E. Fernández-Tarrazo, A. L. Sánchez, Regimes of boundary-layer ignition by heat release from a localized energy source, *Proc. Combust. Institute*, **36** 1467–1473 (2017).

66. A. Liñán, D. Martínez-Ruiz, M. Vera, A. L. Sánchez, The large-activation-energy analysis of extinction of counterflow diffusion flames with nonunity Lewis numbers of the fuel, *Combust. Flame*, **175** 91–106 (2017)

67. C. Huete, A. L. Sánchez, F. A. Williams, Diffusion-flame ignition by shock-wave impingement on a hydrogen-air supersonic mixing layer, *J. Propulsion Power*, **33** 256–263 (2017).

68. A. Liñán, D. Moreno-Boza, I. Iglesias, A. L. Sánchez, F. A. Williams, The slowly reacting mode of combustion of gaseous mixtures in spherical vessels. Part 1: transient analysis and explosion limits, *Combust. Theory Modelling*, **20** 1010–1028 (2016)

69. A. L. Sánchez, I. Iglesias, D. Moreno-Boza, A. Liñán, F. A. Williams, The slowly reacting mode of combustion of gaseous mixtures in spherical vessels. Part 2: buoyancy-induced motion and its effect on the explosion limits, *Combust. Theory Modelling*, **20** 1029–1045 (2016)

70. A. L. Sánchez, F. A. Williams, Corrigendum to "Recent advances in understanding of flammability characteristics of hydrogen" [Prog Energ Combust Sci 41 (2014) 1–55], *Prog. Energy Combust. Sci.*, **54** 93–94 (2016)

71. P. Boivin, A. L. Sánchez, F. A. Williams, Analytical prediction of syngas induction times, *Combust. Flame*, **176** 489–499 (2017)

72. J. Carpio, A. Liñán, A. L. Sánchez, F. A. Williams, Aerodynamics of axisymmetric counterflowing jets, *Combust. Flame*, **177** 137–143 (2017)

73. D. Moreno-Boza, I. Iglesias, A. L. Sánchez, Large-activation-energy analysis of gaseous reacting flow in pipes, *Combust. Flame*, **178** 217–224 (2017)

74. J. Carpio, I. Iglesias, M. Vera, A. L. Sánchez, Critical slot size for deflagration initiation by hot products discharge into hydrogen-air atmospheres, *Int. J. Hydrogen Energy*, **42** 1298–1305 (2017)

75. P. Rajamanickam, W. Coenen, A. L. Sánchez, Non-Boussinesq stability analysis of natural-convection gaseous flow on inclined hot plates, *Int. J. Heat Mass Transfer*, **109** 949–957 (2017)

76. A. Weiss, W. Coenen, A. L. Sánchez, Aerodynamics of planar counterflowing jets, *J. Fluid Mec.*, **821** 1–30 (2017)

77. I. Iglesias, D. Moreno-Boza, A. L. Sánchez, A. Liñán, F. A. Williams, Thermal explosions in spherical vessels at large Rayleigh numbers, *Int. J. Heat Mass Transfer*, **115** 1042–1053 (2017)

78. A. Weiss, M. Vera, A. Liñán, A. L. Sánchez, F. A. Williams, A novel formulation for unsteady counterflow flames using a thermal-conductivity-weighted coordinate, *Combust. Theory Modelling*, **22** 185–201 (2018)

79. A. L. Sánchez, C. Martínez-Bazán, C. Gutiérrez-Montes, E. Criado-Hidalgo, G. Pawlak, W. Bradley, V. Haughton, J. C. Lasheras, On the bulk motion of the cerebrospinal fluid in the spinal canal, *J. Fluid Mec.*, **841** 203–227 (2018)

80. D. Martínez-Ruiz, C. Huete, A. L. Sánchez, F. A. Williams, On the interaction of oblique shocks and laminar shear layers, *AIAA J.*, **56** 1023–1030 (2018)

81. A. Weiss, W. Coenen, A. L. Sánchez, F. A. Williams, The acoustic response of Burke-Schumann counterflow flames, *Combust. Flame*, **192** 25–34 (2018)

82. D. Moreno-Boza, W. Coenen, J. Carpio, A. L. Sánchez, F. A. Williams, On the critical conditions for pool-fire puffing, *Combust. Flame*, **192** 426–438 (2018)

83. Y. Huang, I. Iglesias, A. L. Sánchez, Conductive heating of a confined gas, *SIAM J. Appl. Math.*, to appear (2018)

RESEARCH PROJECTS

1. Análisis de procesos de ignición de hidrógeno, y de rotura de gotas y burbujas inmersas en un flujo turbulento
   FUNDING AGENCY: Spanish DGES
   DURATION: 2000-2002
   CONTRACT # PB98-0142-C04-02
   PRINCIPAL INVESTIGATOR: Antonio L. Sánchez
   TOTAL FUNDING: 48.700 euros

2. Experimental and Numerical Study of Reactive Flows in Complex Geometries with Relevance to Industrial Safety for Explosion Protection
   FUNDING AGENCY: European Commission
   DURATION: 2001-2004
   CONTRACT # EVG1-2001-00026
   PRINCIPAL INVESTIGATOR: Antonio L. Sánchez (Coordinator)
   TOTAL FUNDING: 136.000 euros

3. Flujos Multifásicos Reactivos y No Reactivos. Lechos Fluidificados, Sprays y Microchorros
   FUNDING AGENCY: Spanish MCYT
   DURATION: 2003-2005
   CONTRACT # DPI-2002-04550-C07-06
   PRINCIPAL INVESTIGATOR: Antonio L. Sánchez
   TOTAL FUNDING: 271.000 euros

4. Estudio Aerodinámico de Procesos de Ignición
   FUNDING AGENCY: Spanish MEC
   DURATION: 2006-2008
   CONTRACT # ENE2005-08580-C02-01
   PRINCIPAL INVESTIGATOR: Antonio L. Sánchez
   TOTAL FUNDING: 166.600 euros

5. Combustión Limpia: Análisis, Modelado y Simulación
   FUNDING AGENCY: Madrid Regional Government
   DURATION: 2006-2009
   CONTRACT # S-0505/ENE/0229
   PRINCIPAL INVESTIGATOR: Antonio L. Sánchez
   TOTAL FUNDING: 191.000 euros

6. Aspectos Fundamentales de la Combustión de Hidrógeno
   FUNDING AGENCY: Spanish MICINN
   DURATION: 2009-2011
   CONTRACT # ENE2008-06515-C04-01
   PRINCIPAL INVESTIGATOR: Antonio L. Sánchez
   TOTAL FUNDING: 123.000 euros

7. Desarrollo de una Técnica No Invasiva de Medida de Presión Mediante el Análisis del Espectro Acústico de Microburbujas
   FUNDING AGENCY: Spanish MICINN
   DURATION: 2009-2011
   CONTRACT # DPI2008-06369
   PRINCIPAL INVESTIGATOR: Javier Rodríguez Rodríguez
   TOTAL FUNDING: 150.000 euros

8. MyPlanet: Massively Parallel Computations of Combustion and Emission Simulations
   Funding Agency: European Commission
   Duration: 2008-2012
   Contract # PITN-GA-2008-210781
   Principal Investigator: Immaculada Iglesias
   Total Funding: 425.000 euros

9. Development of predictive tools for hydrogen and syngas combustion in gas-turbine conditions
   Funding Agency: Madrid Regional Government
   Duration: 2010-2013
   Contract # P2009/ENE-1597
   Principal Investigator: Antonio L. Sánchez
   Total Funding: 180.000 euros

10. Sustainable Combustion Research (SCORE)
    Funding Agency: Spanish MICINN
    Duration: 2011-2015
    Contract # CSD2010-00011 (Consolider-Ingenio 2010)
    Principal Investigator: Antonio L. Sánchez
    Total Funding: 830.000 euros

11. Studies of High-Pressure Acoustic Combustion Instabilities in Hydrocarbon-Oxygen Liquid-Propellant Rocket Engines Based on Reduced Chemical-Kinetic Mechanisms
    Funding Agency: Air Force Office of Scientific Research
    Duration: 2016/7-2018/6
    Contract # FA9550-16-0321
    Principal Investigator: Antonio L. Sánchez, F. A. Williams
    Total Funding: $300,000

12. Analysis and Scaling of High-Speed and Turbulent Combustion for Gaseous and Liquid Fuels
    Funding Agency: Air Force Office of Scientific Research
    Duration: 9/1/16-8/31/19
    Contract # FA9550-16-1-0443
    Principal Investigator: F. A. Williams, Antonio L. Sánchez
    Total Funding: $650.000 USD

PAST PhD STUDENTS

1. Antonio Revuelta Bayod (with A. Liñán as co-advisor), Chorros laminares axisimétricos libres y confinados (2002)
2. José Luis Jiménez-Alvarez, Conducción de calor en gases desde fuentes localizadas de calor (2002)
3. José Damián Mellado-Ramírez, Ignición de hidrógeno en capas de mezcla y superficies catalíticas (2002)
4. Mario Sánchez Sanz (with A. Liñán as co-advisor), Chorros laminares de gas con valores muy dispares de las densidades del chorro y del ambiente (2007)
5. Daniel Fernández-Galisteo, Numerical and asymptotic analyses of lean hydrogen-air deflagrations (2009)
6. Pierre Boivin (with C. Jiménez as co-advisor), Reduced-kinetic mechanisms for hydrogen and syngas combustion including autoignition (2011)
7. Jorge Arrieta-Sanagustín (with A. Liñán as co-advisor), Formulation and analyses of vaporization and diffusion-controlled combustion of fuel sprays (2011)