

Luis Velilla-Prieto

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Education

- 2017** PhD in Astrophysics by the University Complutense of Madrid. (9th June)
Thesis title: *Molecular complexity in envelopes of evolved stars: detailed study of the molecular emission of the objects OH231.8+4.2, IKTau, and IRC+10216.*
Advisors: Dr. Carmen Sánchez Contreras and Prof. José Cernicharo.
Excellent Cum Laude by unanimous decision. PhD with European Mention.
(Jury: Prof. H. Olofsson, Dr. V. Bujarrabal, Dr. A. Castro-Carrizo, Dr. D. Montes, and Dr. A. Castillo-Morales)
(Refereed by Prof. Karl M. Menten and Dr. R. Neri)
- 2012** M.S. in Astrophysics by the University Complutense of Madrid and University Autónoma of Madrid. (30th July).
- 2010** Physics degree by the University Complutense of Madrid. (28th September).

Research experience

- 2018-Pr.** Postdoctoral researcher in the Astronomy and Plasma Physics Division from 10th September (Chalmers).
- 2018-2018** Postdoctoral researcher in the Molecular Astrophysics Group from 12th January until 31st August (IFF-CSIC).
- 2017-2018** Postdoctoral researcher in the Molecular Astrophysics Group from 10th June until 12th January (ICMM-CSIC).
- 2014-2017** Predoctoral researcher in the Molecular Astrophysics Group (ICMM-CSIC).
- 2010-14** Predoctoral FPI fellow in the Astrophysics Group (CAB-INTA-CSIC).

Grants, awards and merits

- 2018** Junior member of the International Astronomical Union.
- 2017** PhD European Mention (Universidad Complutense of Madrid).
- 2013** FPI short-stay programme (three months at the Laboratoire d'Astrophysique de Bordeaux, CNRS-Université de Bordeaux, France) fellowship granted by the Spanish department MICINN/MINECO. Amount: 5,100 €.
- 2010-14** FPI Predoctoral fellowship granted by the Spanish MICINN/MINECO. Amount: 55,560 €. (CAB-CSIC).

Participation in funded projects

- ERC-2013-SyG-610256: “Nanocosmos: Gas and Dust from the Stars to the Laboratory: Exploring the nano-cosmos”. Funded by the European Research Council. P.I.: Prof. J. Cernicharo, Dr. C. Joblin, and Prof. J.A. Martín Gago. Amount: ~ 15 M€.
- AYA2012-32032: “Physics and chemistry of the ISM and the circumstellar medium in the era of ALMA”. Funded by the Spanish department of Economy and Competitiveness (MINECO). P.I.: Dr. J. R. Goicoechea. Amount: 316,000 €.
- AYA2009-07304: “Molecular astrophysics: a new vision of the Universe in the era of Herschel and ALMA”. Funded by the Spanish department of Science and Innovation (MICINN). P.I.: Dr. J. R. Goicoechea. Amount: 312,180 €.

Peer-reviewed publications¹ (rev. chr. order)

▷ *Metrics (24th January 2019)*: 188 total citations, h-index: 9

20. “*Gas infall and possible circumstellar rotation in R Leo*”. Fonfría, J.P.; Santander-García, M.; Cernicharo, J.; **Velilla-Prieto, L.** et al. *Astronomy and Astrophysics Letters*, accepted for publication.

19. “*Through the magnifying glass: ALMA acute viewing of the intricate nebular architecture of OH231.8+4.2*”. Sánchez Contreras, C.; Alcolea, J.; Bujarrabal, V.; Castro-Carrizo, A.; **Velilla-Prieto, L.** et al. *Astronomy and Astrophysics*, Volume 618, id.A164, 33 pp.

18. “*IRC +10216 as a spectroscopic laboratory: improved rotational constants for SiC₂, its isotopologues, and Si₂C*”. Cernicharo, J.; Guélin, M.; Agúndez, M.; Pardo, J.R.; Masalkhi, S.; Fonfría, J.P.; **Velilla Prieto, L.** et al. *Astronomy and Astrophysics*, Volume 618, id.A4, 19 pp. (2018)

17. “*Time dependent molecular emission in IRC+10216*”. Pardo, J.R.; Cernicharo, J.; **Velilla Prieto, L.** et al. *Astronomy & Astrophysics (Letter)*, Volume 615, id.L4, 7pp. (2018)

16. “*The maser emitting structure and time variability of the SiS lines J=14–13 and 15–14 in IRC+10216*”. Fonfría, J.P.; Fernández-López, M.; Pardo, J.R.; Agúndez, M.; Sánchez-Contreras, C.; **Velilla Prieto, L.** et al. *The Astrophysical Journal*, Volume 860, Issue 2, article id. 162, 18 pp. (2018)

15. “*Abundance of SiC₂ in Carbon Star envelopes: evidence that SiC₂ is a gas-phase precursor of SiC dust*”. Masalkhi, S.; Agúndez, M.; Cernicharo, J.; **Velilla Prieto, L.** et al. *Astronomy & Astrophysics*, Volume 611, id.A29, 15pp. (2018)

14. “*IRC+10216 in 3-D: morphology of a TP-AGB star envelope*”. Guélin, M.; Patel, N.A.; Bremer, M.; Cernicharo, J.; Castro-Carrizo, A.; Pety, J.; Fonfría, J.P.; Agúndez, M.; Santander-García, M.; Quintana-Lacaci, G.; **Velilla Prieto, L.** et al. *Astronomy & Astrophysics*, Volume 610, id.A4, 20pp. (2018)

¹[Link to the bibliography in ADS](#)

13. “*Clues to NaCN formation*”. Quintana-Lacaci, G.; Cernicharo, J.; **Velilla Prieto, L.** et al. *Astronomy & Astrophysics (Letter)*, Volume 607, id.L5, 6pp. (2017).
12. “*Discovery of Methyl Silane and confirmation of silyl cyanide in IRC+10216*”. Cernicharo, J.; Agúndez, M.; **Velilla Prieto, L.** et al. *Astronomy & Astrophysics (Letter)*, Volume 606, id.L5, 5pp. (2017).
11. “*Growth of carbon chains in IRC+10216 mapped with ALMA*”. Agúndez, M.; Cernicharo, J.; Quintana-Lacaci, G.; Castro-Carrizo, A.; **Velilla Prieto, L.** et al. *Astronomy & Astrophysics*, Volume 601, id.A4, 16 pp. (2017).
10. “*The millimeter IRAM-30m line survey toward IK Tau*”. **Velilla Prieto, L.**; Sánchez Contreras, C.; Cernicharo, J. et al. *Astronomy & Astrophysics*, Volume 597, id.A25, 46 pp. (2017).
9. “*High-resolution rotational spectrum, dunham coefficients, and potential energy function of NaCl*”. Cabezas, C.; Cernicharo, J.; Quintana-Lacaci, G.; Peña, I.; Agúndez, M.; **Velilla Prieto, L.** et al. *The Astrophysical Journal*, Volume 825, Issue 2, article id. 150, 10 pp. (2016).
8. “*Hints of a rotating spiral structure in the innermost regions around IRC+10216*”. Quintana-Lacaci, G.; Cernicharo, J.; Agúndez, M.; **Velilla Prieto, L.** et al. *The Astrophysical Journal*, Volume 818, Issue 2, article id. 192, 20pp. (2016).
7. “*The peculiar distribution of CH₃CN in IRC+10216*”. Agúndez, M.; Cernicharo, J.; Quintana-Lacaci, G.; **Velilla Prieto, L.** et al. *The Astrophysical Journal*, Volume 814, Issue 2, article id. 143, 7pp. (2015).
6. “*The abundance of ²⁸Si³²S, ²⁹Si³²S, ²⁸Si³⁴S, and ³⁰Si³²S, in the inner layers of the envelope of IRC+10216*”. Fonfría, J. P.; Cernicharo, J.; Richter, M.J.; Fernández-López, M.; **Velilla Prieto, L.**; Lacy, J.H. *Monthly Notices of the Royal Astronomical Society*, Volume 453, Issue 1, p.439-449. (2015).
5. “*Discovery of SiCSi in IRC+10216: a missing link between gas and dust carriers of Si-C bonds*”. Cernicharo, J.; McCarthy, M.C.; Gottlieb, C.A.; Agúndez, M.; **Velilla Prieto, L.** et al. *The Astrophysical Journal (Letter)*, Volume 806, Issue 1, article id. L3, 6 pp. (2015).
4. “*Si-bearing molecules toward IRC+10216: ALMA unveils the molecular envelope of CWLeo*”. **Velilla Prieto, L.**; Cernicharo, J.; Quintana-Lacaci, G. et al. *The Astrophysical Journal (Letter)*, Volume 805, Issue 2, article id. L13, 7 pp. (2015).
3. “*Molecular ions in the O-rich evolved star OH231.8+4.2: HCO⁺, H¹³CO⁺ and first detection of SO⁺, N₂H⁺ and H₃O⁺*”. Sánchez Contreras, C.; **Velilla Prieto, L.**; Agúndez, M. et al. *Astronomy & Astrophysics*, Volume 577, id.A52, 22 pp. (2015).
2. “*New N-bearing species towards OH231.8+4.2. HNCO, HNCS, HC₃N, and NO*”. **Velilla Prieto, L.**; Sánchez Contreras, C.; Cernicharo, J. et al. *Astronomy & Astro-*

physics, Volume 575, id.A84, 22 pp. (2015).

1. “Discovery of time variation of the intensity of molecular lines in IRC+10216 in the submillimeter and far-infrared domains”. Cernicharo, J.; Teyssier, D.; Quintana-Lacaci, G.; Daniel, F.; Agúndez, M.; **Velilla Prieto, L.** et al. The Astrophysical Journal (Letter), Volume 796, Issue 1, article id. L21, 6 pp. (2014).

Conference publ. and contributions (rev. chr. order)

13. “Circumstellar chemistry of Si-C bearing molecules in the C-rich AGB star IRC+10216”. **Velilla Prieto, L.**; Cernicharo, J.; Agúndez, M.; et al. IAUS343 “Why galaxies care about AGB stars” Vienna (Austria), 20th-23rd August, 2018. Poster contribution.

12. “The maser-emitting structure and time variability of the SiS lines $J=14-13$ and $15-14$ in IRC+10216”. Fonfría, J.P.; Fernández-López, M.; Pardo, J.R.; Agúndez, M.; Sánchez Contreras, C.; **Velilla Prieto, L.**; et al. IAUS343 “Why galaxies care about AGB stars” Vienna (Austria), 20th-23rd August, 2018. Poster contribution.

11. “Silicon Carbide molecules in evolved stars”. **Velilla Prieto, L.**; Cernicharo, J.; Agúndez, M.; et al. Nanocosmos meeting. Toulouse (France), 12th-13th June, 2017. Invited talk.

10. “Circumstellar chemistry of Si-C bearing molecules toward IRC+10216”. **Velilla Prieto, L.**; Cernicharo, J.; Agúndez, M.; et al. European Conference on Laboratory Astrophysics. Madrid (Spain), 21st-25th October, 2016. Poster contribution.

9. “Gas phase chemical models and observations of AGBs”. Agúndez, M.; Quintana-Lacaci, G.; **Velilla Prieto, L.**; et al. European Conference on Laboratory Astrophysics. Madrid (Spain), 21st-25th October, 2016. Invited talk.

8. “The depletion of the refractory molecules SiS, SiO, SiC₂, and C₂H₄ in the innermost envelope of the AGB star IRC+10216”. Fonfría, J.P.; Cernicharo, J.; Fernández-López, M.; Hinkle, K.H.; Richter, M.J.; Agúndez, M.; Sánchez Contreras, C.; **Velilla Prieto, L.**; et al. European Conference on Laboratory Astrophysics. Madrid (Spain), 21st-25th October, 2016. Poster contribution.

7. “A rotating spiral structure in the innermost regions around IRC+10216”. Quintana-Lacaci, G.; Cernicharo, J.; Agúndez, M.; **Velilla Prieto, L.**; et al. Journal of Physics: Conference Series, Volume 728, Issue 2, article id. 022005 (2016). Conference article.

6. “Silicon bearing molecules towards IRC+10216: Herschel and ALMA unveil the molecular envelope of CWLeo”. **Velilla Prieto, L.**; Cernicharo, J.; Quintana-Lacaci, G. et al. ALMA/Herschel archival workshop. ESO-Garching (Germany), 15th-17th April, 2015. Contributed talk.

5. “Mm-wave and far-IR Molecular line survey of OH 231.8+4.2: Hard-boiled rotten eggs”. Sánchez Contreras, C.; **Velilla Prieto, L.**; Alcolea, J.; et al. Asymmetrical Plan-

etary Nebulae VI conference, Proceedings of the conference held in Playa del Carmen (México), 4th–8th November, 2013. Edited by C. Morisset, G. Delgado-Inglada and S. Torres-Peimbert. Contributed talk.

4. “Molecular variety in O-rich envelopes around evolved stars: new detections towards OH231.8+4.2 and IKTau”. **Velilla Prieto, L.**; Sánchez Contreras, C.; Cernicharo, J. et al. Second national conference on laboratory and molecular astrophysics, held in the UPO, Sevilla (Spain). 14th–16th November, 2012. Poster contribution.

3. “Molecular complexity in envelopes of evolved Oxygen-rich stars: IK Tauri and OH231.8”. **Velilla Prieto, L.**; Sánchez Contreras, C.; Cernicharo, J. et al. Highlights of Spanish Astrophysics VII, Proceedings of the X Scientific Meeting of the Spanish Astronomical Society (SEA), held in Valencia, 9th–13th July, 2012. Poster contribution.

2. “Complex non-equilibrium chemistry in the shock accelerated outflow of the pre-planetary nebula OH231.8+4.2”. **Velilla Prieto, L.**; Sánchez Contreras, C.; Cernicharo, J. et al. NRAO-NASSC 2012 “Outflows, winds and jets: from young stars to supermassive black holes”. Charlottesville (Virginia), USA. 4th March, 2012. Contributed talk.

1. “Molecular complexity in O-rich circumstellar envelopes around evolved stars: IKTau and OH231.8+4.2”. Sánchez Contreras, C., **Velilla Prieto, L.**; Cernicharo, J. et al. Poster number 75, session 1. IAU Symposium 280: “The molecular Universe”. The Molecular Universe, Posters from the proceedings of the 280th Symposium of the International Astronomical Union held in Toledo, Spain, 30th May–3rd June, 2011, #327. Poster contribution.

• Several departmental talks in the CAB, ICMM (Madrid, Spain) and LAB (Bordeaux, France).

Outreach & Teaching

2017 “We are dust from the stars: a nanocosmos of molecules”. Outreach activity for the “Week of Science”.

[Link to the announcement](#)

2017 Collaboration with Natalia Ruiz Zelmanovich for one scientific outreach article for the most read Spanish science blog: “NAUKAS”.

[Link to the article](#)

2017 Outreach article on IRAM’s news “IKTau, a dying star at the origin of prebiotic molecules?”

[Link to the article](#)

2016 Lecturer for the “Guillermo Haro 2016 School on molecular astrophysics”, held in the INAOE at Puebla (Mexico). October 11-21.

[Link to the announcement](#)

2016 Author of a chapter entitled “The fourth dimension” for an updated version of the book “Hundred basic questions about science” by Isaac Asimov, entitled “Science, and I also understand it”.

[Link to the book](#)

- 2015** Interview for HIPERTEXTUAL blog: “Huge doesn’t mean better (for astronomy)”.
[Link to the article](#)
- 2015** Collaboration with Natalia Ruiz Zelmanovich for two scientific outreach articles for the most read Spanish science blog: “NAUKAS”.
[Link to OH231.8+4.2’s article](#)
[Link to IRC+10216’s article](#)
- 2014-2015** Participation in the outreach activities at the ICMM-CSIC.
- 2009** Collaboration for the UCM “International year of astronomy” project: Astronomy accessible for the visually impaired.
- 2007-2009** Astronomer guide (UCM Dept. of astrophysics) during the “VII, VIII and IX Week of Science” to show and explain to visitors (general public and scholar groups) astronomical events (e.g.eclipses), or basics about observational astronomy.

Observational experience

> *Observer:*

2010-Pr. IRAM-30 m (+ 150 hours).

2007-2008 Collaboration in the automation of the UCM observatory radiotelescope.

> *Proposals & Data handling:*

- 2017** PI of the IRAM-30 m 142-17 proposal devoted to study the circumstellar medium of evolved stars.
- 2016** PI of the ALMA Cycle 4 2016.1.01217.S and 2016.1.00119.S proposals devoted to study the circumstellar medium of evolved stars.
- 2016** PI of the IRAM-30 m 203-15 proposal devoted to study the circumstellar medium of evolved stars.
- 2015** PI of the NOEMA S15AZ proposal devoted to study the circumstellar medium of evolved stars.
- 2012** PI of the CARMA c1084 proposal devoted to study the circumstellar medium of evolved stars.
- 2010-Pr.** co-I of several projects accepted for IRAM-30 m, NOEMA, and ALMA, pursuing different scientific goals.

Languages

Spanish	Native	French	Basic
English	Fluent	Italian	Basic

Other merits and skills

- 2017** Front page in Astronomy and Astrophysics - Interstellar and circumstellar matter, May 2017.
- 2017** Participation in the course “Security for Linux systems” CSIC, 25 hours 20th–24th November.
- 2017** Participation in the course “First aids and emergency intervention, basic level. CPR techniques and defibrillator usage” CSIC, 3 hours 19th September.
- 2017** On-line participation in the course “Radio Interferometry: Methods and science” offered by the German ALMA Regional Centre node. 30 hours between 19th April–19th July.
- 2016** Participation in the course “Specific english: on-line meetings” CSIC, 30 hours between October 3rd–November 4th.
- 2014** Participation in the “Astrochemistry’s cool (an international school of astrochemistry)” school, held in the International University Menéndez Pelayo (UIMP), Cuenca (Spain). 14th–18th September.
- 2014** Participation in the course “Programming with PYTHON” held in the National Institute of Aerospace Technology (INTA), Madrid (Spain). 3rd–17th June.
- 2012** Participation in the “8th IRAM mm-interferometry school”, held in Grenoble (France). 15th–19th October.
- 2011** Participation in the “6th IRAM 30m summer school”, Granada (Spain). 24th–30th September.

- Referee for Astronomy and Astrophysics Journal.
- Programming experience with Python, Fortran 90/95, Bash and Awk.
- Advanced user of the astronomical software for mm-wavelength single-dish and interferometric data GILDAS & CASA.

References

Prof. H. Olofsson	hans.olofsson@chalmers.se
Prof. W. Vlemmings	wouter.vlemmings@chalmers.se
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Dr. C. Sánchez-Contreras	csanchez@cab.inta-csic.es
Dr. M. Agúndez	marcelino.agundez@icmm.csic.es