

SEBASTIAN MARINO

ORCID \diamond 0000-0002-5352-2924

Office 308/2, Königstuhl 17, D-69117 \diamond Heidelberg, Germany
+44 7934484412 \diamond sebastian.marino.estay@gmail.com \diamond sebamarino.github.io

Research Interests

Planet formation and the architecture and dynamics of planetary systems. How do comets and planets form? Where do cometary belts form? What is the composition of *exocomets*? Can they deliver volatiles to terrestrial planets? My research tackles these questions through the use of interferometric observations and their comparison with radiative transfer models, together with numerical simulations.

Career

Research fellow, Jesus College & Institute of Astronomy, Cambridge, UK	Oct 2020 - Sep 2023
Postdoctoral researcher, Max Planck Institute for Astronomy, Heidelberg, Germany	Nov 2018 - present
PhD in Astronomy, Institute of Astronomy, University of Cambridge, UK	Oct 2015 - Oct 2018
PhD thesis: <i>Exocometary discs at large radii and their inward transport via planet scattering</i>	
MS in Astronomy with highest honours, Universidad de Chile, Chile. GPA 100%	Mar 2014 - July 2015
MS thesis: <i>Dust traps and warps in transitional protoplanetary discs</i>	
BS in Astronomy with highest honours, Universidad de Chile, Chile. GPA 90%	Mar 2010 - Dec 2013

Scholarships & Awards

2019	Junior Research fellowship by Jesus College, University of Cambridge (1 position/400 applicants).
2018	Shortlisted for Elsevier early career award, top young researcher in physical sciences in the UK.
2017	NASA Hubble/Sagan fellowship (\$85k/yr), declined to take position at MPIA, Heidelberg.
2016	Murdin Prize, best student publication of the year at Institute of Astronomy.
2015	Cambridge Trust Scholarship, 3-year Ph.D. full funding.
2014	Chilean CONICYT scholarship, 2-year M.S. full funding. I obtained the highest score in the country.
2013	Top student in Astronomy. Ranked first of my class over 4 years of undergraduate studies.
2010-2013	Outstanding student, in top 5% of 5,000 students at the faculty of physical and mathematical sciences.

Key achievements

- First warped/misaligned protoplanetary disc (Marino et al. 2015, > 130 citations).
- First detection of exocometary gas around a Solar-type star, (Marino et al. 2016, > 70 citations).
- First detection of CO outgassed from scattered exocomets (Marino et al. 2017, > 50 citations).
- Discovery of three out of 4 gaps seen in debris discs (Marino et al. 2018, 2019, 2020a, > 30 citations)
- First population synthesis model of exocometary gas (Marino et al. 2020b).

Key Research Skills

- Reduction of interferometric sub-mm and radio data (e.g. Marino et al. 2015b).
- Continuum and spectral analysis of sub-millimetre data (e.g. Marino et al. 2016).
- Matched filter to boost signal-to-noise ratio of noisy interferometric data. (e.g. Marino et al. 2016, 2017a)
- Image reconstruction from optical interferometric data (e.g. Lacour et al. 2016, Perez et al. 2020).
- 3D Radiative transfer of discs at multiple frequencies (e.g. Marino et al. 2015a, 2015b).
- MCMC methods to fit radiative transfer disc models to observations (e.g. Marino et al. 2016).
- Simulations of interferometric data/visibilities (e.g. Marino et al. 2018a).
- N-body simulations of planet-disc interactions (e.g. Marino et al. 2018a, 2018b).
- Collisional evolution of debris discs (e.g. Marino et al. 2017b).
- 1D viscous evolution and photodissociation of exocometary gaseous discs (Marino et al. 2020).

Selected conference contributions & seminars

Jan 2021	Severo Ochoa Advanced School, online	Invited lecture
Sep 2020	International Max Planck Research Schools summer school, online	Invited talk
July 2020	Exoplanets III conference, online	Plenary talk
July 2020	European Astronomical Society Annual Meeting 2020, online	Talk
Mar 2020	Colloquium at Max Planck Institute for Astronomy, Heidelberg, Germany	Colloquium
Sep 2019	“Current and future trends in debris disc science II” workshop, Budapest, Hungary	Talk
Jul 2019	“Great barriers in planet formation” conference, Palm Cove, Australia	Talk
Jun 2019	“Planetary Dynamics” conference, Heidelberg, Germany	Talk
Mar 2018	“Diversis mundi: The Solar System in an Exoplanetary context” conference, ESO, Chile	Talk
Feb 2018	“Water during planet formation and evolution” workshop, Zurich, Switzerland	Talk
Feb 2018	“The Origin and Evolution of Comets” Royal Astronomical Society meeting, London, UK	Talk
Jan 2018	Colloquium at Astrophysics department, University of Exeter, UK	Colloquium
Sept 2017	“Planet Formation and Evolution” conference, Jena, Germany	Talk
May 2017	Colloquium at Institute of Astronomy, Cambridge, UK	Colloquium
Jan 2017	Colloquium at Department of Astronomy, Universidad de Chile	Colloquium
Oct 2016	“From discs to planets” workshop, Konkoly Observatory, Budapest, Hungary	Talk
Nov 2016	Colloquium at Institute of Astronomy, Cambridge, UK	Colloquium
May 2016	“Resolving planet formation in the era of ALMA and extreme AO” conference, ESO, Chile	Talk

Selected telescope observing proposals (26h of ALMA time as PI)

PI on “Unveiling the planetary architecture around the Solar analogue HD107146”, ALMA cycle 7, 2019 (12h, B grade).
PI on “Debris discs around UCDs, what lies beyond TRAPPIST-1h?”, ALMA cycle 5, 2017 (8h, A grade).
PI on “Double-ring debris discs at 10s of au: probing how far out planets can form”, ALMA cycle 4, 2016 (6h, B grade).
PI on “Spatial characterisation of Eta Corvis exozodi”, LBTI 2020A (10h).
PI on “Spectroscopic study of newly discovered extreme debris systems”, MPG/ESO/FEROS 2020A (16h).
Co-I on “How early on does planetesimal formation take place?”, ALMA cycle 6, 2018, (40h, B grade, PI: M. Wyatt).
Co-I on “The frontier of rocky planet formation”, ALMA cycle 5, 2017, (30h, B grade, PI: G. Kennedy).
Co-I on “Probing warm dust inside the double-ringed debris disk HD 107146”, VLT/SPHERE, 2017 (2h, PI: S. Perez).
Co-I on “The continuum asymmetry of MWC758: dust trap or companion?”, VLA, 2016 (PI: S. Casassus).

Mentoring

2020 Supervision of summer intern Elle Miller, Max Planck Institute for Astronomy.
2018-present Helping with supervision of PhD student Josh Lovell, University of Cambridge.
2016-2017 Supervisor, Statistical Physics, University of Cambridge.
2015 Supervisor, Research Workshop, Universidad de Chile.
2014 Supervisor, Introduction to Cosmology, Universidad de Chile.
2014 Supervisor, Stellar Astrophysics, Universidad de Chile.
2013 Supervisor, Electromagnetism, Universidad de Chile.

Public Outreach

2020 “How Did the TRAPPIST-1 Planets Get Their Water?” by Matt Williams at Universe Today
2019 “Comet-Blasted Star May Be a Rerun of the Solar Systems Birth” by Nola Taylor at Scientific American.
2017 “Scientists investigate debris disc in a nearby planetary system” by Tomasz Nowakowski at physics.org
2016 Press release “First evidence of icy comets orbiting a sun-like star”, coverage by Astronomy magazine, Daily Mail, LA times, IFL science, etc.
2015 Press release “Shadows cast by a warp in a planet forming system”, coverage by phys.org, ESO, space.com, pourlascience.fr, etc.
2016 Managing outreach activity “Galaxy Under Construction” for 500 people at Institute of Astronomy, Cambridge.
2016 Assisting public observing nights at the Institute of Astronomy, Cambridge.
2014-2015 Astronomy talks to general public in the National Astronomical Observatory of Chile.
2014-2015 Art and astronomy exposition at the Contemporary Art Museum in Santiago, Chile.
2013 Staff at the touristic observatory OAA, giving talks and managing telescopes

Professional service

Referee, The Astrophysical Journal
Referee, The Astronomical Journal
Referee, Publications of the Astronomical Society of the Pacific
Reviewer, Stephen Hawking Fellowship
Telescope Time Allocation Committee Member, MPIA

Organised conferences

LOC for “Binary Stars” conference, Cambridge, UK, 2016
LOC for “Current and future trends in debris disc science II” workshop, Budapest, Hungary, 2019
LOC for “Planetary Dynamics” conference, Heidelberg, Germany, 2019

IT Skills & Languages

Computer Languages	Python, JAVA, C, MATLAB, L ^A T _E X, Linux, HTML
Analysis and modelling software	CASA, RADMC3D, MIRA, SQUEEZE, MERCURY, Rebound
Tools	jupyter notebooks, Emacs, github
Spanish, native language	
English, fluent (speaking, reading, writing)	TOEFL iBT 106

First author publications (> 360 citations):

1. **Marino, S.**, Perez, S., & Casassus, S., “*Shadows Cast by a Warp in the HD 142527 Protoplanetary Disk*”, ApJ, vol. 798, p L44, 2015 131 citations
2. **Marino, S.**, Matrà, L., Stark, C., Wyatt, M. C., Casassus, S., Kennedy, G., Rodriguez, D., Zuckerman, B., Pérez, S., Dent, W. R. F., Kuchner, M., Hughes, A. M., Schneider, G., Steele, A., Roberge, A., Donaldson, J., & Nesvold, E., “*Exocometary gas in the HD 181327 debris ring*”, MNRAS, vol. 460, p 2933, 2016 71 citations
3. **Marino, S.**, Wyatt, M. C., Pani, O., Matrà, L., Kennedy, G. M., Bonsor, A., Kral, Q., Dent, W. R. F., Duchene, G., Wilner, D., Lisse, C. M., Lestrade, J.-F., & Matthews, B., “*ALMA observations of the Corvi debris disc: inward scattering of CO-rich exocomets by a chain of 3-30 M_{\oplus} planets?*”, MNRAS, vol. 465, p 2595, 2017 50 citations
4. **Marino, S.**, Casassus, S., Pérez, S., Lyra, W., Roman, P. E., Avenhaus, H., Wright, C. M., & Maddison, S. T., “*Compact Dust Concentration in the MWC 758 Protoplanetary Disk*”, ApJ, vol. 813, p 76, 2015 36 citations
5. **Marino, S.**, Carpenter, J., Wyatt, M. C., Booth, M., Casassus, S., Faramaz, V., Guzman, V., Hughes, A. M., Isella, A., Kennedy, G. M., Matrà, L., Ricci, L., & Corder, S., “*A gap in the planetesimal disc around HD 107146 and asymmetric warm dust emission revealed by ALMA*”, MNRAS, vol. 479, p 5423, 2018 24 citations
6. **Marino, S.**, Wyatt, M. C., Kennedy, G. M., Holland, W., Matrà, L., Shannon, A., & Ivison, R. J., “*ALMA observations of the multiplanet system 61 Vir: what lies outside super-Earth systems?*”, MNRAS, vol. 469, p 3518, 2017 18 citations
7. **Marino, S.**, Bonsor, A., Wyatt, M. C., & Kral, Q., “*Scattering of exocomets by a planet chain: exozodi levels and the delivery of cometary material to inner planets*”, MNRAS, vol. 479, p 1651, 2018 13 citations
8. **Marino, S.**, Yelverton, B., Booth, M., Faramaz, V., Kennedy, G. M., Matrà, L., & Wyatt, M. C., “*A gap in HD 92945’s broad planetesimal disc revealed by ALMA*”, MNRAS, vol. 484, p 1257, 2019 11 citations
9. **Marino, S.**, Flock, M., Henning, T., Kral, Q., Matrà, L., & Wyatt, M. C., “*Population synthesis of exocometary gas around A stars*”, MNRAS, vol. 492, p 4409, 2020 7 citations
10. **Marino, S.**, Gonzalez-Gaitán, S., Frster, F., Folatelli, G., Hamuy, M., & Hsiao, E., “*Searching for Light Echoes Due to Circumstellar Matter in SNe Ia Spectra*”, ApJ, vol. 806, p 134, 2015 5 citations
11. **Marino, S.**, Wyatt, M. C., Kennedy, G. M., Kama, M., Matrà, L., Triaud, A. H. M. J., & Henning, T., “*Searching for a dusty cometary belt around TRAPPIST-1 with ALMA*”, MNRAS, vol. 492, p 6067, 2020 3 citations
12. **Marino, S.**, Zurlo, A., Faramaz, V., Milli, J., Henning, T., Kennedy, G. M., Matrà, L., Pérez, S., Delorme, P., Cieza, L. A., & Hughes, A. M., “*Insights into the planetary dynamics of HD 206893 with ALMA*”, MNRAS, vol. 498, p 1319, 2020 0 citations

Second & third author publications:

13. Casassus, S., **Marino, S.**, Pérez, S., Roman, P., Dunhill, A., Armitage, P. J., Cuadra, J., Wootten, A., van der Plas, G., Cieza, L., Moral, V., Christiaens, V., & Montesinos, M., “*Accretion Kinematics through the Warped Transition Disk in HD142527 from Resolved CO(6-5) Observations*”, ApJ, vol. 811, p 92, 2015 75 citations
14. Casassus, S., Wright, C. M., **Marino, S.**, Maddison, S. T., Wootten, A., Roman, P., Pérez, S., Pinilla, P., Wyatt, M., Moral, V., Mnard, F., Christiaens, V., Cieza, L., & van der Plas, G., “*A Compact Concentration of Large Grains in the HD 142527 Protoplanetary Dust Trap*”, ApJ, vol. 812, p 126, 2015 66 citations
15. Matrà, L., **Marino, S.**, Kennedy, G. M., Wyatt, M. C., Öberg, K. I., & Wilner, D. J., “*An Empirical Planetesimal Belt Radius-Stellar Luminosity Relation*”, ApJ, vol. 859, p 72, 2018 32 citations
16. Kral, Q., **Marino, S.**, Wyatt, M. C., Kama, M., & Matrà, L., “*Imaging [CI] around HD 131835: reinterpreting young debris discs with protoplanetary disc levels of CO gas as shielded secondary discs*”, MNRAS, vol. 489, p 3670, 2019 26 citations
17. Kennedy, G. M., **Marino, S.**, Matrà, L., Panić, O., Wilner, D., Wyatt, M. C., & Yelverton, B., “*ALMA observations of the narrow HR 4796A debris ring*”, MNRAS, vol. 475, p 4924, 2018 19 citations
18. Read, M. J., Wyatt, M. C., **Marino, S.**, & Kennedy, G. M., “*Shaping HR8799’s outer dust belt with an unseen planet*”, MNRAS, vol. 475, p 4953, 2018 10 citations
19. Casassus, S., **Marino, S.**, Lyra, W., Baruteau, C., Vidal, M., Wootten, A., Pérez, S., Alarcon, F., Barraza, M., Crcamo, M., Dong, R., Sierra, A., Zhu, Z., Ricci, L., Christiaens, V., & Cieza, L., “*Cm-wavelength observations of MWC 758: resolved dust trapping in a vortex*”, MNRAS, vol. 483, p 3278, 2019 8 citations

20. Pérez, S., **Marino, S.**, Casassus, S., Baruteau, C., Zurlo, A., Flores, C., & Chauvin, G., “*Upper limits on protolunar disc masses using ALMA observations of directly imaged exoplanets*”, MNRAS, vol. 488, p 1005, 2019
6 citations
 21. Pinilla, P., Pascucci, I., & **Marino, S.**, “*Hints on the origins of particle traps in protoplanetary disks given by the $M_{\text{dust}} - M_{\star}$ relation*”, A&A, vol. 635, p A105, 2020
3 citations
- Remaining co-author publications:**
22. Price, D. J., Cuello, N., Pinte, C., Mentiplay, D., Casassus, S., Christiaens, V., Kennedy, G. M., Cuadra, J., Sebastian Perez, M., **Marino, S.**, Armitage, P. J., Zurlo, A., Juhasz, A., Ragusa, E., Laibe, G., & Lodato, G., “*Circumbinary, not transitional: on the spiral arms, cavity, shadows, fast radial flows, streamers, and horseshoe in the HD 142527 disc*”, MNRAS, vol. 477, p 1270, 2018
54 citations
 23. Montesinos, M., Perez, S., Casassus, S., **Marino, S.**, Cuadra, J., & Christiaens, V., “*Spiral Waves Triggered by Shadows in Transition Disks*”, ApJ, vol. 823, p L8, 2016
54 citations
 24. Lacour, S., Biller, B., Cheetham, A., Greenbaum, A., Pearce, T., **Marino, S.**, Tuthill, P., Pueyo, L., Mamajek, E. E., Girard, J. H., Sivaramakrishnan, A., Bonnefoy, M., Baraffe, I., Chauvin, G., Olofsson, J., Juhasz, A., Benisty, M., Pott, J.-U., Sicilia-Aguilar, A., Henning, T., Cardwell, A., Goodsell, S., Graham, J. R., Hibon, P., Ingraham, P., Konopacky, Q., Macintosh, B., Oppenheimer, R., Perrin, M., Rantakyro, F., Sadakuni, N., & Thomas, S., “*An M-dwarf star in the transition disk of Herbig HD 142527. Physical parameters and orbital elements*”, A&A, vol. 590, p A90, 2016
48 citations
 25. Perez, S., Dunhill, A., Casassus, S., Roman, P., Szulágyi, J., Flores, C., **Marino, S.**, & Montesinos, M., “*Planet Formation Signposts: Observability of Circumplanetary Disks via Gas Kinematics*”, ApJ, vol. 811, p L5, 2015
45 citations
 26. Casassus, S., Avenhaus, H., Pérez, S., Navarro, V., Cárcamo, M., **Marino, S.**, Cieza, L., Quanz, S. P., Alarcón, F., Zurlo, A., Osses, A., Rannou, F. R., Romn, P. E., & Barraza, M., “*An inner warp in the DoAr 44 T Tauri transition disc*”, MNRAS, vol. 477, p 5104, 2018
38 citations
 27. Cieza, L. A., Ruíz-Rodríguez, D., Perez, S., Casassus, S., Williams, J. P., Zurlo, A., Principe, D. A., Hales, A., Prieto, J. L., Tobin, J. J., Zhu, Z., & **Marino, S.**, “*The ALMA early science view of FUor/EXor objects - V. Continuum disc masses and sizes*”, MNRAS, vol. 474, p 4347, 2018
29 citations
 28. Wyatt, M. C., Bonsor, A., Jackson, A. P., **Marino, S.**, & Shannon, A., “*How to design a planetary system for different scattering outcomes: giant impact sweet spot, maximizing exocomets, scattered discs*”, MNRAS, vol. 464, p 3385, 2017
29 citations
 29. Baruteau, C., Barraza, M., Pérez, S., Casassus, S., Dong, R., Lyra, W., **Marino, S.**, Christiaens, V., Zhu, Z., Carmona, A., Debras, F., & Alarcon, F., “*Dust traps in the protoplanetary disc MWC 758: two vortices produced by two giant planets?*”, MNRAS, vol. 486, p 304, 2019
16 citations
 30. Pérez, S., Casassus, S., Hales, A., **Marino, S.**, Cheetham, A., Zurlo, A., Cieza, L., Dong, R., Alarcón, F., Bentez-Llambay, P., Fomalont, E., & Avenhaus, H., “*Long Baseline Observations of the HD 100546 Protoplanetary Disk with ALMA*”, ApJ, vol. 889, p L24, 2020
14 citations
 31. Matrà, L., Wyatt, M. C., Wilner, D. J., Dent, W. R. F., **Marino, S.**, Kennedy, G. M., & Milli, J., “*Kuiper Belt-like Hot and Cold Populations of Planetesimal Inclinations in the Pictoris Belt Revealed by ALMA*”, AJ, vol. 157, p 135, 2019
14 citations
 32. Kral, Q., Wyatt, M. C., Triaud, A. H. M. J., **Marino, S.**, Thébault, P., & Shorttle, O., “*Cometary impactors on the TRAPPIST-1 planets can destroy all planetary atmospheres and rebuild secondary atmospheres on planets f, g, and h*”, MNRAS, vol. 479, p 2649, 2018
14 citations
 33. Casassus, S., Pérez, S., Osses, A., & **Marino, S.**, “*Cooling in the shade of warped transition discs*”, MNRAS, vol. 486, p L58, 2019
5 citations
 34. Sepulveda, A. G., Matrà, L., Kennedy, G. M., del Burgo, C., berg, K. I., Wilner, D. J., **Marino, S.**, Booth, M., Carpenter, J. M., Davies, C. L., Dent, W. R. F., Ertel, S., Lestrade, J.-F., Marshall, J. P., Milli, J., Wyatt, M. C., MacGregor, M. A., & Matthews, B. C., “*The REASONS Survey: Resolved Millimeter Observations of a Large Debris Disk around the Nearby F Star HD 170773*”, ApJ, vol. 881, p 84, 2019
2 citations
 35. Kral, Q., Matr, L., Kennedy, G. M., **Marino, S.**, & Wyatt, M. C., “*Survey of planetesimal belts with ALMA: gas detected around the Sun-like star HD 129590*”, MNRAS, vol. 497, p 2811, 2020
0 citations
 36. Matrà, L., Dent, W. R. F., Wilner, D. J., **Marino, S.**, Wyatt, M. C., Marshall, J. P., Su, K. Y. L., Chavez, M., Hales, A., Hughes, A. M., Greaves, J. S., & Corder, S. A., “*Dust Populations in the Iconic Vega Planetary System Resolved by ALMA*”, ApJ, vol. 898, p 146, 2020
0 citations

37. Matra, L., Kral, Q., Su, K., Brandeker, A., Dent, W., Gaspar, A., Kennedy, G., **Marino, S.**, Oberg, K., Roberge, A., Wilner, D., Wilson, P., Wyatt, M., Cataldi, G., Higuchi, A., Hughes, M., Kiefer, F., Lecavelier des Etangs, A., Lyra, W., Matthews, B., Moor, A., Welsh, B., & Zuckerman, B., “*Exocometary Science*”, BAAS, vol. 51, p 391, 2019 0 citations

MNRAS=Monthly Notices of the Royal Astronomical Society; MNRASL=Monthly Notices of the Royal Astronomical Society Letters; ApJ=The Astrophysical Journal; ApJL=The Astrophysical Journal Letters; A&A=Astronomy & Astrophysics; AJ=The Astronomical Journal.