

SEBASTIÁN MARINO

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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, Institute of Astronomy, Cambridge, UK	Oct 2020 - Sep 2023
Postdoctoral researcher, Max Planck Institute for Astronomy, Heidelberg, Germany	Nov 2018 - Sep 2020
PhD in 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	Research fellowship University of Cambridge, granted by Jesus College (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, declined to take position at MPIA, Heidelberg.
2016	Murdin Prize, best student publication of the year.
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, > 100 citations).
- First detection of exocometary gas around a Solar-type star, (Marino et al. 2016, > 60 citations).
- First to postulate that spiral density waves could be triggered by shadows (Montesinos et al. 2016, > 40 citations).
- First detection of CO outgassed from scattered exocomets (Marino et al. 2017, > 40 citations).
- First population synthesis model of exocometary gas (Marino et al. 2020).

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).
- Matching 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

Mar 2020	Colloquim at Max Planck Institute for Astronomy, Heidelberg, Germany	Colloquim
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, equivalent to US\$360k)

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”, 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 Universe Today
2019 “Comet-Blasted Star May Be a Rerun of the Solar Systems Birth” by Scientific American.
2017 “Scientists investigate debris disc in a nearby planetary system” by 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, Astrophysical Journal
Referee, Publications of the Astronomical Society of the Pacific
Reviewer, Stephen Hawking Fellowship

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
Analysis and modelling software
Tools

Python, JAVA, C, MATLAB, L^AT_EX, Linux, HTML
CASA, RADMC3D, MIRA, SQUEEZE, MERCURY, Rebound
jupyter notebooks, Emacs, github

Spanish, native language
English, fluent (speaking, reading, writing)

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First author publications:

1. **Marino, S.**; Pérez, S.; Casassus, S., “*Shadows Cast by a Warp in the HD 142527 Protoplanetary Disc*”, ApJL, Volume 798, Issue 2, article id. L44 (2015) 121 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, Volume 460, Issue 3, p.2933-2944 (2016) 65 citations.
3. **Marino, S.**; Wyatt, M. C.; Panic, 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 η Corvi debris disc: inward scattering of CO-rich exocomets by a chain of 3-30 M_{\oplus}* ”, MNRAS, Volume 465, Issue 3, p.2595-2615 (2017) 41 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 Disc*”, ApJ, Volume 813, Issue 1, article id. 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, Volume 479, Issue 4, p.5423-5439 (2018) 17 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, Volume 469, Issue 3, p.3518-3531 (2017) 16 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, Volume 479, Issue 2, p.1651-1671 (2018) 10 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, Volume 484, Issue 1, p.1257-1269 (2019) 6 citation
9. **Marino, S.**; González-Gaitán, S.; Förster, F.; Folatelli, G.; Hamuy, M.; Hsiao, E., “*Searching for Light Echoes Due to Circumstellar Matter in SNe Ia Spectra*”, ApJ, Volume 806, Issue 1, article id. 134, (2015) 5 citations.
10. **Marino, S.**; Flock, M.; Henning, Th.; Kral, Q.; Matrà, L.; Wyatt, M. C., “*Population synthesis of exocometary gas around A stars*”, MNRAS, 492, 4409 (2020) 2 citations
11. **Marino, S.**; Wyatt, M. C.; Kennedy, G. M.; Kama, M.; Matrà, L.; Triaud, A. H. M. J.; Henning, Th., “*Searching for a dust cometary belt around Trappist-1 with ALMA*”, MNRAS, 492, 6067 (2020) 1 citation

Second author publications:

12. Casassus, S.; **Marino, S.**; Pérez, S.; Roman, P.; Dunhill, A.; Armitage, P. J.; Cuadra, J.; Wootten, A.; van der Plas, G.; Cieza, L.; Moral, Victor; Christiaens, V.; Montesinos, Matías, “*Accretion Kinematics through the Warped Transition Disc in HD142527 from Resolved CO(6-5) Observations*”, ApJ, Volume 811, Issue 2, article id. 92, (2015) 72 citations.
13. 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, Volume 859, Issue 1, article id. 72 (2018) 23 citations
14. 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, 489, 3670 (2019) 20 citations
15. Kennedy, G. M.; **Marino, S.**; Matrà, L.; Panic, O.; Wilner, D.; Wyatt, M. C.; Yelverton, B., “*ALMA observations of the narrow HR 4796A debris ring*”, MNRAS, Volume 475, Issue 4, p.4924-4938 (2018) 14 citations
16. Casassus, S.; **Marino, S.**; Lyra, W.; Baruteau, C.; Vidal, M.; Wootten, A.; Pérez, S.; Alarcon, F.; Barraza, M.; Cárcamo, 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, Volume 483, Issue 3, p.3278-3287 (2019) 5 citations
17. 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, Volume 488, Issue 1, p.1005-1011 (2019) 4 citations

Remaining co-author publications:

18. Casassus, S.; Wright, C. M.; **Marino, S.**; Maddison, S. T.; Wootten, A.; Roman, P.; Pérez, S.; Pinilla, P.; Wyatt, M.; Moral, V.; Ménard, F.; Christiaens, V.; Cieza, L.; van der Plas, G., “*A Compact Concentration of Large Grains in the HD 142527 Protoplanetary Dust Trap*”, ApJ, Volume 812, Issue 2, article id. 126, (2015) 65 citations.
19. Montesinos, M.; Pérez, S.; Casassus, S.; **Marino, S.**; Cuadra, J.; Christiaens, V., “*Spiral Waves Triggered by Shadows in Transition Discs*”, ApJL, Volume 823, Issue 1, article id. L8 (2016) 46 citations.
20. 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.; Hiben, P.; Ingraham, P.; Konopacky, Q.; Macintosh, B.; Oppenheimer, R.; Perrin, M.; Rantaky, F.; Sadakuni, N.; Thomas, S., “*An M-dwarf star in the transition disc of Herbig HD 142527. Physical parameters and orbital elements*”, A&A, Volume 590, id.A90, (2016) 44 citations.
21. Price, D. J.; Cuello, N.; Pinte, C.; Mentiplay, D.; Casassus, S.; Christiaens, V.; Kennedy, G. M.; Cuadra, J.; Pérez, S.; **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, Volume 477, Issue 1, p.1270-1284 (2018) 43 citations
22. Pérez, S.; Dunhill, A.; Casassus, S.; Roman, P.; Szulágyi, J.; Flores, C.; **Marino, S.**; Montesinos, M., “*Planet Formation Signposts: Observability of Circumplanetary Discs via Gas Kinematics*”, ApJL, Volume 811, Issue 1, article id. L5, (2015) 40 citations.
23. 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.; Román, P. E.; Barraza, M., “*An inner warp in the DoAr 44 T Tauri transition disc*”, MNRAS, Volume 477, Issue 4, p.5104-5114 (2018) 31 citations
24. 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, Volume 464, Issue 3, p.3385-3407 (2017) 26 citations.
25. Cieza, L. A.; Ruíz-Rodríguez, D.; Pérez, 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, Volume 474, Issue 4, p.4347-4357 (2018) 24 citations
26. 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, Volume 479, Issue 2, p.2649-2672 (2018) 11 citations
27. Baruteau, C.; Barraza, M.; Pérez, S.; Casassus, S.; Dong, R.; Lyra, W.; **Marino, S.**; Christiaens, V.; Zhu, Z.; Carmona, A.; Debras, F.; Alarcón, F., “*Dust traps in the protoplanetary disc MWC 758: two vortices produced by two giant planets?*”, MNRAS, Volume 486, Issue 1, p.304-319 (2019) 10 citations
28. Pérez, S.; Casassus, S.; Hales, A.; **Marino, S.**; Cheetham, A.; Zurlo, A.; Cieza, L.; Dong, R.; Alarcón, F.; Benítez-Llambay, P.; Fomalont, E., “*Long baseline observations of HD100546 with ALMA: a possible circumplanetary disk detected in dust continuum and gas kinematics*”, ApJL, 889, L24 (2020) 9 citations
29. 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 β Pictoris Belt Revealed by ALMA*”, AJ, Volume 157, Issue 4, article id. 135 (2019) 7 citations
30. Read, M. J.; Wyatt, M. C.; **Marino, S.**; Kennedy, G. M., “*Shaping HR8799’s outer dust belt with an unseen planet*”, MNRAS, Volume 475, Issue 4, p.4953-4966 (2018) 9 citations
31. Casassus, S.; Pérez, S.; Osses, A.; **Marino, S.**, “*Cooling in the shade of warped transition discs*”, MNRASL, Volume 486, Issue 1, p.L58-L62 (2019) 4 citations
32. 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, 635, A105 (2020) 1 citation
33. Sepulveda, A. G.; Matrà, L.; Kennedy, G. M.; del Burgo, C.; Oberg, K. I.; Wilner, D. J.; **Marino, S.**; Booth, M.; Carpenter, J. M.; Davies, C. L.; Dent, W. R. F.; Ertel, S.; Lestrade, J.; 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, Volume 881, Issue 1, article id. 84 (2019) 1 citations
34. Kral Q., Matrà L., Kennedy G., **Marino S.**, Wyatt M., “*Survey of planetesimal belts with ALMA: gas detected around the Sun-like star HD 129590*”, arXiv, arXiv:2005.05841 (2020)
35. Matrà, 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*”, Astro2020: Decadal

Survey on Astronomy and Astrophysics, science white papers, no. 391; Bulletin of the American Astronomical Society, Vol. 51, Issue 3, id. 391 (2019)

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.