Philipp Weber

Curriculum Vitae

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Employment

2025 - **YEMS Research Fellow**, *Universidad de Santiago de Chile (USACH)*, Santiago
Departamento de Física.
Topic: Planet Formation around outbursting stars & Hydrodynamical models of Debris Discs

2022 - 2025 **Independent FONDECYT Research Fellow (PI-level project definition and execution)**, *Universidad de Santiago de Chile (USACH)*, Santiago
Departamento de Física.
Topic: Revealing the formation of planets via their shadows, migration, kinematics and dust traps: connecting theory and observations.
Sponsor: Prof. Sebastián Pérez (USACH)

2020 - 2022 **Research Fellow**, *Universidad de Chile (UdC) and Universidad de Santiago de Chile*, Santiago
Departamento de Astronomía.
Topic: Connecting observations and theory of Planet Formation
Advisors: Prof. Simon Casassus (UdC), Prof. Sebastián Pérez (USACH)

Research Interests

- Planet formation and disc evolution (exoplanet origins)
- Gravitational instability, FUor systems and time-variable accretion
- Dust–gas dynamics, radiative transfer and synthetic observables
- ALMA / VLT / JWST synergy (ESO & ESA facilities)
- Links between disc physics, cosmochemistry and Solar-System constraints

Awards & Scholarships

2022 **Fondecyt Research Fellow**, Fellowship funded by the Agencia Nacional de Investigación y Desarollo, Chile, $\sim 90.000\,€$

2019 **Poster Award**, ALMA2019 Science Meeting: Science Results and Cross-Facility Synergies, Cagliari, Italy

2019 **Poster Award**, Conference for Planet Formation and Evolution 2019, Rostock, Germany

Observational Projects & Facility Access

ALMA, co-I of Large Programme ARKS, Weber et al. in prep.

ALMA, 15 accepted ALMA projects as co-I

VLT/SPHERE, 22 h as PI across four projects, with one accepted DDT proposal

VLT/ERIS, 1.5 h as PI for one project with $\times 14$ over-subscription at VLT/UT4

Publication List (First Author) - ADS-link

2025 **A Multi-Wavelength Study of the Dynamic Environment surrounding the FUor V960 Mon**, Weber, P.; Ulloa, S.; Pérez, S.; et al., ApJ in print
This article presents the large-scale observations of V960 Mon, showing the full field of view of ALMA (including continuum, ^{12}CO and ^{13}CO molecular line emission), and VLT/MUSE data. It discusses the connection between the evidence of large-scale infall from an externeal cloudlet and the outbursting nature of the V960 Mon protostar.

2023 **Spirals and clumps in V960 Mon: signs of planet formation via gravitational instability around an FU Ori star?**, Weber, P.; Pérez, S.; Zurlo, A.; et al., ApJL 952L:17

This article focuses on the putative detection of gravitational instability on planetary scales around the FUor object V960 Mon. It uses data from the VLT/SPHERE and ALMA telescopes. I am corresponding author of this publication, led discussion and analysis, reduced the SPHERE data and organized the ESO and ALMA press releases. As a result, this article was covered by ¿100 news outlets[5].

2023 **The SPHERE view of three interacting twin disc systems in polarized light**, Weber, P.; Pérez, S.; Guidi, G.; et al., MNRAS 518:4

This article presents the observational analysis of three twin disc systems (binary/multiples in which two stellar components are accompanied by a disc). I reduced the VLT/SPHERE data, and analysed the polarization pattern, giving new insights into polarization effects in the case of multiple, spatially-separated light sources.

2022 **The steady-state hydrodynamics of a long-lived disc: planetary system architecture and prospects of observing a circumplanetary disc shadow in V4046 Sgr**, Weber, P.; Casassus, S.; Pérez, S., MNRAS

In this project, I provided a hydrodynamical model for the circumbinary disc V4046 Sgr. I ran FARGO3D and RADMC-3D simulations to compare observations to the idea of the presence of two giant planets in the disc. I infered important disc parameters and discussed the idea of a third planet on inner orbits, accompanied by a circumplanetary disc that could cast a shadow on the outer parts in scattered light.

2019 **Predicting the Observational Signature of Migrating Neptune-sized Planets in Low-viscosity Disks**, Weber, P.; Pérez, S.; Benítez-Llambay, P.; Gressel, O.; Casassus, S.; Krapp, L., ApJ, 884:178

I studied the effect of migration on the patterns produced by medium-sized protoplanets (mini-Neptunes) within the dust component. I used FARGO3D and RADMC-3D simulations and included the CASA simobserve task to produce synthetic images under realistic conditions. The appendix of this article provides details on the dust diffusion implementation in the public version of FARGO3D, with numerical tests.

2018 **Characterizing the Variable Dust Permeability of Planet-induced Gaps**, Weber, Philipp, Benítez-Llambay, P.; Gressel, Oliver; Krapp, L.; Pessah, M. E., ApJ, 854:153

This article studies the transport of solids from an outer disc reservoir through the planetary gap into the inner system. I designed and carried out the simulations using FARGO3D. I traced the particles trajectory, and quantified under which conditions solids are prohibited from being transported through the gap.

Publication List (Contributing) - see full ADS-link

2025 **Resolving the large exoKuiper belt of the HD 126062 debris disc and extended gas emission in its vicinity**, Miley et al., A&A 703:235

2025 **Multi-frequency observations of PDS 70c: Radio emission mechanisms in the circum-planetary environment**, Dominguez-Jamett, O. et al., A&A

2025 **VLT/ERIS Observations of the V960 Mon System: A Dust-embedded Substellar Object Formed by Gravitational Instability?**, Dasgupta, A. et al., ApJL 988L:30

2025 **The Ophiuchus DIsk Survey Employing ALMA (ODISEA): A Unified Evolutionary Sequence of Planet-driven Substructures Explaining the Diversity of Disk Morphologies**, Orcajo, S. et al., ApJL 984L:59

2024 **The environment around young eruptive stars. SPHERE/IRDIS polarimetric imaging of seven protostars**, Zurlo, A.; Weber, P.; Pérez, S.; et al., A&A 686:309

2024 **Discovery of an Accretion Streamer and a Slow Wide-angle Outflow around FU Orionis**, Hales, A. S.; Gupta, A.; Ruíz-Rodríguez, D.; et al., ApJ 966:96

2024 **The SPHERE view of the Taurus star-forming region. The full census of planet-forming disks with GTO and DESTINYS programs**, Garufi, A.; Ginski, C.; van Holstein, R. G.; et al., A&A 685:53

2023 **Radio-continuum decrements associated to shadowing from the central warp in transition disc DoAr 44**, Arce-Tord, Carla; Casassus, Simon; Dent, William R. F.; et al., MNRAS 526:2077

2023 **The ALMA view of MP Mus (PDS 66): A protoplanetary disk with no visible gaps down to 4 au scales**, Ribas, Á.; Macías, E.; Weber, P.; et al., A&A 673:77

2022 **The Doppler Flip in HD 100546 as a Disk Eruption: The Elephant in the Room of Kinematic Protoplanet Searches**, Casassus, S.; Cárcamo, M.; Hales, A.; Weber, P.; Dent, B., ApJL 933:4

2022 **High-resolution ALMA observations of V4046 Sgr: a circumbinary disc with a thin ring**, Martinez-Brunner, R.; Casassus, S.; Pérez, S.; et al., MNRAS

2021 **A multiwavelength analysis of the spiral arms in the protoplanetary disk around WaOph 6**, Casassus, S.; Christiaens, V.; Cárcamo, M.; et al., MNRAS, 507:3

2021 **A multiwavelength analysis of the spiral arms in the protoplanetary disk around WaOph 6**, Brown-Sevilla, S.B.; Keppler, M.; Barraza-Alfaro, M., K.; et al., A&A, 654:35

2021 **Modeling the nonaxisymmetric structure in the HD 163296 disk with planet-disk interaction**, Rodenkirch, P.; Rometsch, T.; Dullemond, K.; Weber, P.; Kley, W., A&A, 647:174

2019 **Probing the Protosolar Disk Using Dust Filtering at Gaps in the Early Solar System**, Haugbølle, T.; Weber, P.; Wielandt, D.; Benítez-Llambay, P.; Bizzarro, M.; Gressel, O.; Pessah, M., ApJ, 158:55

Publications submitted / in print

in print **10 Publications: "The ALMA survey to Resolve exoKuiper belt Substructures (ARKS)" accepted by A&A** , *among those: "ARKS IX – Gas-driven origin for the continuum arc in the debris disc of HD 121617"*, Weber et al. in print
This article is a pioneering numerical study on the role of gas drag in the environment of a debris disc.

submitted **Warps survive beyond fly-by encounters in protoplanetary disks. RW Aur A as a case study.**, Kimmig, C; Weber, P.; Rosotti, G.P.; Facchini, S.; Dullemond, C.P., submitted to A&A

submitted **ALMA 873 μm Polarization Observations on the PDS 70 Disk.**, Liu, H.B.; Doi, K.; Casassus, S.; Kataoka, A.; Dong, R.; Hashimoto, J.; Weber, P., submitted to A&A

Selected Invited Seminars

2024 **StarPlan Seminar**, *Spirals and clumps around the outbursting star V960 Mon - evidence of gravitational instability on planetary scales?*, Center for Star an Planet Formation, Aug 13, Copenhagen, Denmark

2024 **IPAG Seminar**, *V960 Mon: spiral and clumps - evidence of gravitational instability around an outbursting star?*, Institut de Planétologie et d'Astrophysique, July 23, Grenoble, France

2023 **JADES e-talk**, *Polarised Light observations of interacting Protoplanetary Discs*, Joint Alma Observatory, Chile

2022 **StarPlan Seminar**, *Polarised Light observations of interacting Protoplanetary Discs*, Center for Star an Planet Formation, June 20, Copenhagen, Denmark

2021 **DAS Seminar (remote)**, *Dust and Planets in Protoplanetary Discs*, Universidad de Chile, April 22, Santiago, Chile

2019 **ESO Seminar**, *Interpreting traces of planets in their birth environment*, European Souther Observatory, December 17, Garching, Germany

2018 **Universidad de Valparaiso**, *Dust filtration induced by a giant planet*, Universidad de Valparaiso, December 20, Valparaiso, Chile

2018 **Universidad de Chile**, *Dust filtration induced by a giant planet*, Universidad de Chile, December 5, Santiago, Chile

Selected Talks at Scientific Meetings

2024 **Born in Fire Conference**, *Observing the environment of an outbursting protostar: evidence of gravitational instability?*, September, UDP Library, Chile

2024 **Dustbusters: New Heights in Planet Formation.**, *Observing the environment of an outbursting protostar: evidence of gravitational instability?*, July 16, ESO Garching, Germany

2021 **Invited Talk (remote): Circumplanetary Disks and Satellite Formation II**, *Signs of a CPD in a circumbinary disc?*, March 17, Zürich, Switzerland

2019 **Poster Prize Talk: ALMA2019 Science Results and Cross-Facility Synergies**, *Towards constraining the migration behavior of planetary cores through highly resolved mm-observations*, Oct 14- 18, Calgari, Italy

Poster presentations

2023 **ALMA at 10 years: Past, Present, and Future**, *Providing Evidence of Gravitational Instability on planetary scales in an FU Orionis Disk*, Dec 4-8, Puerto Varas, Chile

2019 **ALMA2019: Science Results and Cross-Facility Synergies**, *Towards constraining the migration behavior of planetary cores through highly resolved mm-observations*, Oct 14- 18, Calgari, Italy

2019 **Planet Formation and Evolution 2019**, *Size-dependent dust filtration induced by the presence of a giant planet*, Feb 27 - March 1, Rostock, Germany

Schools and Workshops

2019 **Summer Protoplanetary Disk Workshop**, *Dust filtration by a giant planet and its impact on the Solar System*, Jan 29, Santiago de Chile, Chile

2018 **TIARA Summer School on Origins of the Solar System**, *Dust filtration by giant planets*, Academia SINICA, July 19, Taipei, Taiwan

2017 **NBIA summer school on astrophysical plasmas, From Planets to Galaxies**, The Niles Bohr Institute, Aug 28 to Sep 1, Copenhagen, Denmark

2017 **Formation an Evolution of Planets and their Disks**, MIAPP, June 17-26, Munich, Germany

2017 **From Laboratories to Astrophysics: The Expanding Universe of Plasma Physics**, Les Houches physics school, May 2-12, Les Houches, France

2017 **Winter school on Theoretical Physics: The Physics of Planets**, NORDITA, Jan 2-13, Stockholm, Sweden

Teaching

2024 **Lecturer at FARGO3D workshop**, *From simulations to observations*, UAI, Santiago
Two lectures and two hands-on sessions on radiative transfer in workshop.

2023 **Física Computacional IV**, *Métodos numéricos en astrofísica*, Universidad de Santiago de Chile, Santiago
Main lecturer and designer of Bachelor course curriculum in Spanish. 32 blocks of 90 minutes each.

2023 **Desarrollo de Software para Astrofísica**, Universidad de Santiago de Chile, Santiago
Guest lecturer for two 90 minute classes on hydrodynamic simulations in astronomy.

2020 **Introduction to University Pedagogy (one week)**, Københavns Universitet, Copenhagen, Denmark

Teaching assistant

2019 **Computational Astrophysics**, University of Copenhagen, Copenhagen

2019 **Theoretical Astrophysics**, University of Copenhagen, Copenhagen

2018 **Theoretical Astrophysics**, University of Copenhagen, Copenhagen

2015 **Introduction to Astronomy I - Planets and Stars**, University of Heidelberg, Heidelberg

2014 **Introduction to Astronomy II - Galaxies and Cosmology**, University of Heidelberg, Heidelberg

Supervision & Mentoring

- **MSc supervision: 1, co-supervision: 1**
- **BSc co-supervision: 3**

Academic Leadership & Service

ongoing **Referee**, *for* Nature *and major astronomy journals,* ApJ*,* A&A*,* MNRAS *and* Icarus

2025 **Scientific Evaluator to the FONDECTY Postdoc Fellowship**

2025 **ALMA Cycle 12 Science Assessor**, *External Advisor for Large Programme Evaluation*

2024 **Born in Fire Conference**, *Local Organizer*, September 24 - 27, Santiago, Chile

2024 **FARGO3D workshop**, *Scientific Organizer and Lecturer*, January 16 - 19, Santiago, Chile

2022 **YEMS workshop**, *Scientific Organizer*, December 5 - 7, Concepción, Chile

2019 – 2020 **Organizer of StarPlan Seminars**, *Centre for Star and Planet Formation*, Copenhagen, Denmark

2019 **PhD summer school**, *Co-Organizer*, The Niels Bohr Institute, August 5 - 9, Copenhagen, Denmark

2018 – 2019 **Thematic journal club organizer**, *The Niels Bohr Institute* , Copenhagen, Denmark

Press Releases

2025 **ESO press release**, *Astronomers witness newborn planet sculpting the dust around it*, based on Dasgupta et al. (2025).

2024 **ESO press release**, *Groundbreaking survey reveals secrets of planet birth around dozens of stars*, based on Garufi et al. (2024).

2024 **ALMA press release**, *Orion's Erupting Star System Reveals Its Secrets*, based on Hales et al. (2024).

2023 **ALMA press release**, *Star-Birth Spectacle Unveiled from Chile*, based on Weber et al. (2023b).

2023 **ESO press release**, *New image reveals secrets of planet birth*, based on Weber et al. (2023b).

Outreach Organization

2023-2025 **Founder and Organizer of Space is the place**[1], *Public outreach events of scientific talks and Jazz concerts*, Santiago, Chile
9 events in jazz club *Thelonious*, 4 events in Cultural Centre "Casona Compañía", one event at international music festival "WOMAD" and 3 events at theatre "Teatro Comunitario Novedades"

2022 – 2023 **Scientific advisor of the performance art project "Cosmic Microwave Background"**, *Santiago*
Explaining the physics of the CMB and the early evolution of the universe to artists. Providing feedback on scenography. Participation in panel discussion. Several sold out performances in Gabriela Mistral Cultural Centre (GAM). Estimated participants: 100 per event.

2018 – 2021 **Volunteer for Science & Cocktails Copenhagen**[2], *Scientific Overviews*, Fristaden Christiania
Participated in 12 events of internationally renowned speakers and music concert. Typical attendance: 300-1300.

Outreach Talks

2025 **Space is the Place Concepción: "Estrellas de la Astronomía"**, *Casa de Salud*, Concepción, Chile
Public talk accompanied Jazz band. Estimated paritcipants: 50

2024 **Concierto Cielos 2024: "Los secretos de V883 Ori & V960 Mon"**, *Casona Dubois*, Santiago, Chile
Public talks accompanied by orchestra. Estimated paritcipants: 100

2024 **Public Talk in Planetarium**, *Momentos estelares de la astronomía*, Santiago, Chile
Talk about milestones of astronomical research, Einstein's formulation of general relativity, the discovery of Neptune, the misinterpretation of Kepler's Stella Nova, and the complexity of life. Participants: 200.

2023 **Concierto Cielos 2023: "Los secretos de V883 Ori & V960 Mon"**, *Aula Magna USACH*, Santiago
Two public talks accompanied by orchestra. Estimated paritcipants: 800

2023 **Three talks at public highschools for "Astronomy Week"**, *Santiago/San Antonio*, Chile
Giving 45 minutes classes in colleges of low-income neighbourhoods. Estimated participants per event: 50

2022 **Concierto Cielos 2022: "Que pasó en el sistema solar?"**, *Aula Magna and Planetario USACH*
Two public talks accompanied by orchestra. Estimated paritcipants: 2500

2022 **Talk at artist residency "Creation of a ritual II"** , *Kunsthalle Hilsbach*, Germany
Talk about "Rituals & Astronomy", focusing on links between culture and science.

2019 **Public seminar at "Astronomy on Tap Heidelberg"**[3], *O'Reilly's Irish Pub*, Heidelberg, Germamy

Education

2016 – 2020 **Ph.D. student**, *University of Copenhagen*, Copenhagen
Awarded: June 10, 2020 at Niels Bohr Institute, Theoretical Astrophysics Group.
Title: Traces of Planets imprinted in the Dust of Protoplanetary Disks
Ph.D. Advisors: Dr. Oliver Gressel, Dr. Pablo Benítez-Llambay

[1] youngexoplanets.github.io/space-is-the-place
[2] www.scienceandcocktails.org
[3] www.astronomyontap.org

2018 **Change of Environment (three months)**, *Universidad de Chile*, Chile
Part of the Ph.D. programme.
Advisors: Dr. Sebastián Pérez, Prof. Simon Casassus

2014 – 2016 **M.Sc - Physics and Astronomy**, *Ruprecht-Karls-Universität Heidelberg*, Heidelberg
Awarded: July 1, 2016 at Institute for Theoretical Astrophysics
Title: Formation and Evolution of irradiated Transition Disks.
Supervisor: Prof. Cornelis P. Dullemond

2010 – 2014 **B.Sc - Physics and Astronomy**, *Ruprecht-Karls-Universität Heidelberg*, Heidelberg
Awarded: February 10, 2014 at Institue for Theoretical Astrophysics
Title: About the formation of pre-transitional disks caused by deposition of previously sublimated bodies.
Supervisor: Prof. Cornelis P. Dullemond