

# Gesa H.-M. Bertrang

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## Curriculum Vitae

(Last update: Jan 27, 2020)

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### Research Interest

- Planet and Star Formation
  - Magnetic field influence on protoplanetary disks and star-forming regions
  - Dust grain characterization
  - Planet-disk interactions
- Simulations/theory
  - 3D Radiative transfer simulations of dusty circumstellar environments
  - Continuum polarization and dust grain alignment processes
  - Gas polarization, esp. Goldreich-Kylafis effect in different environments
- Observations
  - High-angular resolution observations, imaging and spectroscopy
  - Continuum polarimetry from optical to mm-wavelengths
  - Spectro-polarimetry with focus on (sub)-mm wavelengths
- Code development
  - Python: – Data reduction pipelines (NTT/SOFI, VLT/ISAAC, IGO/IFOSC)  
– Various scripts for data analysis and plotting
  - Fortran: Radiative transfer simulations (MC3D, Mol3D, LinePol)

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### Academic Achievements

- 17 refereed journal articles, 4 as first author, 2 as second author and in supervisory role; 290+ citations (h-index = 10; i10-index = 10)
- 210'000 EUR+ grant income as PI
- PI of 146+ hours observing time on major ground-based facilities, including ALMA, VLT, APEX, NTT

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### Education

- 2011–2015 **PhD (Dr. rer. nat.) in astrophysics**, *Kiel University*.  
Advisor: Sebastian Wolf
- 2005–2010 **Diplom in physics (M.Sc. + B.Sc. equivalent)**, *Kiel University*.  
Advisor: Sebastian Wolf

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### Work Experience

- 2018–2023 **Senior postdoctoral research associate**.  
Max Planck Institute for Astronomy (MPIA)
- 2017–2018 **Fellowship at FONDECYT (Chilean Science Foundation)**.  
Universidad de Chile
- 2015–2017 **Fellowship at MAD nucleus (Chilean Science Foundation)**.  
Universidad de Chile & Universidad Diego Portales
- 2008–2010 **Research student**, *Polarization as magnetic field tracer in star formation*.  
Kiel University

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## Awards and Distinctions

- 2017 – 2018 **Postdoctoral Fellowship Grant**, by the Chilean science foundation CONICYT.  
PI: G Bertrang (EUR 110'000)
- 2015 – 2017 **Postdoctoral Fellowship Grant**, within MAD (Millenium ALMA Disk) nucleus, by the Chilean science foundation CONICYT.  
PI: G Bertrang (EUR 100'000)
- 2018 IAU travel grant, IAU XXX General Assembly, Vienna, Austria.  
PI: G Bertrang (EUR 540)
- 2017 IAU travel grant, IAU Division F meeting Astrobiology 2017, Chile, Coyhaique.  
PI: G Bertrang (EUR 300)
- 2017 ERASMUS+ travel grant, "The Early History of Planetary systems and habitable planets", Estonia, Tartu.  
PI: G Bertrang (EUR 400)
- 2005 **DPG (German Physics Society) Special Award**, for outstanding performance in physics.
- 2005 **DPG (German Physics Society) Award**, for excellent performance in physics.

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## Teaching and Mentoring

- since 2018 **PhD students (2)**: Major – Astrophysics  
*Students*: Lizxandra Flores, Marcelo Barraza (MPIA)  
*Co-Supervisor to Mario Flock (MPIA)*
- 2017 – 2018 **Bachelor student (1)**: Major – Astrophysics  
*Student*: Sebastián Jorquera (University of Chile)  
**Publication: Jorquera & Bertrang (2018), A&A, 618, 163**
- 2011 – 2014
- General Physics, exercise course (undergraduate level)  
Kiel University; *Mathematical Methods, Nuclear physics, Astrophysics*
  - Astrophysics, assessor at various oral exams (undergraduate level)  
Kiel University

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## Outreach

- 2020 Jan Talk at "*Faszination Astronomie*" at HdA, Heidelberg
- 2019 Nov Talk at the *Koblenz Technology Night*, Koblenz
- 2019 Jul Talk to the 50<sup>th</sup> anniversary of MPIA at HdA, Heidelberg
- 2019 Jan Talk at *Astronomy on Tap*, "*Making the invisible visible*", Heidelberg
- 2015 Jun *Newspaper article* to the 350<sup>th</sup> anniversary of Kiel University
- 2013 Jun Girls Day, *Solar observations*, Kiel University

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## Invited Talks (32)

- 2020 Sep Summer school: IMPRS school on Protoplanetary Disks, Heidelberg, Germany.
- 2020 May Workshop: Thinkshop on Protoplanetary Disk Chemodynamics, Potsdam, Germany.
- 2020 Apr Workshop: The building blocks of planets, Ringberg Castle, Germany.

- 2020 Jan **Astronomical Colloquium**, Tübingen University, Germany.
- 2020 Jan Workshop: VLT/Gravity, Heidelberg, Germany.
- 2019 Dec **Lorentz Workshop: Directly Imaging Exoplanets in Polarized Light with ELTs**, Leiden, Netherlands.
- 2019 Nov **Conference: Science of Early Life**, Kloster Seeon, Chiemsee, Germany.
- 2019 Oct **ESO**, European Southern Observatory; Garching.
- 2019 Sep Workshop: From protoplanetary discs to planetary systems, Ringberg Castle, Germany.
- 2019 Aug **NOAO**, National Optical Astronomy Observatory; Tuscon, USA.
- 2019 Aug **Steward Observatory**, Tuscon, USA.
- 2019 Aug CSUN, California State University; Northridgem USA, cancelled.
- 2019 Aug **MIT**, Kavli Institute, Cambridge, USA.
- 2019 Aug **Harvard**, Center for Astrophysics (CfA), Cambridge, USA.
- 2019 Aug Boston University, Boston, USA.
- 2019 Jul Workshop: Turbulence and Structure Formation in PPDs, Ringberg Castle, Germany.
- 2019 Mar **Oxford**, Atmospheric Oceanic and Planetary Physics (AOPP), UK.
- 2018 Sep **MPIA**, Königstuhl Colloquium, Heidelberg, Germany.
- 2018 Jun Workshop: Hide and Seek: Where are the young planets?, Madrid, SPain.
- 2018 Mar **Joint ALMA Observatory**, Santiago, Chile.
- 2018 Nov Valparaiso, Physics and Astronomy Institute (IFA), University of Valparaiso, Chile.
- 2017 Nov Concepcion, Department of Astronomy, University of Concepcion, Chile.
- 2017 Mar Vienna, Department of Astrophysics, University of Vienna, Austria.
- 2017 Aug **MPIA**, Max Planck Institute for Astronomy; Heidelberg, Germany.
- 2017 Jul Lisbon, Astronomical Observatory of Lisbon, Portugal.
- 2017 Jan **ETHZ**, Zurich, Switzerland.
- 2016 Oct **Grenoble**, l'Institut de Planétologie et d'Astrophysique de Grenoble (IPAG), France.
- 2016 Sep Kiel, Institute for Theoretical Physics and Astrophysics (ITAP), Germany.
- 2016 Aug **MPIA**, Max Planck Institute for Astronomy; Heidelberg, Germany.
- 2016 Jan Santiago, Pontificia Universidad Católica de Chile (PUC), Chile.
- 2015 Nov Santiago, European Southern Observatories (ESO), Chile.
- 2012 Nov Santiago, European Southern Observatories (ESO), Chile.

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## Organisation of scientific meetings

- 2020 Apr 14-18 **SOC** of "Simulations and observations of the building blocks of planets",  
*Workshop*.  
Ringberg Castle, Germany

- 2019 Sep 19 **SOC** of "Cosmic dust and spectral line polarization as analytical tools: Bridging spatial and spectral scales & SOFIA's promise ", *Splinter session during the Annual Meeting of the German Astronomical Society in 2019.*  
Stuttgart, Germany
- 2019 Sep 17-18 **SOC** of "From protoplanetary disks to exoplanets - the story of their formation", *Splinter session during the Annual Meeting of the German Astronomical Society in 2019.*  
Stuttgart, Germany
- 2015 - 2017 Disk and Planet **Seminar Organizer and Host.**  
Universidad de Chile and Universidad Diego Portales
- 2014 Sep **LOC** of "Planet formation and evolution 2014 workshop", Kiel, Germany.
- 2010 Jul **LOC** of "Second Chinese-German workshop on Star and Planet formation", Kiel, Germany.

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## Services

- since 2020 **Conflict coach at MPIA.**
- since 2019 **Time Allocation Committee, SOFIA.**
- since 2018 **Hiring panel for Postdoctoral Fellows at MPIA's PSF department.**
- since 2018 **Internal Scientific Advisory Board at MPIA.**  
Wissenschaftlicher Beraterkreis (WBK)
- since 2018 **Postdoc Representative at MPIA.**
- 2012 - 2014 **Section committee of the physics department of Kiel University.**  
Representative of research assistants and associates  
Letter of Recommendation Writer for Students  
Referee for Astrophysical Journal, Astronomy & Astrophysics, and Publications of the Astronomical Society of Japan

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## Observation Record as PI

**Total amount: > 146 hrs**

- 2019 **ALMA**, *Measurements of the magnetic field structure in the nearest protoplanetary disk*, 2019.1.00249.S, 6 hrs.
- 2018 **ALMA**, *Measurements of the magnetic field structure in the nearest protoplanetary disk*, 2018.1.00373.S, 6.1 hrs.  
**ALMA**, *The nature of continuum polarization in protoplanetary disks*, 2018.1.00373.S, 3.1 hrs.
- 2017 **ALMA**, *The nature of continuum polarisation in protoplanetary disks*, 2017.1.00892.S, 18.3 hrs.  
**VLT/SPHERE**, *Bringing disks to life: tracing the short-time dynamics in the protoplanetary disk around HD 169142*, 0101.C-0595, 1.2 hrs.
- 2016 **APEX/ARTEMIS**, *The nature and origin of the Solar system scale disk in the Helix Nebula: Complementing ALMA.*, C 097.F 9704C 2016, 18.6 hrs.  
(Visiting observer for 7 days)

- 2015 **NTT/SOFI**, *Revealing the magnetic field strength and structure of Bok globules on a wide range of scales*, 096.C 0115(A), 5 nights.  
(Visiting observer)
- 2013 **NTT/SOFI**, *Connecting large and small-scale magnetic field structures in Bok globules*, 090.C 0785(A), 3 nights.  
(Visiting observer)
- 2012 **VLT/ISAAC**, *Connecting large and small-scale magnetic field structures in Bok globules*, 089.C 0846(A), 15.6 hrs.

## Publication Record (*ads*)

"[OA]": open access publications; "+": three most important papers

### A. First, second author and advisee refereed publications

- + [OA] **6.** *"Intrinsic polarisation of elongated porous dust grains"*  
Kirchschlager, F., **Bertrang, G. H.-M.**, Flock, M., 2019, MNRAS, 488, 1211  
My contribution to this project is the idea, planning, and analysis of this project along with significant text contributions to sections 1, 3.2, 4, and 5.
- + [OA] **5.** *"HD 169142 in the eyes of ZIMPOL/SPHERE"*  
**Bertrang, G. H.-M.**, Avenhaus, H., Casassus, S., Montesinos, M., Kirchschlager, F., Perez, S., Cieza, L., Wolf, S., 2018, MNRAS, 474, 5105
- [OA] **4.** *"Magnetic fields in Bok globules: multi-wavelength polarimetry as tracer across large spatial scales"*  
Jorquera, S. and **Bertrang, G. H.-M.**, 2018, A&A, 618, A163
- [OA] **3.** *"3D radiative transfer of intrinsically polarized dust emission based on aligned aspherical grains"*  
**Bertrang, G. H.-M.**, Wolf, S., 2017, MNRAS, 469, 2869
- + [OA] **2.** *"Magnetic fields in protoplanetary discs: from MHD simulations to ALMA observations"*  
**Bertrang, G. H.-M.**, Flock, M, Wolf, S., 2017, MNRAS Letters, 464, L61
- [OA] **1.** *"Large-scale magnetic fields in Bok globules"*  
**Bertrang, G. H.-M.**, Wolf, S., Das, H. S., 2014, A&A, 565, A94

### B. Other refereed publications

- [OA] **11.** *"Disks Around T Tauri Stars with SPHERE (DARTTS-S) II: Twenty-one new polarimetric images of young stellar disks "*  
Garufi, A., Avenhaus, H., Perez, S., Quanz, S. P., van Holstein, R. G., **Bertrang, G. H. M.**; Casassus, S., Cieza, L., Principe, D. A., van der Plas, G., Zurlo, A., 2020, A&A 633, 82
- [OA] **10.** *"Characterization of Ring Substructures in the Protoplanetary Disk of HD 169142 from Multi-Wavelength ALMA Observations"*  
Macias, E., Espaillat, C., Osorio, M., Anglada, G., Torrelles, J. M., Carrasco-Gonzalez, C., Flock, M., Linz, H., **Bertrang, G. H. M.**; Henning, Th., et al., 2019, ApJ, 881, 159
- [OA] **9.** *"A highly structured disk around the planet host PDS 70 revealed by high-angular resolution observations with ALMA"*

- Keppler, M., Teague, R., Bae, J., Benisty, M., Henning, T., van Boekel, R., Chapillon, E., Pinilla, P., Williams, J. P., **Bertrang, G. H.-M.**, Facchini, S., et al., 2019, *A&A*, 625, 118
- [OA] **8.** *"Resolved Imaging of the AR Puppis Circumbinary Disk"*  
Ertel, S., Kamath, D., Hillen, M., van Winckel, H., Okumura, J., Manick, R., Boffin, H. M. J., Milli, J., **Bertrang, G. H.-M.**, Guzman-Ramirez, L., et al., 2019, *ApJ*, 157, 110
- [OA] **7.** *"The Ophiuchus DIsc Survey Employing ALMA (ODISEA) - I: project description and continuum images at 28 au resolution"*  
Cieza, L. A., Ruiz-Rodriguez, D., Hales, A., Casassus, S., Perez, S., Gonzalez-Ruilova, C., Canovas, H., Williams, J. P., Zurlo, A., Ansdell, M., Avenhaus, H., Bayo, A., **Bertrang, G. H.-M.**, Christiaens, V., et al., 2019, *MNRAS*, 482, 698
- [OA] **6.** *"Disks around T Tauri Stars with SPHERE (DARTTS-S). I. SPHERE/IRDIS Polarimetric Imaging of Eight Prominent T Tauri Disks"*  
Avenhaus, H., Quanz, S. P., Garufi, A., Perez, S., Casassus, S., Pinte, C., **Bertrang, G. H.-M.**, Caceres, C. Benisty, M. Dominik, C., 2018, *ApJ*, 863, 44
- [OA] **5.** *"ALMA Observations of Elias 2-24: A Protoplanetary Disk with Multiple Gaps in the Ophiuchus Molecular Cloud"*  
Cieza, L. A., Casassus, S., Perez, S., Hales, A. Carcamo, M., Ansdell, M., Avenhaus, H., Bayo, A., **Bertrang, G. H.-M.**, Canovas, H., et al., 2017, *ApJ Letters*, 851, L23
- [OA] **4.** *"Radiation Hydrodynamical Turbulence in Protoplanetary Disks: Numerical Models and Observational Constraints"*  
Flock, M., Nelson, R. P., Turner, N. J., **Bertrang, Gesa H.-M.**, Carrasco-Gonzalez, C., Henning, Th., Lyra, W., Teague, R., 2017, *ApJ*, 850, 131
- [OA] **3.** *"Orbits in the T Tauri triple system observed with SPHERE"*  
Köhler, R., Kasper, M., Herbst, T. M., Ratzka, T., **Bertrang, G. H.-M.**, 2016, *A&A*, 587, A35
- [OA] **2.** *"An extreme-AO search for giant planets around a white dwarf. VLT/SPHERE performance on a faint target GD 50"*  
Xu, S., Ertel, S., Wahhaj, Z., Milli, J., Scicluna, P., **Bertrang, G. H.-M.**, 2015, *A&A Letters*, 579, L5
- [OA] **1.** *"Polarimetric studies of comet C/2009 P1 (Garrad)"*  
Das, H. S., Medhi, B. J., Wolf, S., **Bertrang, G.**, Deb Roy, P., Chakraborty, A., 2013, *MNRAS*, 436, 3500