

# Gesa H.-M. Bertrang

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## Curriculum Vitae

(Last update: Sep 10, 2019)

### Research Interest

- Planet and Star Formation
  - Magnetic field influence on protoplanetary disks and star-forming regions
  - Planet-disk interactions
  - Time-variant processes and evolution in disks
- 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, linepol)

### Academic Achievements

- 16 refereed journal articles, 4 as first author, 2 as second author and in supervisory role; 240+ citations (h-index = 9; i10-index = 9)
- 210'000 EUR+ grant income as PI
- PI of 146+ hours observing time on major ground-based facilities, including ALMA, VLT, APEX, NTT

### Education

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

### Work Experience

- 2018–2023 **Senior postdoctoral research associate**.  
Max Planck Institute for Astronomy (MPIA)
- 2017–2018 **FONDECYT (Chilean Science Foundation) Fellow**.  
Universidad de Chile
- 2015–2017 **MAD (Millenium ALMA Disk nucleus) Fellow**.  
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 (26)

- 2020 Apr **The building blocks of planets**, Ringberg Castle workshop.
- 2019 Oct **Garching**, European Southern Observatory (ESO).
- 2019 Sep **From protoplanetary discs to planetary systems**, Ringberg Castle workshop.

- 2019 Aug **Tucson**, National optical astronomy observatory (NOAO).
- 2019 Aug **Tucson**, Steward Observatory.
- 2019 Aug **CSUN**, California State University, Northridge, cancelled.
- 2019 Aug **MIT**, Kavli Institute.
- 2019 Aug **Harvard**, Center for Astrophysics (CfA).
- 2019 Aug **Boston**, Boston University.
- 2019 Jul **Turbulence and Structure Formation in PPDs**, Ringberg Castle workshop.
- 2019 Mar **Oxford**, Atmospheric Oceanic and Planetary Physics (AOPP).
- 2018 Sep **Heidelberg**, Königstuhl Colloquium (MPIA).
- 2018 Jun **Madrid**, Workshop *"Hide and Seek: Where are the young planets?"*.
- 2018 Mar **Santiago**, Joint ALMA Observatory.
- 2018 Nov **Valparaiso**, Physics and Astronomy Institute (IFA), University of Valparaiso.
- 2017 Nov **Concepcion**, Department of Astronomy, University of Concepcion.
- 2017 Mar **Vienna**, Department of Astrophysics, University of Vienna.
- 2017 Aug **Heidelberg**, Max Planck Institute for Astronomy (MPIA).
- 2017 Jul **Lisbon**, Astronomical Observatory of Lisbon.
- 2017 Jan **Zurich**, ETHZ.
- 2016 Oct **Grenoble**, l'Institut de Planétologie et d'Astrophysique de Grenoble (IPAG).
- 2016 Sep **Kiel**, Institute for Theoretical Physics and Astrophysics (ITAP).
- 2016 Aug **Heidelberg**, Max Planck Institute for Astronomy (MPIA).
- 2016 Jan **Santiago**, Pontificia Universidad Católica de Chile (PUC).
- 2015 Nov **Santiago**, European Southern Observatories (ESO).
- 2012 Nov **Santiago**, European Southern Observatories (ESO).

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## Contributed Talks (18)

- 2019 Sep **AG 2019: Cosmic dust and spectral line polarization as analytical tools: Bridging spatial and spectral scales & SOFIA's promise**, Stuttgart, Germany.
- 2019 Sep **From protoplanetary discs to planetary systems**, Ringberg Castle, Germany.
- 2019 Jul **Turbulence and Structure Formation in Protoplanetary Disks 2019: Observation, Theory, and Experiments**, Ringberg Castle, Germany.
- 2019 May **Polarization in Protoplanetary Disks and Jets**, Sant Cugat, Spain.
- 2019 Feb **Planet Formation and Evolution (PFE 2019)**, Rostock, Germany.
- 2018 Dec **Harvard-Heidelberg meeting on star formation**, Heidelberg, Germany.
- 2018 Sep **Japanese-German meeting on planet formation**, Edesheim, Germany.
- 2018 Mar **Diversis mundi: The Solar System in an Exoplanetary context**, European Southern Observatory (ESO), Santiago, Chile.
- 2017 Jul **Formation of complex molecules in space and on planets - From interstellar clouds to life**, Tartu, Estonia.
- 2016 May **Star Formation 2016**, Exeter, UK.

- 2016 May **Resolving planet formation in the era of ALMA and extreme AO**, European Southern Observatory (ESO), Santiago, Chile.
- 2016 Sep **AG meeting 2016**, Annual meeting of the German Astronomical Society (AG), Bochum, Germany.
- 2015 Sep **Astrobiology and Planetary Atmospheres**, European Southern Observatory (ESO), Santiago, Chile.
- 2013 Jul **Northern Astronomical Colloquium**, (NAC), Rostock, Germany.
- 2013 Oct **Physical Processes in the ISM**, *Max Planck Institute for Extraterrestrial Physics*, Garching, Germany.
- 2012 Oct **The low-Metallicity ISM:**, Chemistry, Turbulence and Magnetic Fields, Göttingen, Germany.
- 2012 Oct **1st ISM-SPP school**, Physics of the Interstellar Medium, Freising, Germany.
- 2012 Sep **AG meeting 2012**, Annual meeting of the German Astronomical Society (AG), Hamburg, Germany.

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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

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

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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.

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## Publication Record (*ads*)

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

6. *"Intrinsic polarisation of elongated porous dust grains"*  
Kirchschlager, F., **Bertrang, G. H.-M.**, Flock, M., 2019, MNRAS in press
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
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
3. *"3D radiative transfer of intrinsically polarized dust emission based on aligned aspherical grains"*  
**Bertrang, G. H.-M.**, Wolf, S., 2017, MNRAS, 469, 2869
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
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

**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., Gomez, J. F., Calvet, N., Dent, W. R. F., 2019, ApJ, in press

**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., Flock, M., Ginski, Ch., Juhasz, A., Klahr, H., Liu, Y., Mueller, A., Perez, L. M., Pohl, A., Rosotti, G., Samland, M., Semenov, D., 2019, A&A, 625, 118

**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., Horner, J., Marshall, J. P., Scicluna, P., Vaz, A., Villaver, E., Wesson, R., Xu, S., 2019, ApJ, 157, 110

**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., Dent, W., Ferrero, G., Gamen, R., Olofsson, J., Orcajo, S., Pena Ramirez K., Principe, D., Schreiber, M. R., van der Plas, G., 2019, MNRAS, 482, 698

**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

**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., Christiaens, V., Dent, W., Ferrero, G., Gamen, R., Olofsson, J., Orcajo, S., Osses, A., Pena-Ramirez, K., Principe, D., Ruiz-Rodriguez, D., Schreiber, M. R., van der Plas, G., Williams, J. P., Zurlo, A., 2017, ApJ Letters, 851, L23

**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

**3.** *"Orbits in the T Tauri triple system observed with SPHERE"*

KÄühler, R., Kasper, M., Herbst, T. M., Ratzka, T., **Bertrang, G. H.-M.**, 2016, A&A, 587, A35

**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

**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