

Matías Blaña

Curriculum Vitae

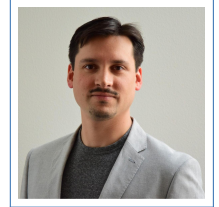
Contact

Munich, Germany

✉ mblana@mpe.mpg.de

📄 <http://matiasblana.github.io>

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I am an astronomer passionate about the study of the dynamics and evolution of local galaxies. For this I develop models and simulations using a wide range of methods and software. By closely working with observations, my dynamical models are a powerful instrument that can reveal not only the substructures in galaxies, or their dark matter content, but also the mechanisms driving their evolution. This allows to make predictions to motivate or strengthen observational proposals. Furthermore, given that galactic dynamics permeates many astrophysical process, it allows me to collaborate in various research areas, as well as it strongly motivates me to teach this essential topic to the future generations of astronomers in Chile.

Education

- 2018 **Ludwig-Maximilians-Universität (LMU), Germany, *Dr. rer. nat., Astronomy.***
Thesis title: "Dynamics of the bar and the bulge of the Andromeda galaxy (M31)"
Thesis committee (& IMPRS): Dr. Ortwin Gerhard (advisor), Dr. Roberto Saglia
Grade thesis exam: "Magna Cum Laude" (1.3)
International Max Planck Research School (IMPRS).
Additional IMPRS committee member: Dr. Peter Erwin
- 2013 **Universidad de Concepción (UdeC), Chile, *Master of Science, Physics and Astronomy.***
Thesis title: "Effects of the initial mass function on the infant mortality of embedded star clusters"
Thesis committee: Dr. Michael Fellhauer (advisor), Dr. Neil Nagar, Dr. Sandro Villanova
Grade thesis exam: 7.0 (highest)
- 2012 **Universidad de Concepción, *Título Profesional, Astronomer.***
Thesis title: "Life of a Hero – Hercules, stream or dwarf galaxy?"
Thesis committee: Dr. Michael Fellhauer (advisor), Dr. Ricardo Demarco, Dr. Neil Nagar
Grade thesis exam: 7.0 (highest)
- 2009 **Universidad de Concepción, *Licenciado en Ciencias Físicas.***

Languages

Spanish **Native Speaker**

English **Fluent**

TOEIC (730pts)

German **Conversational**

Certificate of Instituto Alemán de Osorno, Chile

Teaching & Outreach Experience

- 2018 **Outreach, *Science and career seminar for the high school Instituto Alemán de Osorno.***
- 2013–2012 **Outreach, *Co-founder of the Equipo de Divulgación Astronómica (EDA) at the Astronomy Department at UdeC, collaborated in visiting and hosting high schools, presentation of seminars, production of materials and instruments for students to explain abstract concepts (e.g. building theodolites to teach parallax), designing workshops and collaborating with the EXPLORA–CONICYT center in Coronel, and the observatory of the university.***
- 2012 **Teaching, *Assistant, Astronomy Department at UdeC, Lecture Astronomy I.***
- 2011 **Teaching, *Docente, Escuela de Talentos Universidad de Concepción, Teacher to high school students coursing an advanced summer school program of the UdeC, relating astronomy and Social Responsibility.***
- 2011 **Outreach, *Talks and outreach activities at the Astronomy Department at UdeC.***

Research Projects & Experience

Here are described the main projects I developed and the research groups I joined. In the following section I describe my contributions in various collaborations.

Present– **Postdoctoral Researcher**, PGN GROUP AT MPE (PHYSICS OF GALACTIC NUCLEI),
09/2018 CAST GROUP AT THE OBSERVATORY OF THE LMU (COMPUTATIONAL ASTROPHYSICS).
Mentor: group leader of PGN and CAST Prof. Dr. Andreas Burkert.

- Project (**accepted in MNRAS**): analysis of distant Milky Way satellites: backplash and field dwarfs.
 - Code development: new orbital integrator software DELOREAN in PYTHON with a range of setups for MW potentials, which can calculate orbits backwards in time within a cosmological frame (**new in the literature**).
 - N-body simulations with GADGET3 and GYRFALCON to study tidal disruption and dynamical friction for backplash satellite orbits.
- Project (**in progress**): Hydrodynamics of Local Group dwarfs: gas stripping study.
 - development of wind tunnel hydrodynamical simulations for the dwarfs Leo T and Phoenix, using the grid code RAMSES.
- Project (**in progress**): development of barred galaxy simulation models to study internal and environmental mechanisms, such as ram pressure, that contribute in the secular evolution systems such as NGC1097, NGC1365 and M31.

03/2018– **Doctoral Researcher**, DYNAMICS GROUP AT MPE.

09/2013 *Mentors: group leader Prof. Dr. Ortwin Gerhard, and Dr. Christopher Wegg.*

- Project (**published**): development of made-to-measure (M2M) models to constrain properties of the composite bulge of M31: classical and box/peanut bulges, bar and dark matter. The M2M modelling is a powerful orbital based method that can fit a wide range of photometric and kinematic observations.
 - analysis of data from Spitzer/IRAC and McDonald/VIRUS-W kinematics of M31.
 - developing M2M to include dust modelling, multiple bulge components, mass-to-light ratio profiles.
- Project (**published**): I developed N-body models for the composite bulge of M31, exploring and constraining the properties of the classical bulge. These models provide a metric to study the secular evolution of the classical bulge, such as its gain of angular momentum, due to resonances with the bar of M31.

08/2013– **Master Researcher**, THEORY GROUP AT UDEC.

08/2012 *Mentors: group leader Prof. Dr. Michael Fellhauer, and Dr. Rory Smith.*

- Project (**published, co-author.**): development star cluster simulations to study the infant mortality in young low mass embedded star clusters, using for this the direct N-body code Nbody6. I included the effects of the Initial Mass Function (IMF) and study the dynamical evolution of mass segregation in the forming clusters.

2012–2010 **Título Researcher**, THEORY GROUP AT UDEC.

Mentors: group leader Prof. Dr. Michael Fellhauer, and Dr. Rory Smith.

- Project (**published**): development of N-body and orbital models for the dwarf spheroidal galaxy (dSph) Hercules to study its dynamical regime as stream, tidal or bound dwarf, and its progenitor properties.
- Project (**published**): observations indicate that the dSph Leo IV and Leo V could be the second known binary system in the Milky Way system, being the first the Magellanic Clouds. I developed a restricted N-body code to explore thousands of orbits and constraint their total mass, corroborating the results with N-body simulations.

Research Collaborations

Collaborative projects I joined, which are directly connected to the methods and dynamical models generated during my projects, or as an expert in dynamics.

Present–2018 **China - Shanghai Observatory (SHAO), Juntai Shen Group**, collaboration to study the gas dynamics in M31, where I provide a gravitational potential models from the M2M modelling of M31.

Spain - Instituto de Astrofísica de Islas Canarias (IAC) &.

Germany - Munich Observatory (USM), CAST Group, collaboration to study the gas and stellar dynamics in the nucleus of barred galaxies, where I provide photometric analysis, gravitational potential models and my expertise as dynamicist..

Germany - Munich Observatory (USM), Exgal Group/Wendelstein, collaboration to study microlensing events in M31, where I provide density and kinematic models derived from the M31 M2M models to produce predictions for micro/pixel-lensing observations (WeCAPP).

Germany - MPE, Dynamics Group, collaboration to develop chemo-dynamical models for M31, where I provide the dynamical models from the M2M fitting modelling of M31.

Germany - ESO, collaboration to study the substructure, formation and kinematics of M31 with PNe observations, where I produce stellar kinematic mock observations from the M31 M2M models to compare with the observations.

Chile - UdeC, Theory Group, collaboration to study the orbits of Local Group dwarf galaxies.

2017–2014 **Chile - UdeC, Theory Group**, collaboration to study the infant mortality in forming star clusters, where I developed models that include an IMF to study mass segregation, providing the data for the first analysis.

Chile - UdeC, collaboration to study the evolution of Milky Way satellites and stellar streams, where I contributed in the developing of a method to constrain orbital and progenitor properties..

Awarded Grants and Fellowships

2018 **ANID (CONICYT)**, *Research proposal for the Postdoctoral Fellowship Abroad program*, among the **top 10** candidates from 124 applicants, 40 000 USD.

2013 **DAAD**, *Research proposal for a Doctoral German Scholarship*, 50 000 EUR.

2012 **CONICYT-NACIONAL**, *Master Scholarship*, 6 000 000 CLP.

2012 **ALMA-CONICYT-SOCHIAS**, *Travel*, Heidelberg IMPRS Summer School, 1 000 000 CLP.

2011 **UdeC ARTICULACION**, *Tuition*, Master Scholarship.

Software Skills

Programming Languages PYTHON, BASH, FORTRAN 90 77, C, MATHEMATICA, MATLAB, OCTAVE, IDL, SUPER-MONGO, GNU PLOT, HTML5(beginner), LATEX

Software EMCEE, LINUX, WINDOWS, OPEN/LIBRE/MICROSOFT OFFICE

Astronomical Software DELOREAN(developer), NMAGIC(M2M)(developer), IRAF, ASTROPY, RAMSES, GADGET3, NEMO, GYRFALCON, DICE, SUPERBOX, NBODY6, IMFIT(Photometry)

Conferences & Workshops

2019 **Talk (Shanghai)**, *Galactic Dynamics in the Era of Large Surveys*, Orbital models for Leo T.

2019 **Talk (Germany)**, *CAST Group Workshop*, Orbital models for MW dwarfs.

2019 **Poster (ESO-Germany)**, *A synoptic view of the Magellanic Clouds: VMC, Gaia and beyond*, Orbital models for MW dwarf satellites.

2018 **Talk (Chile)**, *2nd binational AAA-SOCHIAS Meeting*, M31 dynamical models.

- 2018 **Talk (Chile)**, *Seminar at the Astronomy Department UdeC*, M31 M2M models.
- 2017 **Talk (Germany)**, *OPINAS Group Ringberg Workshop*.
- 2016 **Talk (Germany)**, *Research Area F at Excellence Cluster Universe*, M31 models.
- 2016 **Talk (Germany)**, *Seminar IMPRS School: M31 composite bulge*.
- 2016 **Poster (ESO-Germany)**, *Discs in Galaxies at ESO*.
- 2015 **Talk (Germany)**, *OPINAS Group Ringberg Workshop*, M31 Composite bulge models.
- 2012 **Workshop (Germany)**, *7th IMPRS Summer School: Computational Astrophysics*.
- 2012 **Talk (Chile)**, *Reunión anual SOCHIAS*, Orbital and dynamical models for the MW dwarf Hercules.
- 2012 **Talk (Brazil)**, *The Dark Side of the Universe*, MW dwarfs Leo IV and Leo V: a binary system?.
- 2011 **Poster (Argentina)**, *1st binational AAA-SOCHIAS Meeting*, Dynamical models for the MW dwarfs Leo V and Leo IV.

Publication List

I have participated in more than **14** publications, publishing to the date **5** articles as **first author**. Currently, my total **h-index is 9**, while by first author publications my **h-index is 4**. Publications and h-index from ADS list ([link](#))

1. 2020, MNRAS (accepted) Dwarfs in the Milky Way halo outer rim: first in-fall or backplash satellites? Authors: **Matías Blaña**, Andreas Burkert, Michael Fellhauer, Marc Schartmann, Christian Alig
2. 2020 MNRAS (submitted) arXiv200504052G2020/05 Unravelling stellar populations in the Andromeda Galaxy. Authors: Gajda, Grzegorz; Gerhard, Ortwin; **Blaña, Matías**; Zhu, Ling; Shen, Juntao; Saglia, Roberto P.; Bender, Ralf
3. 2019 A&A (published) 631A.56B2019/11 The survey of planetary nebulae in Andromeda (M 31). II. Age-velocity dispersion relation in the disc from planetary nebulae. Authors: Bhattacharya, Souradeep; Arnaboldi, Magda; Caldwell, Nelson; Gerhard, Ortwin; **Blaña, Matías**; McConnachie, Alan; Hartke, Johanna; Guhathakurta, Puragra; Pulsoni, Claudia; Freeman, Kenneth C.
4. 2018 MNRAS (published) 481.3210B2018/12 Sculpting Andromeda - made-to-measure models for M31's bar and composite bulge: dynamics, stellar and dark matter mass. Authors: **Blaña Díaz, Matías**; Gerhard, Ortwin; Wegg, Christopher; Portail, Matthieu; Opitsch, Michael; Saglia, Roberto; Fabricius, Maximilian; Erwin, Peter; Bender, Ralf
5. 2018 A&A (published) 618A.156S2018/10 Stellar populations of the central region of M31. Authors: Saglia, R. P.; Opitsch, M.; Fabricius, M. H.; Bender, R.; **Blaña, M.**; Gerhard, O.
6. 2018 A&A (published) 611A.38O2018/03 Evidence for non-axisymmetry in M 31 from wide-field kinematics of stars and gas. Authors: Opitsch, M.; Fabricius, M. H.; Saglia, R. P.; Bender, R.; **Blaña, M.**; Gerhard, O.
7. 2017 MNRAS (published) 472.465D2017/11 How fast is mass segregation happening in hierarchically formed embedded star clusters? Authors: Domínguez, R.; Fellhauer, M.; **Blaña, M.**; Farias, J. P.; Dabringhausen, J.
8. 2017 MNRAS (published) 466.4279B2017/04 Andromeda chained to the box - dynamical models for M31: bulge and bar. Authors: **Blaña Díaz, Matías**; Wegg, Christopher; Gerhard, Ortwin; Erwin, Peter; Portail, Matthieu; Opitsch, Michael; Saglia, Roberto; Bender, Ralf
9. 2016 MNRAS (published) 461.3630D2016/10 Could Segue 1 be a destroyed star cluster? - a dynamical perspective. Authors: Domínguez, R.; Fellhauer, M.; **Blaña, M.**; Farias, J. P.; Dabringhausen, J.; Candlish, G. N.; Smith, R.; Choque, N.

10. 2015 MNRAS (published) 450.2451F2015/07 The difficult early stages of embedded star clusters and the importance of the pre-gas expulsion virial ratio. Authors: Farias, J. P.; Smith, R.; Fellhauer, M.; Goodwin, S.; Candlish, G. N.; **Blaña, M.**; Dominguez, R.
11. 2015 MNRAS (published) 446..144B2015/01 Life and death of a hero - lessons learned from modelling the dwarf spheroidal Hercules: an incorrect orbit? Authors: **Blaña, M.**; Fellhauer, M.; Smith, R.; Candlish, G. N.; Cohen, R.; Farias, J. P.
12. 2013 MNRAS (published) 435.2391A2013/11 A possible formation scenario for dwarf spheroidal galaxies - II. A parameter study. Authors: Assmann, P.; Fellhauer, M.; Wilkinson, M. I.; Smith, R.; **Blaña, M.**
13. 2013 MNRAS (published) 433.2529S2013/08 Ursa Major II - reproducing the observed properties through tidal disruption. Authors: Smith, R.; Fellhauer, M.; Candlish, G. N.; Wojtak, R.; Farias, J. P.; **Blaña, M.**
14. 2012 A&A (published) 542A..61B2012/06 Leo IV and V - A possible dwarf galaxy pair? Authors: **Blaña, M.**; Fellhauer, M.; Smith, R.
15. 2011 BAAA (published) 54.397B2011 Leo IV & V - A possible dwarf galaxy pair? (star cluster scenario). Authors: **Blaña, M.**; Fellhauer, M.; Smith, R.