



**Area of Impact: Astronomy**  
**Specialty: Astrophysics**

Chile, thanks to its atmospheric conditions, has a privileged position in astronomical terms. Chile currently accounts for 40% of worldwide capacity for astronomical observation and is expected to be at 70% in 2024, with revolutionary new telescopes such as the European Extremely Large Telescope (E-ELT) and the Large Synoptic Survey Telescope (LSST). These advances require the development of new algorithms and intelligent software to analyze the information and thus interdisciplinary collaboration between astronomers, mathematicians and statistical engineers.

The Millennium Institute of Astrophysics, MAS, was founded with the objective of preparing a new generation of researchers for this so-called "Big Data era," bringing together a multidisciplinary team of scholars and students from prestigious Chilean universities and a wide network of international collaboration.

Its main goals are to carry out massive and large-scale explorations of the sky; to develop efficient data analysis techniques in order to extract relevant information from large volumes astrophysical data; to participate in programs of instrument construction and others that allow the incorporation of the country into the world of cutting-edge technologies related to astronomy and to develop front-line research in the astrophysics area, exploiting a new dimension of the human exploration of the universe: The Time Domain. Work at MAS is organized into four lines of research: discovery and characterization of supernovas and their use as distance indicators; the Milky Way and the Local Group; Transients, Variables and Planets; and Astrostatistics and Astroinformatics.



MAIN ACHIEVEMENTS

- Discovery of a cosmic explosion that would be the brightest supernova found so far.
- Discovery of the hidden component of the Milky Way.
- Detection for the first time of magnetar in bursts of gamma-rays.
- Detection of binary systems in RR Lyrae stars.
- Discovery of a star that can escape a black hole with minor damage.
- Astronomers find the most distant galaxy possible to corroborate.
- Detection of water molecules for the first time on Neptune-sized exoplanet.
- Discovery of Rocky Planet with the largest mass found so far.
- Supernova observation in real time.
- Creation of algorithms that enable detection of abnormal light curves in astronomical catalogs.
- Development of periodic light curves processing Pipeline.

CONTACT INFORMATION

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Manuela Zoccali



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## RESEARCHERS

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## RESEARCH TOPICS

- Discovery and characterization of supernovas and their use as distance indicators.
- Milky Way and the Local Group.
- Transients, Variables and Planets.
- Astrostatistics and Astroinformatics.

## NOTED OUTREACH ACTIVITIES

Outreach Program ObservaMAS, Acercándote MAS al Cosmos (Bringing the Cosmos Closer).

- **Animated series about astronomy for all audiences:** Short animated films in Animate format, drawn and produced by the prominent national illustrator, William "Guillo" Bastías, with the objective of bringing innovative and playful astronomy-related content to a general public, which can be difficult to address at first.
- **MAS en tu Colegio (MAS in your School):** astronomy workshops for primary school students, a program of modules that comprise 16 fun activities to carry out in classrooms with 3rd, 4th, 7th and 8th grade students, which have contents that stem from the curriculum provided by the Ministry of Education. Additionally, astronomy talks for high school covering the most diverse astrophysical topics, such as the dimensions of the universe, stellar evolution, supernovas, the concept of Big Data, spectrometry, interferometry, among others, all presented using an accessible and playful language.
- **Online book "Astronomía para todos" ("Astronomy for all"),** book consisting of 10 chapters, each one showing an entertaining display of infographics and charts to explain astronomical concepts that can be difficult for the non-scientific public to tackle, presenting them by using simple language and in an attractive way. [www.astrofisica.cl/astronomiaparatodos](http://www.astrofisica.cl/astronomiaparatodos)
- **Talks for General Audiences, developed in partnership with other institutions in the field.** In 2015 these talks reached nearly 1,500 people in three regions (V-VIII and RM).
- **Online Training for Primary School Teachers,** planned out to be completed within 10 lesson hours. It consists of 10 modules that provide content and videos with fun activities that the teacher can replicate in the classroom.
- **Workshop for Journalists,** in order to build a bridge between mass media and scientists. The workshop consisted of four lectures including basic concepts of astronomy and closure with astronomical observation.

**PRODUCTIVITY PUBLICATIONS  
(BETWEEN 2013-2016\*)**  
ISI: 303 | SCIELO: 8  
\*Up to May 2016

**ACTIVE MILLENNIUM INSTITUTE**  
From 12/26/2013 to 12/26/2023  
The Millennium Institutes have a duration of 10 years, subject to an evaluation halfway through the period.

**PRESENCE**  
METROPOLITANA REGION  
ANTOFAGASTA REGION  
COQUIMBO REGION  
VALPARAÍSO REGION  
BIOBÍO REGION



## HOST INSTITUTIONS:



UNIVERSIDAD  
DE CHILE



Universidad  
Andrés Bello



Universidad  
de Concepción



Universidad  
de Valparaíso  
CHILE