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Alejandro S. Borlaff, PhD

About me: **NASA Postdoctoral Fellow** at the Ames Research Center. Astrophysicist with background in galactic and extragalactic research. Skilled in data analysis and statistics. Large experience with observational methods and instrumentation. I have participated in more than 50 observing nights in four different observatories.

Research experience

NASA Postdoctoral Program Fellowship

The ultra-low surface brightness Universe with HST and beyond
November 2019 - Present
NASA Ames Research Center, Moffett Field (California, USA)

Deep imaging is the next frontier for many studies in galaxy evolution and cosmology. Nevertheless, as we increase the depth of the astronomical images more and more instrumental effects prevent us from obtaining a clear detection of the darkest regions of the Universe. The main objective of this proposal is to use the archive deep cosmological observations of the *Hubble Space Telescope* (HST), simulations, and data from other telescopes to prepare the future observations with *Euclid*, *James Webb Space Telescope* (JWST) and other space observatories.

PI: Pamela M. Marcum (*pamela.m.marcum@nasa.gov*).

European Space Agency: ESA - ESAC Faculty Research Specialist

Image processing for low surface brightness emission with Euclid
April 2019 - November 2019
ESA - ESAC, European Space Astronomy Centre, (Madrid, Spain)

The main objective is to determine the capabilities of **Euclid** to analyse the low surface brightness Universe, as an extension to the primary scientific mission, enabling the study the darkest regions of the Universe.

PIs: Bruno Altieri (*bruno.altieri@sciops.esa.int*) and Roland Vavrek.

IAC Resident Astrophysicists PhD Programme

Thesis: *Understanding the outskirts of disc galaxies*
Distinction Excellent *Cum laude*
Oct 2014 - Nov 2018
San Cristobal de la Laguna (Santa Cruz de Tenerife, Canary islands, Spain)

Studying the structure of the outskirts of galaxy discs and the low-surface brightness universe. We developed new pipelines to improve the low-surface brightness limits of the WFC3/IR *Hubble Ultra Deep Field*. Support of the *GHAFAS*/Fabry-Pérot spectrograph at the William Herschel Telescope, adaptive optics module *AOLI* and the Fabry-Perot interferometer *NEFER* at the Gran Telescopio Canarias.

PhD supervisors: Prof. John E. Beckman (*jeb@iac.es*) & Dr. Carmen Eliche-Moral (*mceliche@fis.ucm.es*).

CEFCA Fellowship in Astrophysics Research

Jun 2014 - Sept 2014
Teruel (Aragón, Spain)

Project supervisor: Dr. Jesús Varela (*jvarela@cefca.es*).

Education

Master's degree on Astrophysics

Sept 2013 - Sept 2014
***Universidad Complutense de Madrid (UCM)*, Madrid**
Level 7 of the European Qualifications Framework (EQF 7). 60 ECTS.
Master's thesis: "Morphological visual classification of galaxies at cosmological distances"
Supervisors: Dr. Pablo G. Pérez-Gonzalez & Dr. Carmen Eliche-Moral.
Mark: (9.4/10)

Master's average mark: (9.07/10).
Distinctions:

- Interstellar medium (10/10).
- Galactic dynamics (9.8/10).
- Statistical methods and data analysis (10/10).
- Experimental methods in Astrophysics (9.7/10).

Physics (5-year) degree with specialisation in Astrophysics

Sept 2008 - Sept 2013
***Universidad Complutense de Madrid (UCM)*, Madrid**
Level 7 of the European Qualifications Framework (EQF 7). 304.5 ECTS.
Degree's thesis: "Antitruncated disks on lenticular galaxies formed through major mergers". Supervisors: Dra. Carmen Eliche-Moral & Prof. Jaime Zamorano Calvo. Mark: (9.5/10)

Degree's average mark: (7.8/10).
Distinctions:

- Analog and digital electronics (10/10).
- Experimental methods in Astrophysics (9.7/10).
- Interstellar medium (10/10).

Skills

Programming languages

- Python
- R
- IDL
- MATLAB
- HTCondor
- IRAF
- Shell
- C++

Observing experience

- William Herschel Telescope (ING, 4.2m)
- Gran Telescopio Canarias (GTC, 10.4m)
- Optical Ground Station (ESA, 1m)
- SARA Kitt Peak 0.9m
- Calar Alto 2.5m

Data reduction pipelines

- Astrodrizzle (HST/JWST)
- ABYSS HUDF/WFC3
- Reflex (MUSE)
- HSTCAL

Data analysis tools

- AstroPy
- NumPy
- pPXF & GANDALF
- SciPy
- Gnuastro
- SExtractor

3D printing and design

- Repetier
- Tinkercad

Publications in refereed journals:

I have participated in **19 scientific publications** in refereed journals, **five of them as first author**. I have **287 refereed citations** with a **h-index of 9** and a **i10-index of 8**. In addition, I am referee for **The Astrophysical Journal**. **List of selected articles:**

1. **Borlaff**, Trujillo, Román, Beckman, Eliche-Moral, Infante-Sáinz et al. The missing light of the Hubble Ultra Deep Field (2019). A&A, V621, id.A133.
2. **Borlaff**, Eliche-Moral, Beckman et al. - Evolution of the anti-truncated stellar profiles of S0 galaxies since $z = 0.6$ in the SHARDS survey: I - Sample and Methods (2017). A&A, V604, id.A119.
3. Trujillo, Beasley, **Borlaff**, Carrasco, Di Cintio, Filho, Monelli et al. - A distance of 13 Mpc resolves the claimed anomalies of the galaxy lacking dark matter (2019) - MNRAS
4. **Borlaff**, Eliche-Moral, Rodríguez-Pérez, Querejeta, Tapia, Pérez-González, Zamorano, Gallego, & Beckman - Antitruncated stellar discs resulting from major mergers (2014) - A&A V570, A103, 30.

Conferences, courses and traineeships:

IAU Special Session 355 (Tenerife, July 2019) - The Realm of the Low Surface Brightness Universe
Talk: ***New limits to low surface brightness details: the Hubble ultra deep field even deeper***

Square Kilometer Array Spain Meeting (IAA, Granada, June 2019)
Talk: ***The ultra-low surface brightness Universe as counterpart to SKA detections***

ESA/ESAC (European Space Astronomy Centre) Seminars - (31/01/2019)
Talk: ***The ultra-low surface brightness Universe with HST and future space telescopes*** *- ESAC - Madrid (Spain)*

FINCA - Finnish Centre for Astronomy with ESO visitor program fellowship (University of Oulu, 04/2018)
Director: Pertti Rautiainen

European Week of Astronomy and Space Science. Liverpool (UK). (EWASS 2018, 04/2018)
Poster contribution: *"Evolution of anti-truncated stellar profiles of S0 galaxies since $z = 0.6$ in the SHARDS survey."*

JWST IAC Workshop - GO1 Proposal Planning (03/2018)
La Laguna, Tenerife, Canary Islands (Spain)

International Space Science Institute - "Exploring the Ultra-Low Surface Brightness Universe" meeting (Bern, Nov 2017)
Young Scientist invited talk. Director: David Valls-Gabaud
"Looking for the missing light of the Hubble Ultra Deep Field"
ISSI international group membership

ERASMUS+ grant. University of Oulu (06/2017 - 09/2017)
Director: Heikki Salo & Pertti Rautiainen
Invited talk:
"Understanding the outskirts of galaxies"

IAU Special Session 321 (03/2016) Formation and evolution of galaxy outskirts (Toledo)
Two posters and talk contribution (IAUS321 award, best poster).

Human Spaceflight - An introduction (Spring 2017)
KTH Royal Institute of Technology
EDX online course. Professor: Christer Fuglesang (ESA)

Winter and 4x4 driving course. (11/2016).
Santa Cruz de Tenerife (Spain)

IRAM 30m Radioastronomy Summerschool (09/2015)
IRAM organization scholarship grant.

European Week of Astronomy and Space Science. Tenerife (Spain). (EWASS 2015) - Scientific organizer
Poster contribution:
"Antitruncated stellar discs resulting from major mergers"

Outreach and organising activities

- Teaching assistant at the William Herschel Telescope (Roque de los Muchachos observatory): Observational techniques – Master's degree on Astrophysics of the University of La Laguna.
- *At The Telescope*. Dedicated youtube channel to science communication (2016).
- Staff member of the Journal Club at the Instituto de Astrofísica de Canarias. IAC *Convive* award. (2015 - 2018)
- Scientific organizer of the European Week of Astronomy and Space Science (EWASS 06/2015) *Special Session Sp16: The outskirts of galaxies: present status and future challenges.*
- Voluntary guide at the laboratories of the Universidad Complutense de Madrid during the Science Week (11/2011).
- Multiple press releases, interviews and radio outreach programs.

Languages

- Spanish - Native.
- English - Fluent speaking, writing and understanding (C1).
- Russian - Basic speaking, writing and understanding (A1).

Personal complementary information

Interests
- Astrophysics
- Space science
- Statistics
- 3D printing
- Human space exploration
- Data science
- Arduino
- Radio communications

Sports
- Scuba-diving (PADI Advanced + Enriched Air Diver certification).
- Ninjutsu (2nd Dan black-belt).
- Running
- Hiking
- Climbing