Carlos Gomez-Guijarro

Title

GOODS-ALMA 2.0: Understanding the role of compact star formation in galaxy evolution

Abstract

Compact star formation appears to be generally common in dusty star-forming galaxies. However, it remains to be understood how systematic compactness is and its role in the framework set by the scaling relations in galaxy evolution. GOODS-ALMA is a 1.1mm galaxy survey over a continuous area of 72 arcmin2 at a homogeneous sensitivity with two array configurations aimed at understanding these questions. In this new version 2.0 we present a new low-resolution dataset and its combination with the previous high-resolution dataset. The latest results reveal that dust continuum emission at 1.1mm prevails, and sizes as extended as typical star-forming stellar disks are rare. A population of galaxies with modest star formation rates, but which exhibit extremely compact star formation with starburst-like depletion timescales unveils. Compact star formation appears as a physical driver of depletion timescales, gas fractions, and dust temperatures. The new findings suggest that the star formation rate is sustained in very massive SFGs, even when their gas fractions are low and they are presumably on the way to quiescence. Gas and star formation compression seems to be a mechanism that allows to hold their star formation rate.

PERSONAL INFORMATION

Carlos Gómez Guijarro

62 Rue de la Tombe Issoire, 75014 Paris, France

+33 766264326

carlos.gomezguijarro@cea.fr

Date of birth 26th Dec. 1990 | Nationality Spanish

CURRENT POSITION

2019/10– CNRS postdoctoral researcher at UMR AIM (DAp) - CEA Paris-Saclay
David Elbaz team - Laboratory of Cosmology and Galaxy Evolution (LCEG)

EDUCATION

2015/10–2019/03 PhD in Astrophysics, Niels Bohr Institute, University of Copenhagen, Denmark
Thesis: High-redshift Starbursts as Progenitors of Massive Galaxies
Advisor: Sune Toft

2013/09–2014/09 Master of Science in Astrophysics, Universidad Complutense Madrid, Spain
Average grade: 9.0/10 - Thesis: 9.2/10
Awarded with a distinction in the course *Galaxy Formation and Evolution*

2008/09–2013/09 Bachelor of Science in Physics and Astrophysics, Universidad Complutense Madrid, Spain
Long cycle degree of 5 years
Top 10% of the class - Thesis: 9.5/10
Awarded with 12 distinctions
Access grade: 9.23/10

RESEARCH EXPERIENCE

2015/10–2019/09 PhD Fellow at Cosmic Dawn Center, Niels Bohr Institute, University of Copenhagen, Denmark
Prior 2018/07 PhD Fellow at Dark Cosmology Centre, Niels Bohr Institute

2017/04–06 Visit internship (3 months) with Dominik Riechers at Cornell University, USA

2017/02 Research visit (1 week) with ALMA ARC Node at Onsala Space Observatory, Sweden

2016/09 Research visit (1 week) with Alexander Karim at AIfA Bonn, Germany

2013/02–2015/09 Research assistant with Jesús Gallego at UCM, Spain

2015/07 Research visit (1 month) with Omaira González-Martín at IRyA, Mexico

2014/07–09 Internship (3 months) with Omaira González-Martín at IAC, Spain

2009/03–05 Trainee (3 months) with Miguel Ángel González-Barrio at UCM, Spain

SCHOLARSHIPS AND AWARDS

2015/10–2019/03 PhD Fellowship, Niels Bohr Institute, University of Copenhagen, Denmark

2014/07–2014/09 Summer Grant at the IAC within the Program of Initiation to Astrophysical Research

2013–2014 Collaboration Scholarship by the Ministry of Education of the Spanish Government
Awarded to talented students to collaborate with a university department

2008–2009 Scholarship for Outstanding Students by the Education Office of the Community of Madrid
Awarded to students with the top grades at the Spanish University Access Test

OBSERVING TIME ALLOCATION AND EXPERIENCE

Proposal time allocation

PI – NOEMA W21CO (8h B grade): Uncovering a unique population of gas giants at z = 1.2
PI – NOEMA W19CV (7.3h B grade): Peering into the pace of massive galaxy evolution
Co-I – Keck S22A-046 (2nights): The emerge of the first quiescent galaxies – take 2
Co-I – NOEMA M21AA (159h A grade): NOEMA forming-clusters evolution survey (NICE)
Co-I – ALMA 2021.1.00815.S (39.8h C grade): Testing structure formation, quenching and gas accretion models
Co-I – VLA 21A-133 (165.5h B grade): A golden reference for ISM studies of distant normal galaxies
Co-I – Gemini 21BCF05 (9.8h): Are submm compact main sequence galaxies actually faded starbursts?
Co-I – VLA 21A-043 (11.5h C grade): Flares, breaks and warps in the outskirts of the HI and stellar disk of UGC11859
Co-I – Keck S20B-031 (2nights): The emerge of the first quiescent galaxies
Co-I – Keck S20A-037 (1nights): Direct spectroscopic confirmation of z > 4 quiescent galaxies
Co-I – VLA 20B-247 (24.2h C grade): Investigating possible non-gravitational ICM heating in a galaxy cluster at z = 2
Co-I – NOEMA 225-19 (22h B grade): Knocking on giant's door: A large-scale view of candidate z > 4 dusty galaxies
Co-I – Keck S18B-040 (1nights): Direct spectroscopic confirmation of z > 4 quiescent galaxies
Co-I – ALMA 2018.1.01676.S (9.4h C grade): A total mass profile for a prototypical z ~ 4.6 massive star forming disk galaxy
Co-I – ALMA 2018.1.01225.S (19.4h C grade): What is the origin and subsequent evolution of starbursts at z ~ 2?
Co-I – HST GO 15117 (101orbits): BUFFALO
Co-I – Keck S17B-106 (1nights): Direct spectroscopic confirmation of z > 4 quiescent galaxies
Co-I – ALMA 2016.1.01001.S (14.6h C grade): What is the origin and subsequent evolution of starbursts at z ~ 2?

Visitor observations

Gran Telescopio Canarias 10.4m (OSIRIS, 1night); Keck 10m (MOSFIRE, 2half-nights); Nordic Optical Telescope 2.6m (ALFOSC and FIES, 8nights); Calar Alto Observatory 2.2m (CAFOS and FOCES, 3nights)

CONFERENCES AND WORKSHOPS

Invited talks

2021/11 Sino-French workshop: Simulations and observations of high-z galaxies and protoclusters, Nanjing (Virtual), China
2021/10 High-z dusty galaxies, Marseille, France
2020/01 The growth of galaxies in the early universe VI, Sexten, Italy
2018/03 Galaxy interactions and mergers across cosmic time, Sexten, Italy
2017/11 The physics of quenching massive galaxies at high redshift, Leiden, The Netherlands

Contributed talks

2020/03 IAU Symposium 359: Galaxy evolution and feeback across different environments, Bento Gonçalves, Brazil
2019/11 ASPECS Team Meeting 2019, Schloss Ringberg, Germany
2019/09 GOODS-ALMA meeting, CEA, Saclay, France
2018/09 Birth, life and fate of massive galaxies and their central beating heart, Favignana, Italy
2018/08 IAU General Assembly 2018 – Division J Meeting – Build-up of galaxy clusters, Vienna, Austria
2018/07 Spanish Society of Astronomy Meeting 2018, Salamanca, Spain
2018/06 COSMOS Team Meeting 2018, Copenhagen, Denmark
2017/07 COSMOS Team Meeting 2017, Kyoto, Japan
2016/06 COSMOS Team Meeting 2016, Baltimore, USA
2014/09 Spanish Society of Astronomy Meeting 2014, Teruel, Spain

Posters

2021/06 EAS 2021 – Annual Meeting, Leiden (Virtual), The Netherlands
2017/08 SMG20, Durham, UK
2014/06 EWASS 2015 – Galaxy studies in the mid-infrared form space and ground, Tenerife, Spain

COLLOQUIA, SEMINARS, AND TALKS

Invited talks

2021/12 Joint ALMA Observatory colloquia, Santiago, Chile
2021/05 CAB MdM seminars, Centro de Astrobiología, Madrid, Spain
2021/03 IPARCOS astro-seminars, Universidad Complutense, Madrid, Spain

2019/11 Journal club seminars, IAP, Paris, France

Visitor talks

2017/11 Subaru seminars, Subaru Telescope, Hawaii, USA
2017/11 Freddie seminars, IfA, Hawaii, USA
2016/04 Advanced radio astronomy seminars, Cornell University, USA

Local talks

2020/05 LCEG DAp seminars, CEA Saclay, France
2019/05 Interferometry seminar, DARK, Copenhagen, Denmark
2018/03 Cake talks, DARK, Copenhagen, Denmark

STUDENT SUPERVISION

2021/10– David Blánquez Sese, PhD student, DAWN, Copenhagen, Denmark, co-supervisor
2019/10– Mengyuan Xiao, PhD student, CEA Saclay/Nanjing University, France, co-supervisor
2020/01–06 Guillaume Villaret, 1st year master student, CEA Saclay, France, co-supervisor

TEACHING EXPERIENCE

2018 Teaching Assistant in the Danish Summer School in observational astronomy, University of Copenhagen
2017–2018 Teaching Assistant in the third-year physics bachelor cosmology course, University of Copenhagen
2016 Teaching Assistant in the Niels Bohr Institute Summer School in observational astronomy, University of Copenhagen

PROFESSIONAL SERVICE

Organization of scientific meetings

2018/06 COSMOS Team Meeting 2018 (LOC), Copenhagen, Denmark

Reviewer

2021– Referee for Astronomy and Astrophysics
2019– Referee for The Astrophysical Journal
2021 Evaluation of ALMA Cycle 8 proposals
2018 Evaluation of a Gemini telescope proposal on behalf of the Canadian Time Allocation Committee

Others

2020– Organization team member of the astrophysics seminars of the DAp, CEA Saclay, France
2018 Creator, organizer and speaker of the seminar series *All you always wanted to know about*, aimed at discussing and sharing knowledge about general astronomy topics, DARK, Copenhagen, Denmark

OUTREACH

2019/12 Interview for the podcast *Hablando con Científicos* of cienciaes.com, Madrid, Spain
2018/10 Exhibiter at the event *Art in Science* during the Culture Night 2018, Copenhagen, Denmark
As winner of the *Mega* category in the 2017 contest
2017/10 Exhibiter at the event *Art in Science* during the Culture Night 2017, Copenhagen, Denmark
2013/03 Volunteer at *La Uni en la Calle* (2nd edition), Madrid, Spain
2012/11 Volunteer at *La Uni en la Calle* (1st edition), Madrid, Spain
2009/11 Volunteer at the *IX Week of Science*, Madrid, Spain

COLLABORATIONS

International teams and projects

2019– GOODS-ALMA, 1.1mm galaxy survey (data manager)

2015–	The Cosmic Evolution Survey, COSMOS (member)
2018–	BUFFALO, a *HST* survey in the Frontier Fields (member)
2015–	SHARDS, an ESO/Gran Telescopio Canarias large program in GOODS-N and the Frontier Fields (member)

International collaborations

Cosmic DAWN Center (Denmark), Cornell University (USA), AlfA Bonn (Germany), Oxford/Cambridge (UK), LAM (France), CAB (Spain), IAC (Spain), UCM (Spain)

LANGUAGES

Spanish	Native proficiency
English	Full professional proficiency
French	Limited working proficiency

REFERENCES

Prof. Sune Toft	DAWN, University of Copenhagen	sune@nbi.ku.dk
Dr. David Elbaz	CEA Saclay	david.elbaz@cea.fr
Prof. Georgios Magdis	DAWN, Danish Technical University	geoma@space.dtu.dk
Dr. Emanuele Daddi	CEA Saclay	edaddi@cea.fr
Prof. Dominik Riechers	Cornell University	riechers@astro.cornell.edu
Dr. Natascha M. Föster Schreiber	MPE, Garching	forster@mpe.mpg.de
Prof. Pablo G. Pérez-González	CAB, Spain	pgperez@cab.inta-csic.es

LIST OF PUBLICATIONS

Refereed — 7 first author + 24 co-author (547 citations as of 20th December, source ADS)

7. **Gómez-Guijarro, C.**, Elbaz, D., Xiao, M., et al. 2022, A&A in press
GOODS-ALMA 2.0: Starbursts in the main sequence reveal compact star formation regulating galaxy evolution pre-quenching

6. **Gómez-Guijarro, C.**, Elbaz, D., Xiao, M., et al. 2021, A&A in press (arXiv:2106.13246)
GOODS-ALMA 2.0: Source catalog, number counts, and prevailing compact sizes in 1.1mm galaxies

5. **Gómez-Guijarro, C.**, Magdis, G. E., Valentino, F., et al. 2019, ApJ, 886, 88
Compact Star-Forming Galaxies as Old Starbursts Becoming Quiescent

4. **Gómez-Guijarro, C.**, Riechers, D. A., Pavesi, R., et al. 2019, ApJ, 872, 117
Confirming *Herschel* Candidate Protoclusters from ALMA/VLA CO Observations

3. **Gómez-Guijarro, C.**, Toft, S., Karim, A., et al. 2018, ApJ, 856, 121
Starburst to Quiescent from *HST*/ALMA: Stars and Dust Unveil Minor Mergers in Submillimeter Galaxies at z ~ 4.5

2. **Gómez-Guijarro, C.**, González-Martín, O., Ramos Almeida, C., et al. 2017, MNRAS, 469, 2720
A comparison between the soft X-ray and [OIII] morphologies of active galactic nuclei

1. **Gómez-Guijarro, C.**, Gallego, J., Villar, V., et al. 2016, A&A, 591, A151
Properties of galaxies at the faint end of the Hα luminosity function

24. Puglisi, A., Daddi, E., Valentino, F., et al. **(including Gómez-Guijarro, C.)**, 2021, MNRAS, 508, 5217
Submillimetre compactness as a critical dimension to understand the main sequence of star-forming galaxies

23. Kokorev, V. I., Magdis, G. E., Davidzon, I., et al. **(including Gómez-Guijarro, C.)** 2021, ApJ, 921, 40
The Evolving Interstellar Medium of Star-forming Galaxies, as Traced by Stardust

22. Valentino, F., Daddi, E., Puglisi, A., et al. **(including Gómez-Guijarro, C.)** 2021, A&A, 654, A165
The effect of active galactic nuclei on the cold interstellar medium in distant star-forming galaxies

21. Kalita, B. S., Daddi, E., D'Eugenio, C., et al. **(including Gómez-Guijarro, C.)** 2021, ApJ, 917, L17
An Ancient Massive Quiescent Galaxy Found in a Gas-rich z ~ 3 Group

20. Kalita, B. S., Daddi, E., Coogan, R. T., et al. **(including Gómez-Guijarro, C.)** 2021, MNRAS, 503, 1174
Feedback factory: multiple faint radio jets detected in a cluster at z = 2
19. Fraternali, F., Karim, A., Magnelli, B., **Gómez-Guijarro, C.,** et al. 2021, A&A, 647, A194
Fast rotating and low-turbulence discs at z ~ 4.5: Dynamical evidence of their evolution into local early-type galaxies
18. Stockmann, M., Jørgensen, I., Toft, S., et al. **(including Gómez-Guijarro, C.)** 2021, ApJ, 908, 135
The Fundamental Plane of Massive Quiescent Galaxies at z ~ 2
17. Donevski, D., Lapi, A., Małek, K., et al. **(including Gómez Guijarro, C.)** 2020, A&A, 644, A144
In pursuit of giants. I. The evolution of the dust-to-stellar mass ratio in distant dusty galaxies
16. Franco, M., Elbaz, D., Zhou, L., et al. **(including Gómez-Guijarro, C.)** 2020, A&A, 643, A53
GOODS-ALMA: Using IRAC and VLA to probe fainter millimeter galaxies
15. Franco, M., Elbaz, D., Zhou, L., et al. **(including Gómez-Guijarro, C.)** 2020, A&A, 643, A30
GOODS-ALMA: The slow downfall of star formation in z = 2-3 massive galaxies
14. Valentino, F., Daddi, E., Puglisi, A., et al. **(including Gómez-Guijarro, C.)** 2020, A&A, 641, A155
CO emission in distant galaxies on and above the main sequence
13. Martin-Alvarez, S., Slyz, A., Devriendt, J., **Gómez-Guijarro, C.** 2020, MNRAS, 495, 4475
How primordial magnetic fields shrink galaxies
12. Steinhardt, C. L., Jauzac, M., Acebron, A., et al. **(including Gómez-Guijarro, C.)**, ApJS, 247, 64
The BUFFALO HST Survey
11. Valentino, F., Tanaka, M., Davidzon, I., et al. **(including Gómez-Guijarro, C.)** 2020, ApJ, 889, 93
Quiescent Galaxies 1.5 Billion Years after the Big Band and Their Progenitors
10. Stockmann, M., Toft, S., Galazzi., A., et al. **(including Gómez-Guijarro, C.)** 2020, ApJ, 888, 4
X-Shooter spectroscopy and HST imaging of 15 ultra massive quiescent galaxies at z > 2
9. Tanaka, M., Valentino, F., Toft, S., et al. **(including Gómez-Guijarro, C.)** 2019, ApJ, 885, L34
Stellar Velocity Dispersion of a Massive Quenching Galaxy at z = 4.01
8. Cortzen, I., Garrett, J., Magdis, G., et al. **(including Gómez-Guijarro, C.)** 2019, MNRAS, 482, 1618
PAHs as tracers of the molecular gas in star-forming galaxies
7. Borlaff, A., Truijillo, I., Román, J., et al. **(including Gómez-Guijarro, C.)** 2019, A&A, 621, A133
The missing light of the Hubble Ultra Deep Field
6. Kubo, M., Tanaka, M., Yabe, K., et al. **(including Gómez-Guijarro, C.)** 2018, ApJ, 867, 1
The Rest-frame Optical Sizes of Massive Galaxies with Suppressed Star Formation at z ~ 4
5. Fujimoto, S., Ouchi, M., Kohno, K., et al. **(including Gómez-Guijarro, C.)** 2018, ApJ, 861, 7
ALMA 26 Arcmin^2 Survey of GOODS-S at One Millimeter (ASAGAO): Average Morphology of High-z Dusty Star-forming Galaxies is an Exponential Disk (n ~ 1)
4. Jiménez-Andrade, E. F., Magnelli, B., Karim, A., et al. **(including Gómez-Guijarro, C.)** 2018, A&A, 615, A25
Molecular gas in AzTEC/C159: a star-forming disk galaxy 1.3 Gyr after the Big Bang
3. Lee, N., Seth, K., Scott, K. S., et al. **(including Gómez Guijarro, C.)** 2017, MNRAS, 471, 2124
The fine line between normal and starburst galaxies
2. Magdis, G. E., Rigopoulou, D., Daddi, E., et al. **(including Gomez Guijarro, C.)** 2017, A&A, 603, A93
Gas and dust in star-forming galaxies at z ~ 3. Extending galaxy uniformity to 11.5 billion years
1. Toft, S., Zabl, J., Richard, J., et al. **(including Gómez-Guijarro, C.)** 2017, Nature, 546, 510
A massive, dead disk galaxy in the early Universe