



Universiteit
Leiden
The Netherlands

Chronicles of cosmic dawn: high redshift quasars as probes of supermassive black holes and the intergalactic medium

Onorato, S.

Citation

Onorato, S. (2025, November 13). *Chronicles of cosmic dawn: high redshift quasars as probes of supermassive black holes and the intergalactic medium*. Retrieved from <https://hdl.handle.net/1887/4283072>

Version: Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/4283072>

Note: To cite this publication please use the final published version (if applicable).

PUBLICATIONS

First author

- *Optical and near-infrared spectroscopy of quasars at $z > 6.5$: public data release and composite spectrum*

Silvia Onorato, Joseph F. Hennawi, Jan-Torge Schindler, Jinyi Yang, Feige Wang, Aaron J. Barth, Eduardo Bañados, Anna-Christina Eilers, Sarah E. I. Bosman, Frederick B. Davies, Bram P. Venemans, Chiara Mazzucchelli, Silvia Belladitta, Fabio Vito, Emanuele Paolo Farina, Irham T. Andika, Xiaohui Fan, Fabian Walter, Roberto Decarli, Masafusa Onoue, Riccardo Nanni

Published in Monthly Notices of the Royal Astronomical Society

Volume 540, Issue 1, June 2025, Pages 1308–1328

- *Homogeneous measurements of proximity zone sizes for 59 quasars in the Epoch of Reionization*

Silvia Onorato, Joseph F. Hennawi, Elia Pizzati, Bram P. Venemans, Anna-Christina Eilers

Publicly available at <https://arxiv.org/abs/2505.09676>

Currently under review for publication on Monthly Notices of the Royal Astronomical Society

- *The Ly α transmission probability distribution function from the E-XQR-30 sample*

Silvia Onorato, Timo Kist, Joseph F. Hennawi, Frederick B. Davies

In preparation for publication on Monthly Notices of the Royal Astronomical Society

Not related to the topics of this thesis:

- *The structural properties of multiple populations in the dynamically young globular cluster NGC 2419*

Silvia Onorato, Mario Cadelano, Emanuele Dalessandro, Enrico Vesperini, Barbara Lanzoni, Alessio Mucciarelli

Published in Astronomy & Astrophysics

Volume 677, September 2023, A8

Contributing author

- *First measurement of the Mg II forest correlation function in the Epoch of Reionization*

Suk Sien Tie, Joseph F. Hennawi, Feige Wang, **Silvia Onorato**, Jinyi Yang, Eduardo Bañados, Frederick B. Davies, Jose Oñorbe

Published in Monthly Notices of the Royal Astronomical Society
Volume 535, Issue 1, November 2024, Pages 223-246

- *Discovery and characterization of 25 new quasars at $4.6 < z < 6.9$ from wide-field multiband surveys*

Silvia Belladitta, Eduardo Bañados, Zhang-Liang Xie, Roberto Decarli, **Silvia Onorato**, Jinyi Yang, Manuela Bischetti, Masafusa Onoue, Federica Loiacono, Laura N. Martínez-Ramírez, Chiara Mazzucchelli, Frederick B. Davies, Julien Wolf, Jan-Torge Schindler, Xiaohui Fan, Feige Wang, Fabian Walter, Tatevik Mkrtchyan, Daniel Stern, Emanuele P. Farina, Bram P. Venemans

Published in Astronomy & Astrophysics
Volume 699, July 2025, A335

CURRICULUM VITAE

I was born on June 15th, 1996 in Palermo, the main city of Sicily in Southern Italy, but I grew up in a smaller city nearby named Bagheria. Even people from Northern Italy struggle to understand what coming from the South, and in particular from an island, really means. From the “South”, we *Sicilians* learn that time flows differently. If the weather is too hot, life tends to slow down. But in general, we do not really like rushing anything, and we would rather enjoy any single moment. We could say that life is still marked by seasons, by the sunlight, and sometimes by the bells of a church. From the “island” side, I developed a deep and visceral connection to the sea. Its sound, smell, and even salt, make me happy. These feelings probably found fertile ground in me as I spent most of my childhood at my mum’s hometown, a tiny village of less than 500 souls located on top of a hill and named Condò, close to Milazzo (the place where there is the best sea in the world).

From this side, my childhood was pretty nice and smooth, growing up with my younger brother Simone (beloved just for the past 10 years), and balanced with a strong commitment to schoolwork. The reason for that was primarily my mum, Anna Maria, at least at the very beginning. She really wanted me to have a brilliant future, ever since I was very young. In fact, when I was less than 5 years old, before starting elementary school, she homeschooled me, teaching me to read and write, and essentially making me the smartest kid in kindergarten. Later in school, I studied hard and enjoyed pretty much all the different subjects, without a particular favorite. However, in an old diary, I found a note from when I was 8 years old, saying that I watched an outreach TV program about the Universe, and I was astonished by how much about the Universe we still do not know. I like to think of that as the beginning of everything.

The downside of being a studious kid was, of course, bullying. I still have mixed feelings when I think about my time in school. On the one hand, I was happy to learn many things and prove that I was a good student; on the other hand, I had very few friends, almost no one used to come to my birthday parties, and I suffered from different injustices in all the schools I attended. During that period, what helped me build self-confidence and make friends was attending acting classes (until I was ~ 13 years old) and playing volleyball (which I still love and do). The passion for volleyball came from the special bond I have always had with my cousin Clarissa. I cannot help but smile when I think about us playing at grandma’s house and bringing destruction everywhere.

When I went to high school, at Liceo Scientifico “Giuseppe D’Alessandro”, things improved a little bit friend-wise, and I could enjoy those years much more than the previous ones. Also, at that point, it was pretty clear that I had a marked inclination for all the scientific subjects, and especially for

mathematics, whose exercises I often solved just for fun. When it was time to choose a university, I did not want to study only pure math, because part of me feared it would drive me to madness; instead, the obvious choice seemed to be Physics in Palermo. I graduated from high school in July 2015 with a final grade of 100/100, and everything felt as though it had already been written. Yet I was not entirely convinced about studying Physics; I knew something was missing. I began searching online for programs that aligned more closely with my true passion: Astronomy, and I found bachelor's courses both in Bologna and Padova. A few days later, I was hanging out with friends, and I met a schoolmate who had moved to Bologna the year before to start the university there. We spent the whole night talking, and at that point, I was sure of what I wanted; so, less than a month later, I left my hometown and moved to Bologna to start a new chapter of my life.

I obtained my bachelor's degree in Astronomy at Alma Mater Studiorum, University of Bologna in December 2018, with a final grade of 106/110, and a thesis titled "Mechanisms of Energy Transport in Astrophysics" supervised by Prof. Daniele Dallacasa. Immediately afterward, I enrolled in the master's program in Astrophysics and Cosmology, still at the University of Bologna. I obtained the master's degree in March 2021 (remotely, due to the COVID-19 pandemic) with a final grade of 109/110, and a thesis on "The primordial structure of Multiple Populations in the Globular Cluster NGC 2419", which later on ended up in the publication of my first paper. This project was supervised by Dr. Mario Cadelano, Dr. Emanuele Dalessandro, and Prof. Barbara Lanzoni, all of whom inspired me and conveyed a genuine joy for research. This was a wonderful conclusion to my time in Bologna, for which I will always be grateful, as I met many extraordinary people and found a bit of myself on the way.

After months of uncertainty about where the next step would lead me, in September 2021, I won the Ph.D. position that brought me to Leiden, in the Netherlands, to work with Prof. Joe Hennawi on high-redshift quasars. This was a different topic from the one I had explored in my master's thesis, and it truly felt like stepping out of my comfort zone. However, I was certain of my desire to pursue a Ph.D. and to do research, and I knew that life is a never-ending process of learning that constantly pushes us forward. These past four years have been a real roller coaster, both personally and academically, but full of rewarding experiences and people who have been essential in helping me reach this point. After completing my Ph.D. journey, I will begin a postdoctoral position at Gemini Observatory in Hilo, Hawaii, under the supervision of Dr. Emanuele Paolo Farina, continuing work on high-redshift quasars.

ACKNOWLEDGEMENTS

Here we are, at the acknowledgements of my Ph.D. thesis... many times along this journey I doubted this moment would ever come. But eventually it did, and I'm deeply happy and grateful to all the people who made it possible.

I must begin by thanking my supervisor, Joe Hennawi. Our working relationship over these years was not without its complications. Yet it also shaped my growth in ways I could not have anticipated, and I am grateful for everything I have learned from you. Bram, thank you for being extremely kind and supportive whenever I needed help, whether with science or life in general. Serena, I have always appreciated our conversations and all the help you provided over these years.

Thanks to all the people in the worldwide ENIGMA group I had the pleasure of crossing paths with: from Leiden, Ben W., Caitlin, Daming, JT (you were an amazing flatmate buddy), Lars, Riccardo (we all missed you very much when you left), and Timo (I will never thank you enough for your patience and help with all the theoretical stuff I don't enjoy that much); from Santa Barbara, Ben S., Diego, Jiamu, Kathlynn, Koki, Linda, Molly & Shane (it was really nice to meet and get to know you, guys), Suk Sien, Teng, Vikram, and Yi.

Thank you to all the office mates I had over these years, such as Beth, Filip, and Yannick. A special virtual hug goes to Piyush: you have always been kind, friendly, cheerful, and gossipy in the perfect balance – even if you fail miserably when it comes to basic knowledge of Italian food (but I think I can forgive you). Thanks to Veronica, who (together with JT) helped me regain some trust in sharing a house with others. Thanks to the fellow members of the Borrel Committee, Andrew and Osmar, who shared both the initial enthusiasm and the final exhaustion with me. I really enjoyed our time together, especially our trips to Sicily and Ireland.

Thank you to 'La Banda della BUMBA', aka the crazy Italians that helped ease homesickness during the gray, cold Leiden days: Ale, Bianca, Karin, Nicco, Nicole, and Paola. I couldn't be more grateful for all the amazing moments we shared – from MasterChef/Pechino Express, to delicious *Emilian* (and not) meals, camping (in the rain), and screaming at Ed Sheeran. I'm still unsure what the most accurate definition of *friendship* is, but I'm pretty confident that whatever it is, it suits you all. Thank you to the international quota of the group, Josh and Marta. Josh, you are one of the funniest people I have ever met, and I am so glad for all we shared between board games (especially Ticket to Ride, which is just enjoyable and not stressful at all), Christmas dinners, and even the Mud Run (that I still don't know how you managed to drag me into). Marta, you are the best life (and gym) coach someone could ever ask for, and an amazing human being.

Thanks to all the people I got to know better during the three PhSki trips, who made them even more special: Amy, Anniek, Casper, Celine, Chloe, Christiaan, Christian, Ciaran, Darío, Erik, Esther, Ivana, Jelle, Jessica, Joey, Logan, Louis, Lucie, Luna, Mantas, Manuel, Martje, Orestis, Richelle, Rob², Roi, Roland, Sam, Sill, Thijs, Thomas, Victor, Will, Yuze, Zephyr, and Zeynab.

Thanks to the people I was lucky to meet at, or through, the Observatory who all left a positive mark on me: Alberto, Alfred, Andres³, Aniruddh, Anna, Arianna, Ben, Brigitte, Colin, Dario, Dennis, Dilovan, Elena, Elina, Evgenii, Fran, Fraser, Gijs, Jeger, Joan, Jurjen, Kevin, Konstantinos, Leoni, Markus, Pato, Pavel, Pranjali, Rico, Sid, Stefano, Vanesa, Victorine, Willeke, and Zorry.

Thank you to Luca and Elisa for the good times we had, both in fun and in struggle (especially during our respective moves). Thanks to my volleyball mates, in particular Eline and Elsemiek. Thanks also to all my friends scattered around the world, who live far away in space but very close in my heart: Anna, Arianna, Chiara, Dalila, Fabio, Federica, Fije, Gabri, Gandi, Giovanni, Giulia, Kikka, Marco³, Martina, Provi, Seyma, and Silvia.

Grazie alla mia famiglia: mamma, nonna, Simone, e Chiara. La distanza fa schifo, e non esiste momento in cui io non senta la vostra mancanza. Ma seppur a distanza, con mille pensieri, casini, incastri... ci siamo, ed è quello che conta.

Elia, the ‘final boss’ of this section... while writing this, I realized you should have been mentioned in every paragraph above. But thinking about it, that makes perfect sense. We started this adventure together as really good friends and we shared so many moments: we traveled, hiked, skied, camped, got ticks, were stopped by (German) police, went to hospitals, biked (and fell off), moved (in and out), walked, cooked for each other, talked, argued, laughed, joked, sang, danced, cried... in one word, lived together. Eventually, it just felt *right*. Thank you.