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Not so smooth after all: resolving dust and gas structures in protoplanetary disks

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List of publications

First author papers

1. *ALMA survey of Class II protoplanetary disks in Corona Australis: a young region with low disk masses*
Cazzoletti, P., Manara, C. F., Baobab Liu, H., van Dishoeck, E. F., Facchini, S., Alcalà, J. M., Ansdell, M., Testi, L., Williams, J. P., Carrasco-González, C., Dong, R., Forbrich, J., Fukagawa, M., Galván-Madrid, R., Hirano, N., Hogerheijde, M., Hasegawa, Y., Muto, T., Pinilla, P., Takami, M., Tamura, M., Tazzari, M., Wisniewski, J. P., (2019), *Astronomy and Astrophysics*, 626, A11
2. *Evidence for a massive dust-trapping vortex connected to spirals. Multi-wavelength analysis of the HD 135344B protoplanetary disk*
Cazzoletti, P., van Dishoeck, E. F., Pinilla, P., Tazzari, M., Facchini, S., van der Marel, N., Benisty, M., Garufi, A., Pérez, L. M., (2018), *Astronomy and Astrophysics*, 619, A161
3. *CN rings in full protoplanetary disks around young stars as probes of disk structure*
Cazzoletti, P., van Dishoeck, E. F., Visser, R., Facchini, S., Bruderer, S., (2018), *Astronomy and Astrophysics*, 609, A93
4. *Testing dust trapping in the circumbinary disk around GG Tauri A*
Cazzoletti, P., Ricci, L., Birnstiel, T., Lodato, G., (2017), *Astronomy and Astrophysics*, 599, A102

Co-authored papers

5. *Bright C₂H emission in protoplanetary disks in Lupus: high volatile C/O > 1 ratios*
Miotello, A., Facchini, S., van Dishoeck, E. F., **Cazzoletti, P.**, Testi, L., Williams, J. P., Ansdell, M., van Terwisga, S., van der Marel, N., in press, *Astronomy and Astrophysics*
6. *Observational constraints on dust disk sizes in tidally truncated protoplanetary disks in multiple systems in the Taurus region*
Manara, C. F., Tazzari, M., Long, F., Herczeg, G. J., Lodato, G., Rota, A. A., **Cazzoletti, P.**, van der Plas, G., Pinilla, P., Dipierro, G., Edwards, S., Harsono, D., Johnstone, D., Liu, Y., Menard, F., Nisini, B., Ragusa, E., Boehler, Y., Cabrit, S., (2019), *Astronomy and Astrophysics*, 628, A95
7. *An Inner Disk in the Large Gap of the Transition Disk SR 24S*
Pinilla, P., Benisty, M., **Cazzoletti, P.**, Harsono, D., Pérez, L. M., Tazzari, M., (2019), *Astrophysical Journal*, 878, 16
8. *High gas-to-dust size ratio indicating efficient radial drift in the mm-faint CX Tauri disk*
Facchini, S., van Dishoeck, E. F., Manara, C. F., Tazzari, M., Maud, L., **Cazzoletti, P.**, Rosotti, G., van der Marel, N., Pinilla, P., Clarke, C. J., (2019), *Astronomy and Astrophysics*, 626, L2
9. *Stringent limits on the magnetic field strength in the disc of TW Hya. ALMA observations of CN polarisation*
Vlemmings, W. H. T., Lankhaar, B., **Cazzoletti, P.**, Ceccobello, C., Dall’Olio, D., van Dishoeck, E. F., Facchini, S., Humphreys, E. M. L., Persson, M. V., Testi, L., Williams, J. P., (2019), *Astronomy and Astrophysics*, 624, L7
10. *The ALMA Lupus protoplanetary disk survey: evidence for compact gas disks and molecular rings from CN*
van Terwisga, S. E., van Dishoeck, E. F., **Cazzoletti, P.**, Facchini, S., Trapman, L., Williams, J. P., Manara, C. F., Miotello, A., van der Marel, N., Ansdell, M., Hogerheijde, M. R., Tazzari, M., Testi, L., (2019), *Astronomy and Astrophysics*, 623, A150
11. *On the secular evolution of GG Tau A circumbinary disc: a misaligned disc scenario*

- Aly, H., Lodato, G., **Cazzoletti, P.**, (2018), *Monthly Notices of the RAS*, 480, 4738
12. *Nitrogen isotope fractionation in protoplanetary disks*
Visser, R., Bruderer, S., **Cazzoletti, P.**, Facchini, S., Heays, A. N., van Dishoeck, E. F., (2018), *Astronomy and Astrophysics*, 615, A75
13. *ALMA Observations of the Young Substellar Binary System 2M1207*
Ricci, L., **Cazzoletti, P.**, Czekala, I., Andrews, S. M., Wilner, D., Szűcs, L., Lodato, G., Testi, L., Pascucci, I., Mohanty, S., Apai, D., Carpenter, J. M., Bowler, B. P., (2017), *Astronomical Journal*, 154, 24
14. *The cool-core state of Planck SZ-selected clusters versus X-ray-selected samples: evidence for cool-core bias*
Rossetti, M., Gastaldello, F., Eckert, D., Della Torre, M., Pantiri, G., **Cazzoletti, P.**, Molendi, S., (2017), *Monthly Notices of the RAS*, 468, 1917
15. *Vortices and Spirals in the HD135344B Transition Disk*
van der Marel, N., Cazzoletti, P., Pinilla, P., Garufi, A., (2016), *Astrophysical Journal*, 832, 178

Curriculum Vitae

I was born on October 4th, 1990 in Monza, Italy to Sergio Cazzoletti and Serena Farina. I lived for the most part of my life in Concorezzo, a small city north-east of Milan. Science and physics have always been two of my main interests. However, I have seen many different passions sprouting and growing throughout the years.

Ever since primary and secondary school, it has been clear that I had a much better aptitude for science and mathematics than for literature and humanistic subjects. Consequently, I decided to attend "Scientific" High-School (Liceo Scientifico, in italian) at Istituto Sacro Cuore in Milan. In those year, I started developing a big interest for engines and sport cars, and became an avid reader of car magazines. This passion brought me to the decision to choose to study Mechanical Engineering at the University. I therefore took the test, and was admitted to Politecnico di Milano. As a farewell to physics and astronomy, I chose "cosmological models" as a topic for my final high-school project. I enjoyed this project so much, that I ended up never registering for Mechanical Engineering, and choosing Physics instead.

In September, 2009 I started my Bachelor's degree at Università degli studi di Milano. I enjoyed all the courses and exams, but it was only in the third year that I found the topic I was sure I wanted to keep studying: the course was "Introduction to Astronomy", and the topic was (of course) astronomy. For my Bachelor thesis, I worked at INAF with Dr. Mariachiara Rossetti and Dr. Fabio Gastaldello, studying the morphology of galaxy clusters through *Chandra* X-Ray data. For my Master's degree I chose almost all astronomy related exams, and was particularly struck by the course held by Prof. Giuseppe Lodato about the theory of accretion disks. For my master's thesis, I moved for a few months to the Harvard-Smithsonian Center for Astrophysics to work on modelling and observations of protoplanetary disks. I was supervised by Dr. Luca Ricci and Prof. Giuseppe Lodato. During the university years I developed a huge passion for cooking, and attended a number of cooking classes. This

time, however, I never really thought about becoming a Chef: even though I still love cooking, I enjoyed my first astronomy research experience so much that I immediately decided to apply for a PhD at Leiden University.

I was offered a position with Prof. Dr. Ewine van Dishoeck to work on the new exciting data that ALMA was starting to provide, and in particular to study and help in the interpretation of the substructures that were observed more and more frequently in protoplanetary disks, both in gas and dust. I spent all four years of my PhD in München, Germany, at Max-Planck-Institut für extraterrestrische Physik. I met great scientists and had beautiful collaborations with many of them, exploiting the vicinity of the European Southern Observatory. During these years, I was member of the LOC of three international conferences, and I had the pleasure to supervise a talented high-school student during her summer project, hopefully also helping her to decide what to study after high-school.

In the last year of my PhD I also got married to Federica. Next year, we will happily move back to our home country, and I will start a whole new career path as a Data Scientist. I hope to be able to exploit all the skills I developed during my PhD also in this different field, and I want to keep putting my curiosity to good use!

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Surely I would have not started this PhD without two people. Prof. Giuseppe Lodato. Thank you for giving me strong theoretical foundations and teaching me a solid approach to the study of protoplanetary disks, and for introducing me to this world. Dr. Luca Ricci, you were the first to introduce me the observational aspects of astronomy, and you gave me the possibility to be part of my first true research projects.

As my PhD developed between Leiden and Munich, I was part of two research groups. First of all, the MPE infrared group: thank you for hosting me. The atmosphere of excellence was perceivable through the corridors. Thomas, Yao, Lisa, and Nadia (for one year), you have been great colleagues in Germany. The second group is the fantastic Leiden one, with its present and past members. I feel privileged for having been a part of it. Nienke, I am grateful to you for involving me in the first HD 135344B project, for helping with ALMA data, and in general for teaching me a lot about interferometry, from the very first days. Paola, I greatly enjoyed working with you. Thanks for the great discussions, for the interesting projects together and for your constant and sincere friendliness. Anna: thank you for introducing me to DALI, and thanks also to Carlo and to your amazing family for the generous dinner invitations in Leiden before and in Munich after. Those have been occasions for many conversations

that have often ended up being important for me, both from the professional and personal point of view. Daniel, your help with my ALMA data was invaluable. Simon, your support with DALI was irreplaceable, and your insight about jobs outside of astronomy has been really useful. Merel, Arthur and Sierk: we started together and it was great to have the three of you as companions of this trip! You have more than once been a great help to me. Also, the last ALMA proposal I am still involved in is with you, so keep me updated. Good luck with everything, I wish you all the best from my heart. Łukasz, you really are a nice person to be with. Also, thanks for helping me to accept that coffee is not only espresso. Leon, a sincere thank you for your (future) help with my PhD organisational stuff, and good luck with your applications. Margot and Martijn, it was nice meeting you. I am grateful for your help with the translation. Pooneh, in the brief time we met I liked your enthusiasm and positive attitude. Good luck with the next years! An acknowledgement goes then to the current postdocs of the group. To Alex, for always bringing enthusiasm and optimism. To Giovanni, for sharing his passion, competence and attention to details. To Alvaro and Andreas, for bringing some larger scale structures into my horizon and broadening my scientific knowledge. To Benoit, Shota: we did not get to interact much, but it was a pleasure to meet you and to hear about your research. Outside the group, I would then like to thank Marco: we shared a great and fun year in Muncih. Thanks for all the help with GALARIO afterwards.

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Then Chicca: our story began at the beginning of this PhD adventure and reached its fulfilment near its end! The PhD played an important role in shaping our relation, and without any doubt our relation enriched it immensely. Thanks for the support, the trust, for being willing to move to Munich with me, and finally for bringing me back to our home country. It has been 4 great years, and I am sure we both agree that the best is yet to come!

Finally, un grazie infinito ai miei genitori. Per avermi supportato (e sopportato), spinto, spronato, aiutato, sostenuto e soprattutto per avermi sempre voluto bene. Non potrò mai sdebitarmi, spero vi basti la mia gratitudine (che spesso non traspare come dovrebbe).