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Galaxy alignments from multiple angles

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Citation
Fortuna, M. C. (2021, November 25). *Galaxy alignments from multiple angles*. Retrieved from https://hdl.handle.net/1887/3243460

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

List of Publications

First author

Fortuna, M.C.; Hoekstra, H.; Dvornik, A.; *KiDS-1000: weak lensing and intrinsic alignment around luminous red galaxies*, to be submitted in A&A

Fortuna, M.C.; Hoekstra, H.; Johnston, H.; Vakili, M.; Kannawadi, A.; Georgiou, C.; Joachimi, B.; Weight, A.H.; Asgari, M.; Bilicki, M.; Heymans, C.; Hildebrandt, H.; Kuijken, K.; Von Wietersheim-Kramsta, M.; *KiDS-1000: Constraints on the intrinsic alignment of luminous red galaxies*, A&A, 654, A76 (2021)

Fortuna M.C.; Hoekstra, H.; Joachimi, B.; Johnston, H.; Chisari, N. E.; Georgiou, C.; Mahony, C.; *The halo model as a versatile tool to predict intrinsic alignments*, MNRAS, 501, 2, 2983-3002 (2021)

Contributing author

Mahony, C.; **Fortuna, M.C.**; Joachimi, J.; Korn, A.; Hoekstra, H. *Forecasting the potential of weak lensing magnification to enhance LSST large-scale structure analyses*, to be submitted in MNRAS

Robertson, N. C.; Alonso, D.; Harnois-Déraps, J.; Darwish, O.; Kannawad, A.; Amon, A.; Asgari, M.; Bilicki, M.; Calabrese, E.; Choi, S. K.; Devlin, M. J.; Dunkley, J.; Dvornik, A.; Erben, T.; Ferraro, S.; **Fortuna, M. C.**; Giblin, B.; Han, D.; Heymans, C.; Hildebrandt, H.; Hill, J. C.; Hilton, M.; Ho, S. P.; Hoekstra, H.; Hubmayr, J.; Hughes, J.; Joachimi, B.; Joudaki, S.; Knowles, K.; Kuijken, K.; Madhavacheril, M. S.; Moodley, K.; Miller, L.; Namikawa, T.; Nati, F.; Niemack, M. D.; Page, L. A.; Partridge, B.;

Schaan, E.; Schillaci, A.; Schneider, P.; Sehgal, N.; Sherwin, B. D.; Sifón, C.; Staggs, S. T.; Tröster, T.; van Engelen, A.; Valentijn, E.; Wollack, E. J.; Wright, A. H.; Xu, Z.; *Strong detection of the CMB lensingxgalaxy weak lensingcross-correlation from ACT-DR4,PlanckLegacy and KiDS-1000*, A&A 649, A146 (2021)

Johnston, H.; Joachimi, B.; Norberg, P.; Hoekstra, H.; Eriksen, M.; **Fortuna, M.C.**; Manzoni, G.; Serrano, S.; Siudek, M.; Tortorelli, L.; Cabayol, L.; Carretero, J.; Casas, R.; Castander, F.; Fernandez, E.; García-Bellido, J.; Gaztanaga, E.; Hildebrandt, H.; Miquel, R.; Padilla, C. Sanchez, E.; Sevilla-Noarbe, I.; Tallada-Crespí, P.; *The PAU Survey: Intrinsic alignments and clustering of narrow-band photometric galaxies*, A&A 646, A147 (2021)

Vakili, M.; Hoekstra, H.; Bilicki, M.; **Fortuna, M. C.**; Kuijken, K.; Wright, A. H.; Asgari, M.; Brown, M.; Dombrovskij, E.; Erben, T.; Giblin, B.; Heymans, C.; Hildebrandt, H.; Johnston, H.; Joudaki, S.; Kannawadi, A.; *Clustering of red-sequence galaxies in the fourth data release of the Kilo-Degree Survey*, submitted to A&A, eprint arXiv:2008.13154

Heymans, C.; Tröster, T.; Asgari, M.; Blake, C.; Hildebrandt, H.; Joachimi, B.; Kuijken, K.; Lin, C.; Sánchez, A. G.; van den Busch, J.L.; Wright, A. H.; Amon, A.; Bilicki, M.; de Jong, J.; Crocce, M.; Dvornik, A.; Erben, T.; **Fortuna, M.C.**; Getman, F.; Giblin, B.; Glazebrook, K.; Hoekstra, H.; Joudaki, S.; Kannawadi, A.; Köhlinger, F.; Lidman, C.; Miller, L.; Napolitano, N. R.; Parkinson, D.; Schneider, P.; Shan, H.; Valentijn, E.; Verdoes K., Gijs; Wolf, C.; *KiDS-1000 Cosmology: Multi-probe weak gravitational lensing and spectroscopic galaxy clustering constraints*, A&A 646, A140 (2021)

Georgiou, C.; Chisari, N. E.; **Fortuna, M. C.**; Hoekstra, H.; Kuijken, K.; Joachimi, B.; Vakili, M.; Bilicki, M.; Dvornik, A.; Erben, T.; Giblin, B.; Heymans, C.; Napolitano, N. R.; Shan, H. Y.; *GAMA+KiDS: Alignment of galaxies in galaxy groups and its dependence on galaxy scale*, A&A 628, A31 (2019).

Johnston, H.; Georgiou, C.; Joachimi, B.; Hoekstra, H.; Chisari, N. E.; Farrow, D.; **Fortuna, M. C.**; Heymans, C.; Joudaki, S.; Kuijken, K.; Wright, A.; *KiDS+GAMA: Intrinsic alignment model constraints for current and*

future weak lensing cosmology, A&A 624, A30 (2019)

Curriculum Vitae

I was born in Assisi on the 7th of March 1991 and I spent my early childhood in Perugia. I moved with my family to Reggio Calabria in 1997, where I attended almost my entire school time. Growing up in different cities had an important impact on me and helped me to always have the curiosity to change cities and the environment.

My passion for science emerged during middle school: I was extremely fascinated by both natural science and physics, and this motivated me to enrol in the Scientific Liceum. I was very lucky and I had great teachers in all of my schools: this built up my passion and I started reading lots of outreach books about physics. My interest in cosmology was mainly sourced by the conversations with my grandfather, who was the first to introduce me to the Big Bang theory, the cosmic expansion and all the suggestive pictures from the Hubble Telescope. Nevertheless, it was still difficult to choose which university I wanted to attend. I have always been extremely attracted to arts and I love to paint and draw. During high school, I had the great luck to meet Nietta D'Atena, an artist from Reggio Calabria, and to attend her evening art laboratory, where she was teaching sculpture and painting. My passion for science convinced me to enrol in Physics, but with the aim to go back to art any time possible. I kept attending evening courses on art during my whole University time.

I studied at the University of Milano-Bicocca: I got my Bachelor Degree in Physics in 2013 with a thesis on Active Galactic Nuclei, supervised by Dr Massimo Dotti and co-supervised by Dr Alessandro Lupi. I then enrolled in the Master course in Astrophysics and Space Physics at the same university. During it, I joined the Technical University of Vienna with the Erasmus Programme. There I followed courses in Theoretical Physics and experienced for the first time what it meant to live in a different country. Back in Italy, I did my Master Thesis under the supervision of Prof. Luigi Guzzo and Dr Adam Hawken at the Observatory of Brera-Merate, joining

the ERC group Darklight. The international environment of the group further encouraged me to apply for the PhD position at Leiden Observatory. I graduated in March 2016 with a thesis titled 'Constraining the Halo Occupation Distribution by combining galaxy surveys and numerical simulations'.

I started my PhD at the Leiden Observatory in September 2016, under the supervision of Prof.Dr.Henk Hoekstra, and I joined the weak lensing group of the Observatory. My research mainly focused on studying the intrinsic alignment of galaxies using both modelling and observational approaches. I worked on a model to incorporate the small scale signal as well as its dependence on galaxy properties and constrained these latter directly on data from KiDS. The model and the pipeline I developed are currently used in ongoing projects in the Kilo Degree Survey (KiDS) and Euclid collaborations. Since the beginning of my PhD, I became a member of KiDS, the Physics of the Accelerated Universe Survey (PAUS), Euclid, and in the later years also of the Large Synoptic Survey Telescope (LSST). All these collaborations were great experiences of scientific exchange and coordination. Thanks to PAUS, I was able to go several times to observe at the William Herschel Telescope at La Palma, in the Canary Islands. In 2016 I attended the winter school in Cosmology in Tonale, Italy. During my PhD, I visited the University College of London (UCL) several times, I attended conferences and collaborations meetings, and I presented my work on many occasions in different countries: the US, UK, France, Finland, Germany. I was invited to give a review talk at the annual Euclid Italy meeting in February 2020. For three years, I served as an assistant to the course 'Galaxies and Cosmology' taught by Dr J.Hodge. I also participated in non-scientific activities of the Leiden Observatory: for one year (2017/2018), I was one of the four organisers of the 'borrel', a social event that takes place every Friday and is meant to create a friendly environment and socialise with the colleagues outside work; I have also been a member of the social committee for three years (2016-2019), and I volunteer to the 'Discovery Club', an outreach programme coordinated by the UNAWE team to teach and play with Astronomy with the children in the refugee centres near Leiden, during summer 2018.

Now that this part of the journey is turning to an end, I will serve science in a new way: I want to become an illustrator for science communication. This will finally bring together my two main passions and, somehow, the two halves of me.

Acknowledgements

This PhD has been an incredible experience and this was thanks to all the people that have been a part of it. From the scientific to the social side: some people have been very close to me, some have been important even if more tangential. I want to thank you all. During the multiple attempts to write these acknowledgements, I always realised I had forgotten someone, so I am pretty sure I still have. I hope you will feel my thanks in between these lines anyway!

I would like to thank Henk for having been a stimulating and supportive supervisor. I greatly enjoyed the scientific conversations and your ability to always keep in mind the big picture. I think you really communicate your passion for science, and this is something I will bring with me after this PhD.

During these years many people have crossed the Weak Lensing Group, leaving their personal touch. I have learnt from you all. Ricardo, Margot, Christos, Andrej, Stijn, Omar, Lammim, Shun-Sheng, Marcello, Massimo, Martin, Maciek, Patricia, Mohammadjavad, Arun, Alessandro, Matthieu, Yannick, David, Koen. Thank you for your mentoring and the stimulating discussions. It was always nice to interact with you, both scientifically and not, and to share experiences at conferences.

I would like to especially thank the KiDS team as a whole: I enjoyed our time together enormously. I was always looking forward to the KiDS busy weeks. I do not think this is the standard: you made it a great environment, managing to combine tough science and fun. Harry, Constance and Andrej, I really enjoyed collaborating with you. I also want to express my gratitude to Benjamin and Elisa: I considered you as second supervisors. Thank you for your guidance.

I would like to thank the Leiden Observatory for the great support it provides to its PhD students, both for technical and bureaucratic matters as for the effort to make everyone feel welcome, by promoting social events and outings. This would not be possible without the incredible work of Evelijn, Alexandra, Monica, Marjan and all the secretaries and the administrative staff. My gratitude to the IT for their incommensurable support: Erik, Leonardo, David, Eric.

I would also like to thank Pedro Russo, Mahbobah Ahmadi and the whole Universe Awareness team for organising the activities at the refugee camps, and for allowing me to bring one of the boxes of 'Universe in a box' to a school in Cambodia.

I have learnt a lot from the Equality Diversity and Inclusion committee and the EDI journal club. I found the meetings always very stimulating, and they inspired me in multiple discussions outside the Observatory.

This PhD would not have been the amazing experience that it was without all the good memories and the friendship of the people that I met. Each of you added an important piece to the story: Aayush, Andrea M., Andrej, Emanuele; Dilovan and Omar: I will miss all the lunches, the funny moments and the chats together; Francisca, Francesco (che ricordi le serate cinema a casa tua, le discussioni sui massimi sistemi, la politica, Battiato, la fantascienza), Gabi and Marco, Igone and David, Kim (from the runs and the workout sessions to the borrels and so many recipes and dinners), Matteo (grazie per le belle chiacchierate serali!), Pooneh, Salvatore, Valeriya, Vincenzo. But also: Santiago, Pedro, Mieke, Bernardo, Luke, Leindert, Łukasz, Clément, Hiddo, Daniel, Matus, Lammim, Shun-Sheng, Bas, Stella, Matthieu, Steven, Stijn (thank you so much for translating the summary!), Sanjana, Martijn, Anna, Anniek, Mantas, Marta, Aurora, Sarah, Joe, Morgan, Olivier. Thanks to all the running members of the social committee and the borrel committee over the years, and all the people that with their effort contribute making the Observatory the great place it is.

To the borrellinas: it was a lot of fun to organise the borrels together!

A special thank goes to the yoga team that helped to survive the lockdown: Ele and Lorenzo, Tommaso, Fraser, Kirsty, Pooneh, Chiara and the occa-

sional joiners.

Fraser, thank you for checking my English when I was in doubt! I will miss your big smile and our Sunday runs together!
Kirsty, living together was so much fun! Thanks for taking care of my plants so many times (and forever). I will miss the K-fam!

Christos: thank you for your direct and sincere friendship, for the work and non-related work chats in the office and outside; for the conferences, the trips, and all the rest. Jit: for your rudeness and your kindness: it is so much less fun when you are not around! For complaining about my continuous saving (it's coming in handy uh), for your great vodka and your sincerity. I am just sorry I can't complain anymore about you not cooking for us. Ele: we did so many things together! I couldn't have hoped for a better partner for all of my hobbies and activities. Thank you for the chats, the dress consultancies and your contagious enthusiasm and sociality. Gabriella: you came last but you imposed yourself like a truck :D For the laughs and the trash, and for all the times together cooking, eating and drinking, as it should be: thanks! You guys are one of the most precious takeaways of this PhD!

Per i Mellon non ci sono parole adatte a descrivervi né per ringraziarvi della vostra presenza nella mia vita: siete qualcosa di speciale ed unico. È anche grazie alla vostra vicinanza che in tanti momenti ho trovato la grinta giusta per affrontare le sfide che mi si presentavano. In ordine casuale: Marco G., Iaco, la Fra, Enrica, Mirko, Edoardo, Giulia F., Ghil, Marta B., Marco A. e Giulia, Marco B., Nicco e Olivia, Alberto e Judith, Yasir. E ancora: Marta M., Nadine, Mitch, Maria Cristina: grazie di tutto! Chiara, Richard: voi ci siete stati nel momento più difficile. Vi voglio bene.

Alla mia famiglia va un grazie particolare. Si dice sempre, ma lo penso davvero: siete sempre stati di supporto ed incoraggianti in tutte le mie scelte. Se ho imboccato questo percorso è certamente merito dell'atmosfera stimolante che si respirava a casa, del sostegno nelle sfide, della curiosità a cui ci avete educato. Siete chiassosi, a volte un po' intensi, sempre in grado di far sentire la vostra vicinanza nella distanza, e sempre, sempre presenti in tutto. Grazie!

Tommaso, questo dottorato è anche merito tuo, del tuo infaticabile sosteg-

no e della pazienza con cui mi sei stato vicino. Con te al mio fianco ho scoperto il coraggio di fare passi azzardati. Se questa nuova avventura lavorativa si affaccia davanti a me è anche grazie al tuo incredibile incoraggiamento. So che di grazie ce ne saranno ancora tanti: e andiamo!