Weak Gravitational Lensing Studies

from Space Missions

ISSI/ISSI-BJ International Team Proposal, March 27, 2018

Team Members

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France: Yannick Mellier (IAP), Jean Luc Stark (CEA), Martin Kilbinger (CEA), Charling Tao (CPPM)

Germany: Peter Schneider (Bonn), Hendrik Hildebrandt (Bonn), Tim Schrabback (Bonn), Huanyuan Shan (Bonn)

Switzerland: Jean-Paul Kneib (EPFL)

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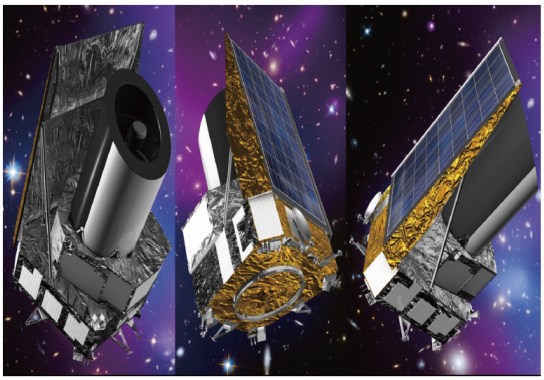

Artist views of the Euclid Satellite – © ESA

Artistic view of the Euclid

Artistic view of CSS-OS

Abstract:

Arising from light deflections by large-scale structures in the Universe, the weak gravitational lensing (WL) effect has been identified as one of the most important probes in cosmological studies, in particular for understanding the nature of dark matter and dark energy, and the law of gravity. WL effects result in only tiny shape distortions (namely shear) and flux magnifications on background objects. Extracting their signals accurately is therefore highly challenging observationally, methodologically, and statistically. Space-borne missions have unique advantages of being devoid of terrestrial atmospheric impacts to achieve stable high-resolution observations. For both the ESA Euclid mission and the Chinese Space Station Optical Survey (CSS-OS), WL studies are the key science driver. They target at accurate photometric measurements for over a billion galaxies to extract WL signals. Together with the 3-D galaxy distribution from spectroscopic observations, precision cosmological studies can be achievable with an order of magnitude higher statistical power compared to the current surveys. To realize such huge capabilities, however, systematic errors need to be thoroughly understood and controlled. Developing different statistical methods to fully use the data is also greatly important. To investigate these critical issues and explore the synergy and complementarities of Euclid and CSS-OS, we have formed an excellent team consisting of key WL members of the Euclid project and of the CSS-OS to apply for the ISSI/ISSI-BJ International Team Program. Our studies will focus on the following three aspects:

1) Investigate different statistical tools and possible systematic effects. They include how to extract WL signals from magnification measurements; higher order statistics beyond two-point correlations; joint analyses of shear and magnification; joint analyses of WL effects and galaxy clustering.
2) Develop and test different shear measurement methods taking into account specific survey designs, especially CSS-OS which is less systematically studied yet than Euclid.
3) Explore the synergistic power of the two surveys, particularly the photometric redshift measurements by combining the multi-band observations in the optical from CSS-OS and that of NIR from Euclid.

The ISSI/ISSI-BJ International Team Program provides an excellent opportunity for members from Euclid and CSS-OS to work closely together. Our goal is that through the program, we can further improve the readiness of WL analyses for the two surveys, in terms of both observational analyses and statistical and cosmological studies. In particular, the build-up of the WL data analysis pipeline for CSS-OS can be greatly benefited from working together with Euclid team and the world-leading experts in the field.

Research key words: cosmology, dark matter, dark energy, gravitational weak lensing

1. Introduction

Gravitational in origin, lensing effects are uniquely important in probing the distribution and properties of dark matter as well as that of dark energy through its effect on the cosmic expansion history (Schneider et al. 1992; Mellier 1999). Unlike strong lensing effects where individual systems can be analyzed, weak lensing (WL) effects are weak. Correspondingly, WL studies are statistical in nature. To derive WL signals demands accurate measurements over a large number of far away faint and small galaxies, and thus is extremely challenging. Over the past 20 years, we have seen the fast developments of WL

observations, notably from COSMOS and CFHTLenS to ongoing surveys of KiDS, DES and HSC. The cosmological power of WL effects has been fully demonstrated. Near future surveys have been under intensive preparation and construction, including the ground-based LSST and the space missions of ESA (Euclid), NASA (WFIRST), and China (CSS-OS). These stage IV surveys aim to measure over a billion galaxies to perform WL studies, which is a few tens times larger than the number of galaxies in current surveys.

The huge improvement in statistics requires much tighter systematic controls than the present studies, which poses significant challenges to the field. From observational aspects, space-borne missions avoid the turbulent effects from the terrestrial atmosphere, and thus stable and high-resolution observations can be obtained. This is especially important for precision WL analyses. On the other hand, even space missions can suffer different systematic effects depending on the instrumental design, orbital characteristics, and survey strategy. Thus for a specific survey, great efforts need to be devoted to develop the analyzing methodology and pipelines, and to study in detail potential systematics. The realization of the scientific capability of large WL surveys also relies critically on the statistical analyses.

2. Scientific Objectives

In this section, we describe the scientific objectives for our ISSI team focusing on the two space missions, CSS-OS (Zhan 2011) and Euclid (Laureijs et al. 2011). Some of their imaging survey design characteristics are shown in the table.

Project	Orbit	Launch	FOV/deg^2	R_{EE80}	Pixel	Area/deg^2	Wavelength/nm	Filters
Euclid	L2	~2021	0.53	0.23''	0.1''	~15000	550-920 1000-2000	1 3
CSS-OS	LEO	~2022	1.1	0.15''	0.074''	~15000	255-1000	7

2.1 Statistical analyses

WL cosmological studies are statistically based (e.g., Schneider et al. 1998). While 2-point shear (tomographic) correlation analyses have been proven to be powerful (e.g., Kilbinger et al. 2013; Hildebrandt et al. 2017), they contain only part of the cosmological information embedded in the WL data. Nonlinear structure formation leads to non-Gaussianity of the large-scale structures in the Universe. Different physical processes at the very early Universe can also generate primordial non-Gaussianity, which in turn leaves imprints in the structure formation and therefore in WL signals. Thus the statistical properties of WL signals beyond Gaussian include additionally important cosmological information. Studies of 3-point correlations have been done using data from a few surveys, e.g., CFHTLenS (Fu et al. 2014) and COSMOS (Semboloni et al. 2011). Focusing on high signal regions, WL peak statistics associate closely with massive nonlinear structures, and thus are sensitive to the non-Gaussianity of large-scale structures (e.g., Fan et al. 2010; Lin & Kilbinger 2015; Lanusse et al. 2016). They have been applied to e.g., CFHTLenS, KiDS and DES (e.g., Shan et al. 2012, 2017). Similarly, WL measurements can be used to calibrate mass proxies for galaxy cluster surveys, providing an alternative route to probe the statistics of high-density regions (e.g., Schrabback et al. 2018; Li, R. et al. 2011). Minkowski functional analysis is also an important probe theoretically.

In comparison with 2-pt cosmic shear correlations, studies for other probes are far less extensive yet. Future surveys, such as Euclid and CSS-OS, demand very high accuracies, and thus detailed investigations, particularly on different systematics involved in these non-Gaussian statistical analyses, are necessarily important. Having worked in this direction from different aspects, our ISSI team will work together with the goal to make these statistics ready for Euclid and CSS-OS.

At present, WL signals are mostly extracted from their shear effects by measuring the shapes of galaxies. On the other hand, WL also induces magnification effects leading to spatial correlations of galaxies in addition to their intrinsic clustering (Scranton et al. 2005). In principle, WL signals can also be obtained by detecting these additional correlations. For that, the galaxy intrinsic clustering is a dominant source of contaminations. There have been studies to investigate different ways to separate the lensing induced correlations from the intrinsic ones. Much more efforts are needed to make it a feasible analysis reaching the accuracy desired by Euclid and CSS-OS.

Most of the previous studies consider shear and magnification separately. However, data from WL surveys, such as Euclid and CSS-OS, contain both shear and magnification information. It is possible to perform joint analyses using the shear and magnification related observables simultaneously. Such analyses may also help to suppress the impacts of systematic effects in cosmological studies, in comparison with that using shear or magnification analyses separately. This line of studies will also be one of the goals for our ISSI team.

The above aspects of statistical studies will be pursued through theoretical and simulation analyses (e.g., Wei et al. 2018).

2.2 Shear measurements

For WL studies, lensing signals are mainly extracted from their shear distortions on background galaxies. Thus accurate shape measurements are crucial. Current weak lensing surveys are mostly ground based with typical seeing of ~0.7'' and the CCD pixel scale of ~0.2''. For Euclid and CSS-OS, as shown above, their resolutions are much higher, and can resolve a lot of small galaxies for shape measurements. The COSMOS survey is an existing space-based survey from Hubble. It is very deep, but the survey area is only ~1.6 $\deg^2$. Its shear catalog contains only a few times 10^5 galaxies (Schrabback et al. 2010), comparing to over a billion of galaxies targeted by Euclid and CSS-OS. The requirement on systematic controls for Euclid and for CSS-OS is much more stringent than that of COSMOS. Thus the shear measurement algorithms that are optimized to current surveys need to be carefully investigated to test if they can reach the desired accuracy for future space missions taking into account the specific characteristics of the surveys.

Over the years, the lensing community has conducted several challenges to test shear measurement methods. The most recent GREAT3 (Mandelbaum et al. 2015) challenge has a branch that simulated space-based observations for testing. While the outcome is very informative and inspiring, the simulations there cannot include details specific to a particular survey.

One of the studies of our ISSI team is to test and develop shear measurement pipeline(s) for CSS-OS. Its imaging survey will be multi-bands in NUV, u, g, r, i and z. The 7 filters are distributed in the focal plane. For the wide WL survey, each pointing will be observed twice per band over the period of 10 years, with 150s each without dithering.

We have done preliminary imaging simulations for CSS-OS and performed shear measurements using Lensfit (Miller et al. 2013) and Fourier_QUAD (Zhang et al. 2017). The analyses show that we need more much detailed investigations. For example, we find that small galaxies with effective radius

less than 3 pixels (~0.2'') cannot be measured well. On the other hand, for CFHTLenS, the Lensfit weight for galaxies with effective radius of 3 pixels (~0.54'') already reaches nearly the maximum weight. This indicates that the absolute size of galaxies matters here. What are the reasons for this, algorithm related or design related (e.g., indicating a certain level of under sampling exists), or both?

We will carry out more imaging simulations adding different effects one by one in accord with CSS-OS design and survey strategy, and perform much more detailed analyses. Our ISSI team consists of Euclid key members and world-leading experts in the field. Their rich experiences and in depth understanding for the problems in shear measurements are invaluable. We will work closely together. We aim to pin down the potential problems in CSS-OS shear measurements, further improve the existing algorithms and build analysis pipelines for CSS-OS.

2.3 Synergy of Euclid and CSS-OS

Euclid and CSS-OS will observe roughly the same sky areas with comparable depths and resolutions but in different filters. They complement each other in many aspects. To explore the synergistic power of the two surveys is importantly beneficial for both to extend their scientific capabilities.

The photometric redshift (photo-z) determination depends on multi-band photometric observations. The optical bands, e.g., u,g,r,i, and z, are critical for nearly all the galaxies in the photo-z estimation. NIR bands play important roles to improve the photo-z accuracy for galaxies close to z~1 and above. The imaging survey of Euclid is done using a wide band in optical, which will be used to measure the shear signals. In addition, there will be 3 NIR bands photometric observations. For CSS-OS, 7-band imaging observations in optical will be performed. The photo-z determination will be greatly improved by using the data from the two surveys synergistically (Jouvel et al. 2009; Hildebrandt et al. 2010). Particularly, the galaxy samples from the two surveys are expected to be similar in terms of galaxy characteristics. This is advantageous over that to combine with ground-based data because different resolutions result in different galaxy samples.

Our ISSI team will work together to investigate in depth this potential.

As a summary, the proposed studies include 1) WL statistical analyses; 2) shear measurement tests and developments, especially for CSS-OS; 3) synergistic studies of Euclid and CSS-OS. Our team consists of core WL members from Euclid and from CSS-OS, and the world-leading experts in the field who pioneered WL science theoretically and observationally. We also have young scientists actively involved in the studies. Due to the page limitation, we leave the descriptions of the research specialties and the experiences of the team members to their CVs.

References

Fan, Z.H., Shan, H.Y., & Liu, J.Y, 2010, ApJ, 719, 1408

Fu, L.P., Kilbinger, M., Erben, T. et al., 2014, MNRAS, 441, 2725

Hildebrandt, H., Arnouts, S., Capak, P. et al., 2010, A&A, 523, A31

Hildebrandt, H., Viola, M., Heymans, C. et al., 2017, MNRAS, 465, 1454

Jouvel, S., Kneib, J.-P., Ilbert, O. et al., 2009, A&A, 504, 359

Kilbinger, M., Fu, L.P., Heymans, C. et al., 2013, MNRAS, 430, 2220

Lanusse, F., Starck, J.-L., Leonard, A. et al., 2016, A&A, 591, A2

Laureijs, R., Amiaux, J., Arduini, S. et al., Euclid Definition Study Report, 2011, arXiv:1110.3193

Li, R., Mo, H.J., Fan, Z.H. et al., 2013, MNRAS, 430, 3359

Lin, C.A. & Kilbinger, M., 2015, A&A, 583, A70
Mandelbaum, R., Rowe, B., Armstrong, R. et al., 2015, MNRAS, 450, 2963
Mellier, Y. 1999, ARAA, 37, 127
Miller, L. Heymans, C., Kitching, T.D. et al., 2013, MNRAS, 429, 2858
Schneider, P., Ehlers, J. & Falco, E.E., 1992, Gravitational Lenses, (New York: Springer-Verlag Heidelberg)
Schneider, P., van Warebeke, L., Jain, B. et al., 1998, MNRAS, 296, 873
Schrabback, T., Applegate, D., Dietrich, J.P. et al., 2018, MNRAS, 474, 2635
Schrabback, T., Hartlap, J., Joachimi, B. et al., 2010, A&A, 516, A63
Scranton, R., Menard, B., Richard, G.T. et al., 2005, ApJ, 633, 589
Semboloni, E., Schrabback, T., van Waerbeke, L. et al., 2011, MNRAS, 410, 143
Shan, H.Y., Kneib, J.-P., Tao, C. et al., 2012, ApJ, 748, 56
Shan, H.Y., Liu,X.K., Hildebrandt, H. et al., 2017, MNRAS, 474, 1116
Wei, C.L., Li, G.L., Kang, X. et al., 2018, ApJ, 853, 25
Zhan, H., 2011, Scientia Sinica Physica, Mechanica & Astronomica, 41, 1441
Zhang, J., Zhang, P.J. & Luo, W.T., 2017, ApJ, 834, 8

3. Work Plan

3.1 Schedule

We plan to have 4 meetings in the period of two years, each with 3 or 4 days, and 2 in Beijing and 2 in Bern. Although our ISSI team has 16 members, they may not be able to participate to all the meetings. Some of our team members can also attend the meetings on their own research grants. Therefore we expect that the needed financial support from ISSI and ISSI-BJ will be <= 24 man-weeks.

The first kick-off meeting is panned for November 2018, and last for 3 days in Beijing. In this meeting, we will have presentations about Euclid and CSS-OS, and also from team members to introduce their work already done. We will then have extensive discussions and form different working groups for next-step studies.

The second meeting will be in April 2019 in Bern for 4 days. Day 1 will be the general meeting that different working groups will present their progress to all the participants. Then group discussions will be done extensively to discuss the identified problems and try to find solutions for next-step studies (day 2 and 3). Day 4 will be a summary meeting.

The third meeting will last for 4 days in Beijing in October 2019. It will consist of 1-day presentations, 2-day discussions, and 1-day summary.

The final meeting will be in Bern in April 2020. It will last for 3 days with 2-day presentations and 1-day final summary. We wish to identify further collaborations.

3.2 Facilities

We will require standard facilities available at ISSI-BJ and ISSI, including meeting rooms, video-projectors, discussion boards and WIFI connection. Chinese and Swiss power adaptors are needed in ISSI-BJ and in ISSI, respectively.

3.3 Financial support

We apply for the standard financial support offered by ISSI/ISSI-BJ, covering a per diem for the team members during the meetings in Beijing or in Bern. Part of the members can be self-supported.

The total financial support we require from ISSI/ISSI-BJ will not exceed 24 man-weeks. Under the Young Scientist scheme, we will request support for a few postdocs and Ph.D. students who contribute importantly to the project.

3.4 Added values

The role of ISSI/ISSI-BJ will be critically important to the success of the project. It is through ISSI/ISSI-BJ that scientists from Euclid and CSS-OS will be able to work closely together. The meetings supported by ISSI and ISSI-BJ will provide excellent opportunities for us to have concrete face-to-face discussions that are otherwise hard to realize.

4. The Team Members

Main members

China	Zuhui Fan (PKU & YNU): Statistical analyses and CSS-OS simulations
	Hu Zhan (NAOC): CSS-OS simulations and liaison to the engineering team
	Ran Li (NAOC): CSS-OS simulations and statistical analyses
	Jun Zhang (SJTU): Leader of the CSS-OS simulations and shear measurements
	Liping Fu (SHNU): Co-leader of CSS-OS shear measurements
	Guoliang Li (PMO): Numerical simulations and statistical analyses
France	Yannick Mellier (IAP): Euclid Consortium Lead
	Jean Luc Stark (CEA): Statistical analyses and shear measurements
	Martin Kilbinger (CEA): Statistical analyses and shear measurements
	Charling Tao (CPPM): Statistical analyses
Germany	Peter Schneider (Bonn): Leader of the statistical analyses
	Hendrik Hildebrandt (Bonn): Leader of Photo-z studies
	Tim Schrabback (Bonn): Shear measurements and statistics analyses
	Huanyuan Shan (Bonn): Shear measurements and statistical analyses
Switzerland	Jean-Paul Kneib (EPFL): Statistical analyses and photo-z studies
U.S.A.	Brice Menard (JHU): Statistical analyses

Other experts who potentially contribute to the project:

Pengjie Zhang (SJTU): Statistical analyses
Xi Kang (PMO): Numerical simulations
Yan Gong (NAOC): Photo-z studies

CVs of team members in alphabet order of last name

NAME, First Name: **FAN, Zuhui**

Affiliation: Department of Astronomy, School of Physics, Peking University (PKU)
& South-Western Institute for Astronomy Research (SWIFAR), Yunnan University (YNU)

Role in the project: Coordinator of the team; Statistical analyses and CSS-OS simulations

Current position: Professor, Department of Astronomy, School of Physics, PKU &
Professor, SWIFAR, YNU (from June 2018)

Former Position(s): 2002.06 – now: Professor, Department of Astronomy, PKU
1996.01 - 2002.06: Visiting Scientist, Department Astronomy and Astrophysics, University of Chicago
1999.09 – 2000.02: Postdoc, Taiwan University & ASIAA, Taiwan

Education: 1990.09 – 1995. 12: Ph.D., Department of Physics， University of Washington
1985.09 – 1988.07: Master in Physics, Department of Physics, PKU
1981.09 – 1985.07: Bachelor in Physics, Department of Physics, PKU

Services in National and/or International Committees (last ones):

2013 -2017: Member of the Advising Committee for Astronomy Education, Ministry of Education of the People's Republic of China
2008, 2009, 2014: Member of the final Review Committee for research grant application, National Natural Science Foundation of China (NSFC)

Honors: 2014.01 – 2018.12: PI of the key NSFC research project on "Cosmological studies with CFHTLenS and VOICE"
2016: Excellent Graduate Teaching Award, PKU
2014: Excellent Research Award, ZhongShengBiao Foundation, PKU
2007: YangFuQing--WangYangYuan Award for Excellent Research and Teaching, PKU

Selected Publications:

- Yuan, S., Liu, X.K., Pan, C.Z., Wang, Q., & Fan, Z.H., 2018, ApJ, in press, arXiv: 1803.09410, *Projection Effects of Large-Scale Structures on Weak-Lensing Peak Abundances*
- Liu, X.K., Li, B.J., Zhao, G.B., Chiu, M.C., Fang, W., Pan, C.Z., Wang, Q., Du, W., Yuan, S., Fu, L.P. & Fan, Z.H., 2016, PRL, 117, 051101, *Constraining f(R) Gravity Theory Using Weak Lensing Peak Statistics from the Canada-France-Hawaii-Telescope Lensing Survey*
- Liu, X.K.,Pan,C.Z., Li, R., Shan, H.Y., Wang, Q., Fu, L.P., Fan, Z.H., Kneib, J.-P., Leauthaud, A., van Waerbeke, L., Makler, M., Moraes, B., & Charbonnier, A., 2015, MNRAS, 450, 2888, *Cosmological Constraints from Weak Lensing Peak Statistics with Canada-France-Hawaii Telescope Stripe 82 Survey*
- Du, W. & Fan, Z.H. , 2014, ApJ, 785, 57, *Effects of Center Offset and Noise on Weak –Lensing Derived Concentration-Mass Relation of Dark Matter Halos*
- Fan, Z.H., Shan, H.Y. & Liu, J.Y., 2010, ApJ, 719, 1408, *Noisy Weak-Lensing Convergence Peak statistics near Clusters of Galaxies and beyond*
- Sun, L., Fan, Z.H., Tao, C., Kneib, J.-P.,Jouvel, S., & Tilquin, A., 2009, ApJ, 699, 958, *Catastrophic Photo-z Errors and Dark Energy Parameter Estimates with Cosmic Shear*
- Fan, Z.H., 2007, ApJ, 669, 10, *Intrinsic Alignments of Galaxies and Their Effects on Weak-Lensing Detections of Mass Concentrations*

MEMBERS TEAM CV (1 page / core member team; 2 page / team leader/s)

NAME, First Name: **FU, Liping**

Affiliation: Shanghai Key Lab for Astrophysics, Shanghai Normal University, Shanghai 200234, China

Role in the project: Co-leader of CSS-OS shear measurements

Current position: Professor of Shanghai Normal University

Former Position(s):

2008.3-2010.10 Marie Curie Postdoc Fellowship,
Astronomical Observatory of Capodimonte, Naples, Italy

Education:

2004.11-2008.3 Marie Curie PhD Fellowship, Institut d'Astrophysique de Paris, Paris, France; supervisor: Yannick Mellier

Services in National and/or International Committees (last ones):

Honors: Outstanding Youth Science Foundation of National Natural Science Foundation of China (2018.1 – 2020.12)

Selected Publications:

(1) Fu, L.，Semboloni, E.，Hoekstra, H.，Kilbinger, M.，van Waerbeke, L.，Tereno, I.，Mellier, Y.，Heymans. M.，Coupon, J.，Benabed, K.，Benjamin, J.，Bertin, E.，Dore, O.，Hudson, M.J.，Ilbert, O.，Maoli, R.，Marmo, C.，McCracken, H.J.，Menard, B.，Very weak lensing in the CFHTLS wide: cosmology from cosmic shear in the linear regime，Astronomy and Astrophysics，2 008.2.1，479(1):9~25

(2) Kilbinger, Martin，Fu, Liping，Heymans, Catherine，Simpson, Fergus，Benjamin, Jonathan，Erben, Thomas，Harnois-Deraps, Joachim，Hoekstra, Henk，Hildebrandt, Hendrik，Kitching, Thomas D.，Mellier, Yannick，Miller, Lance，Van Waerbeke, Ludovic，Benabed, Karim，Bonnett, Christopher，Coupon, Jean，Hudson, Michael J.，Kuijken, Konrad，Rowe, Barnaby，Schrabback, Tim，Semboloni, Elisabetta，Vafaei, Sanaz，Velander, Malin，CFHTLenS: combined probe cosmological model comparison using 2D weak gravitational lensing，Monthl y Notices of the Royal Astronomical Society，2013.4.01，430(3):2200~2220

(3) Fu, Liping，Kilbinger, Martin，Erben, Thomas，Heymans, Catherine，Hildebrandt, Hendrik，Hoekstra, Henk，Kitching, Thomas D.，Mellier, Yannick，Miller, Lance，Semboloni, Elisabetta，Simon, Patrick，Van Waerbeke, Ludovic，Coupon, Jean，Harnois-Deraps, Joachim，Hudson, Michael J.，Kuijken, Konrad，Rowe, Barnaby，Schrabback, Tim，Vafaei, Sanaz，Velander, Malin，CFHTLen S: cosmological constraints from a combination of cosmic shear two-point and three-point correlations，Monthly Notices of the Royal Astronomical Society，20 14.7.1，441(3):2725~2743

(4) Fu, Liping，Kilbinger, Martin，A new cosmic shear function: optimized E-/B-mode decomposition on a finite interval，Monthly Notices of the Royal Astronomical Society，2010.1.11，401(2):1264~1274

(5) Fu, Liping，Fan, Zuhui，Probing the dark side of the Universe with weak gravitational lensing effects，Research in Astronomy and Astrophysics，201 4.9.1，14(9):1061~1120

MEMBERS TEAM CV (1 page / core member team; 2 page / team leader/s)

NAME, First Name: **HILDEBRANDT, Hendrik**

Affiliation: Argelander-Institut für Astronomie, University of Bonn

Role in the project: Leader of Photo-z studies

Current position: Head of Emmy Noether Research Group

Former Position(s): Marie Curie International Outgoing Fellowship

Education: PhD in astronomy from University of Bonn (2007)

Services in National and/or International Committees (last ones):

- SOC member for the conference “Bright and Dark Universe”, Naples, 2017.
- External PhD examiner for three PhD defenses in Leiden and Barcelona.
- Representative of the academic staff in the board of the AIfA (2012-2013).

Honors:

- 2018: STFC Ernest Rutherford Fellowship, GBP 660k for 5 years
- 2017: ERC Consolidator Grant, EUR 2M for 5 years
- 2017: DFG Heisenberg Fellowship, EUR 530k for 3 years
- 2015: Reader in Theoretical Astrophysics at QMU London (declined)
- 2012: Emmy Noether Junior Research Group EUR 1.2M for 5 years
- 2010: Marie Curie International Outgoing Fellowship, EUR 221k (3 years)
- 2010: CITA National Fellowship

Selected Publications:

- Hildebrandt H. et al. 2017, ”KiDS-450: cosmological parameter constraints from tomographic weak gravitational lensing”, MNRAS, 465, 1454
- Kuijken K., Heymans C., Hildebrandt H. et al. 2015, ”Gravitational lensing analysis of the Kilo-Degree Survey”, MNRAS, 454, 3500
- Erben T., Hildebrandt H. et al. 2013, ”CFHTLenS: imaging data and catalogue products”, MNRAS, 433, 2545
- Hildebrandt H. et al. 2012, ”CFHTLenS: improving the quality of photometric redshifts with precision photometry”, MNRAS, 421, 2355
- Hildebrandt H. et al. 2010, ”PHAT: PHoto-z Accuracy Testing”, A&A, 523, A31
- Hildebrandt H., Wolf C., Benı´tez N. 2008, ”A blind test of photometric redshifts on ground based data”, A&A, 480, 703
- Hildebrandt H., et al. 2013, ”Inferring the mass of submm galaxies by exploiting their magnification of background galaxies”, MNRAS, 429, 3230
- Hildebrandt H. et al. 2009, ”CARS III. First detection of cosmic magnification in samples of normal high-z galaxies”, A&A, 507, 683

MEMBERS TEAM CV (1 page / core member team; 2 page / team leader/s)

NAME, First Name: **KILBINGER, Martin**

Affiliation: CEA Saclay/Irfu/SAp

Role in the project: Team member, Statistical analyses and shear measurements

Current position: Faculty at CEA Saclay/DAp, since 2011

Former Position(s):

2009-2011	Postdoc at University Munich (LMU) and Excellence Cluster Universe Garching
2009	Visiting postdoc at Shanghai Normal University, China (3 months)
2006-2009	Postdoc at IAP, France
2006	Postdoc at Bonn University, Germany

Education:

2005	PhD at University Bonn, Germany, supervisor: Peter Schneider
2002	MSc (equiv.) in physics, University Bonn, Germany
2000	MSc (equiv.) in astronomy, University Nice, France

Honors:

2013	Regional grand for PhD student, 102,200 Euro
2012	1, 000 Euro for travel and collaboration with China from the CNRS LIA Origins program
2006	PhD award for best thesis

Selected Publications:

C.-A. Lin and **M. Kilbinger**. A new model to predict weak-lensing peak counts. II. Parameter constraint strategies. A&A, 583:A70, 2015

M. Kilbinger. Cosmology with cosmic shear observations: a review. Reports on Progress in Physics, 78(8):086901, 2015

M. Kilbinger, L. Fu, C. Heymans, F. Simpson, et al. CFHTLenS: cosmological model comparison using 2D weak lensing. MNRAS, 430:2200, 2013

M. Kilbinger, D. Wraith, C. P. Robert, K. Benabed, et al.. Bayesian model comparison in cosmology with Population Monte Carlo. MNRAS, 405:2381–2390, 2010

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Research Topics:

Science: Cosmology, Dark Energy, Redshift Surveys, Dark Matter, Gravitational Lensing, Cluster of Galaxies, Dark Ages, Formation and Evolution of Galaxies (http://lastro.epfl.ch)
Instrumentation: Developing Fiber Positioner Robotic System (http://astrobots.epfl.ch)
Management: co-Lead of the Swiss SKA board (http://ska.epfl.ch/)

Role in Project:

Statistical analysis of weak lensing (in particular galaxy-galaxy lensing), photometric redshifts and their requirement on the definition of the filters (e.g. Jouvel, Kneib et al 2009).

Professional History:

- 2017-today Director of the EPFL Space Engineering Center (http://espace.epfl.ch)
- 2016-today Director of the EPFL Laboratory of Astrophysics
- 2012-today Professor at the EPFL Laboratory of Astrophysics (ERC Advanced Grant laureate)
- 2007-2012 Director of Research (CNRS equivalent of Professor)
- 2005-2012 Head of the Cosmology group (~30 people including students and postdocs)
- 2004-2007 Research scientist (CNRS) at the Laboratoire d'Astrophysique de Marseille (LAM)
- 2002-2004 Visiting Professor at the California Institute of Technology (Caltech)
- 1996-2004 Research scientist (CNRS) at the Astrophysical Laboratory of Toulouse
- 1994-1996 Marie Curie fellowship at the Institute of Astronomy, Cambridge, UK
- 1993-1994 Fellowship at the Astronomy department at ESO/La Silla, Chile
- 1990-1993 PhD thesis at Toulouse University, France - supervisors: B. Fort and Y. Mellier.

Training: *advisor of 23 PhD students and 15 Post-Docs*

Research Projects and Grants (last 5 years):

- 2018-2021: Cosmology with 3D maps of the Universe (SNF: 1'200kCHF)
- 2018-2021: 4MOST Cosmology (SNF Flare: 807kCHF; EPFL: 500 kCHF)
- 2016-2019: MOONS for VLT (SNF Flare co-applicant: 270kCHF in 2016, 1'460kCHF in 2017)
- 2016-18: Multi-tracer cosmology with eBOSS (SNF: 220 kCHF)
- 2015-17: *DESI Building the fiber positioner robotic system* (SNF/FLARE+EPFL: 750 kCHF)
- 2014-16: *Developing a robot-positioners system for massive spectroscopic surveys* (SNF: 115 CHF)
- 2012-17: *Light on the Dark* - ERC Advanced grant (2.5 MEuros)

Publications:

- Full Publication: ***426 publications, ~37,100 citations, h factor: 93 (from ADS)***
  http://adsabs.harvard.edu/abstract_service.html
- ResearcherID: http://www.researcherid.com/rid/A-7919-2015

International Review Committees (last five years):

- In the last five years, I was member of the Observing Program Committee of the: European Southern Observatory, XMM-Newton space telescope, Hubble Space Telescope, and James Web Space Telescope.
- Evaluation panel member: SNF/Ambizione-Prima, ANR (France), ERC starting grant (Europe)

Involvement in large projects (last five years):

- 2018-: Member of the SDSS-V collaboration (developing robotic fiber positioning system)
- 2016-: Co-lead of the Swiss SKA board (http://ska.epfl.ch)
- 2016-: Co-PI of the cosmology survey of the 4MOST project
- 2013-: Member of the SKA cosmology working group
- 2013-: Member of the DESI collaboration (targeting & robotic fiber positioning system)
- 2012-: Principal Investigator of the SDSS-IV "extended-BOSS" (eBOSS) project [since 2018: Deputy PI].
- 2010-: co-lead of the Euclid Strong Lensing Science Group

Awards:

- 2012: ERC Advanced Grant - project "Light on the Dark" (LIDA)
- 2010: CNRS Award of Scientific Excellence, awarded to scientists for their excellence research.
- 2004: Prize of the French Astronomy & Astrophysical Society, awarded to the most talented young researcher.

MEMBERS TEAM CV (1 page / core member team; 2 page / team leader/s)

NAME, First Name: **LI, Guoliang**

Affiliation: Purple Mountain Observatory(PMO), CAS, China

Role in the project: Ray-tracing simulation of weak lensing effects, PSF reconstruction, shear measurement and analysis of the systematic bias.

Current position: Research Professor

Former Position(s): Postdoc

Education:

Ph.D. **(2006)** *Astrophysics*, Shanghai Astronomical Observatory, CAS, China
2006–2007, *Research Assistant*, Purple Shanghai Astronomical Observatory, China
2007–2009, *Postdoc* and Alexander von Humboldt Fellow, Bonn University, Germany
2010 – 2011,*Postdoc, Purdue University, USA*
2012– now, *Research Professor*, Purple Mountain Observatory, China

Selected Publications:

1. Wei, C.L.; Li, G.L.; Kang, X.; Luo, Y.; Xia, Q.; and 13 coauthors, "Full-sky Ray-tracing Simulation of Weak Lensing Using ELUCID Simulations: Exploring Galaxy Intrinsic Alignment and Cosmic Shear Correlations", 2018, ApJ, 853,25
2. Li, G. L.; Wang, L., "How to co-add images? I. A new iterative method for image reconstruction of dithered observations", 2017, RAA, 17, 100
3. Li, B.S.; Li, G.L.; Cheng, J.; Peterson, J.; Cui, W.," The point spread function reconstruction by using Moffatlets — I", 2016, RAA, 16, 139
4. Li, G. L.; Xin, B.; Cui, W., "Shape measurement by using basis functions",2013, Astrophysics from Antarctica, Proceedings of the International Astronomical Union, IAU Symposium, Volume 288, pp. 306-308
5. Kitching, T. D.; Rowe, B.; Gill, M.; Heymans, C.; Massey, R.; Witherick, D.; Courbin, F.; Georgatzis, K.; Gentile, M.; Gruen, D.; Kiplinger, M.; Li, G. L.; Mariglis, A. P.; Meylan, G.; Storkey, A.; Xin, B.," Image Analysis for Cosmology: Results from the GREAT10 Star Challenge",2013, ApJS,205,12
6. Er, X.Z.; Li, G.L.; Mao, S.; Cao, L.," Gravitational lensing effects on submillimetre galaxy counts", 2013, MNRAS,430,1423
7. Li, G. L.; Mao, S.; Jing, Y. P.; Lin, W. P.; Oguri, M.," Properties of wide-separation lensed quasars by clusters of galaxies in the Sloan Digital Sky Survey", 2007, MNRAS,378,469
8. G.L. Li, S. Mao, Y.P. Jing, M. Bartelmann, X. Kang and M. Meneghetti, "Is the number of giant arcs in ΛCDM consistent with observation?", 2005, ApJ, 635, 795

MEMBERS TEAM CV (1 page / core member team; 2 page / team leader/s)

NAME, First Name: **LI, Ran**

Affiliation: National astronomical observatories of China (NAOC)

Role in the project: CSS-OS Simulations and statistical analysis

Current position: Professor

Former Position(s):

2013-2017 associate professor, NAOC

2011-2013 postdoc, NAOC

Education:

2006-2009, PhD, Department of astronomy, Peking University

2002-2006, B.S., Department of astronomy, Peking University

Services in National and/or International Committees (last ones): n/a

Honors: n/a

Selected Publications:

[1] Li, Ran ; Shan, Huanyuan; Kneib, Jean-Paul; Mo, Houjun; Rozo, Eduardo; Leauthaud, Alexie; Moustakas, John; Xie, Lizhi; Erben, Thomas; Van Waerbeke, Ludovic; Makler, Martin; Rykoff, Eli; Moraes, Bruno, "Measuring subhalo mass in redMaPPer clusters with CFHT Stripe 82 Survey", MNRAS, 2016.5.21, 458(3): 2573~2583

[2] Li, Ran ; Frenk, Carlos S.; Cole, Shaun; Gao, Liang; Bose, Sownak; Hellwing, Wojciech A., Constraints on the identity of the dark matter from strong gravitational lenses, MNRAS , 2016.7.21, 460(1): 363~372

[3] Li,Ran ; Shan,Huanyuan; Mo, Houjun; Kneib,Jean-Paul; Yang,Xiaohu, First galaxy-galaxy lensing measurement of satellite halo mass in the CFHT Stripe-82 Survey, MNRAS, 2014, 438(4): 2864~2870

[4] Li, Ran ; Mo, H. J.; Fan, Zuhui; Yang, Xiaohu; van den Bosch, Frank C., Constraining the substructure of dark matter haloes with galaxy-galaxy lensing , Monthly Notices of the Royal Astronomical Society, 2013.4, 430(4): 3359~3375

[5] Li, Ran; Mo, H. J.; Fan, Zuhui; Cacciato, Marcello; van den Bosch, Frank C.; Yang, Xiaohu; More, Surhud, Modelling galaxy-galaxy weak lensing with Sloan Digital Sky Survey groups , MNRAS, 2009.4.1, 394(2): 1016~1030

MEMBERS TEAM CV (1 page / core member team; 2 page / team leader/s)

NAME, First Name: **MELLIER, Yannick**

Affiliation: Institut d'Astrophysique de Paris

Role in the project: Weak lensing analysis and measurements

Current position: Astronomer, IAP in Paris

Education: PhD in astrophysics from Toulouse, France (1987)

Services in National and/or International Committees (last ones):

- Euclid Consortium Lead
- Network coordinator of the LENSNET RTN (FP4) European network
- Node coordinator of the AstroWise RDT (FP5) European network
- Node coordinator of the AVO RDT (FP5) European network
- CO-PI of CFHT-LS Wide survey
- Node coordinator of European DUEL network

Honors: CNRS Silver Medal （２００９）

Selected Publications:

[1] "Testing the accuracy of clustering redshifts with simulations", Scottez, V.; Benoit-Lévy, A.; Coupon, J.; Ilbert, O.; Mellier, Y., 2018, NMRAS, 474, 392

[2] " Detection of non-Gaussian Signatures in the VIRMOS-DESCART Lensing Survey ", Bernardeau, F.,Mellier, Y., L. van Waerbeke, 2002, A&A, 389, L28

[3] "Weak lensing study of galaxy biasing", Henk Hoekstra, L. van Waerbeke, Michael D. Gladders, Yannick Mellier, H.K.C. Yee, 2002, ApJ, 577, 604

[4]" Likelihood Analysis of Cosmic Shear on Simulated and VIRMOS-DESCART Data ", L. van Waerbeke, Y. Mellier, R. Pello, U-L. Pen, H.J. McCracken, B. Jain 2002, A&A, 393, 369

[5] “Detection of correlated galaxy ellipticities on CFHT data: first evidence for gravitational lensing by large-scale structures”, van Waerbeke, L., Mellier, Y., Erben, T. et al. , 2000, A&A, 358, 30

[6]"Probing the Universe with Weak Lensing",Mellier, Y., 1999 , ARAA, 37, 127

MEMBERS TEAM CV (1 page / core member team; 2 page / team leader/s)

NAME, First name: MENARD, Brice

Affiliations: Johns Hopkins University, department of Physics & Astronomy
Kavli IPMU, Tokyo University

Role in the project: advising on statistical analyses

Current position: Professor of Physics & Astronomy
LSST representative for Johns Hopkins University
Member of the Euclid, WFIRST, SDSS4 and PFS Collaborations

Former Position(s): Senior Research associate at CITA, University of Toronto
Postdoctoral fellow at the Institute for Advanced Study, Princeton

Education: PhD from the University of Paris
& the Max Planck Institute for Astrophysics

Services in National and/or International Committees (last ones):
reviewer for NSF & NASA astrophysics research grant proposals

Honors: Packard fellow, E. Schmidt fellow, Kavli fellow, Sloan Fellow

Selected Publications:

"Detection of Cosmic Magnification with the Sloan Digital Sky Survey". Scranton, Ryan; Ménard, Brice; Richards, Gordon T. et al., 2005ApJ...633..589

"Measuring the galaxy-mass and galaxy-dust correlations through magnification & reddening." Ménard, Brice; Scranton, Ryan; Fukugita, Masataka; Richards, Gordon, 2010MNRAS.405.1025M

"Clustering-based redshift estimation: method and application to data", Ménard, Brice; Scranton, Ryan; Schmidt, Samuel; et al., 2013arXiv1303.4722M

"Exploring the SDSS photometric galaxies with clustering redshifts", Rahman, Mubdi; Mendez, Alexander J.; Ménard, Brice; Scranton, Ryan et al, 2016MNRAS.460..163

"Clustering-based redshift estimation: comparison to spectroscopic redshifts", Rahman, Mubdi; Ménard, Brice; Scranton, Ryan; Schmidt, Samuel et al., 2015MNRAS.447.3500R

MEMBERS TEAM CV (1 page / core member team; 2 page / team leader/s)

NAME, First Name: **SCHNEIDER, Peter**

Affiliation: AIfA, University of Bonn

Role in the project: Member

Current position: Full Professor (since 2000)

Former Position(s): Research Staff, MPA, Garching, Postdoc JILA, Colorado (1986-88)

Education: Univ. Bonn: Diploma 1983, PhD 1984, Habilitation 1992

Services in National and/or International Committees (last ones): Chair XMM-Newton OTAC (2017-2020), Chair Euclid Consortium Editorial Board (since 2015), Chair Visiting Committee AIP Potsdam (2013-2016), Study Advisor Astronomy Univ. Bonn (since 2015), Member of Scientific Advisory Committee MPIA Heidelberg (2015-2020), Co-Chair of the ERC-PE9 Panel for Consolidator Grants (2013, 2015), Chairman of the Department of Physics & Astronomy at Bonn University (2008-2010)

Honors: Dieter-Rampacher-Preis 1985, awarded for the youngest Ph.D. in the Max-Planck-Society, Otto-Hahn-Medaille der Max-Planck-Gesellschaft 1985, GEFFRUB-Preis der Univ. Bonn 1985, Physik-Preis der Akademie der Wissenschaften zu Goettingen 1986, Membership Deutsche Akademie der Naturforscher Leopoldina since 2003, Appointment offer: Chair in Astrophysics, Imperial College London, 2006 (declined), Appointment offer: Full Professor of Physics, School of Basic Sciences, Ecole Polytechnique Federale de Lausanne, 2007 (declined)

Selected Publications: Schneider, P., Ehlers, J. and Falco, E.E.: 1992, ``Gravitational Lenses'', a monograph, 560 pages, 103 figures,Astronomy and Astrophysics Library, Springer-Verlag, New York; Schneider, P., Kochanek, C.S. & Wambsganss, J.: 2006, ``Gravitational Lensing: Strong, Weak & Micro'', Saas-Fee Advanced Course 33, Swiss Society for Astrophysics and Astronomy, G. Meylan, P. Jetzer & P. North (Eds.), 552 pages, 196 figures, Springer-Verlag: Berlin; Schneider, P.: 2015, ``Extragalactic Astronomy and Cosmology. An Introduction'', Second Edition, 626 pages, 514 figures, Springer-Verlag: Berlin; Bartelmann, M. & Schneider, P.: 2001, ``Weak gravitational lensing'', Physics Reports 340, 291—472; Schneider, P., van Waerbeke, L., Jain, B. & Kruse, G.: 1998, ``A new measure for cosmic shear'', MNRAS 296, 873—892;

MEMBERS TEAM CV (1 page / core member team; 2 page / team leader/s)

NAME, First Name: **SCHRABBACK, Tim**

Affiliation: Argelander Institute for Astronomy, Bonn University, Germany

Role in the project: Shear measurements and statistics analyses

Current position: Research staff

Former Position(s): PDR at Leiden University, KIPAC Fellow at Stanford University

Education: Diploma in Physics (Bonn University), PhD in Astronomy (Bonn University)

Services in National and/or International Committees (last ones): ESO Time Allocation Committee : 3x member of the Cosmology Expert Panel (P99-P101)

Honors: KIPAC Fellowship (Stanford University)

Selected Publications:

1. Schrabback, T., et al. (12 authors) 2007, “Cosmic shear analysis of archival HST/ACS data. I. Comparison of early ACS pure parallel data to the HST/GEMS survey”, A&A, 468, 823 (25 pages, 69 citations).

2. Schrabback, T. et al. (22 authors) 2010, “Evidence of the accelerated expansion of the Universe from weak lensing tomography with COSMOS”, A&A, 516, A63 (26 pages, 251 citations).

3. Schrabback, T. et al. (19 authors) 2015, “CFHTLenS: weak lensing constraints on the ellipticity of galaxy-scale matter haloes and the galaxy-halo misalignment”, MNRAS, 454, 1432 (21 pages, 17 citations).

4. Schrabback, T. et al. (29 authors) 2018a, “Cluster Mass Calibration at High Redshift: HST Weak Lensing Analysis of 13 Distant Galaxy Clusters from the South Pole Telescope Sunyaev-Zel’dovich Survey”, MNRAS, 474, 2635 (44 pages, 12 citations).

5. Schrabback, T. et al. (19 authors) 2018b, “Precise weak lensing constraints from deep high-resolution Ks images: VLT/HAWK-I analysis of the super-massive galaxy cluster RCS2J232727.7-020437 at z = 0.70”, A&A, 610, A85 (17 pages).

Curriculum Vitae

Dr. Huanyuan SHAN

Argelander-Instituts für Astronomie (AIfA), Universität Bonn,

Auf dem Hügel 71, 53121 Bonn, Germany

Phone: +49 17625585215

E-Mail: shanhuany@gmail.com

Positions

- 2016-present, Postdoc, AIfA, Bonn, Germany
- 2012-2016, Postdoc (Marie-Curie Fellowship), LASTRO, EPFL, Switzerland
- 2010-2012, Postdoc, Tsinghua Center for Astrophysics, Tsinghua University, China
- 2008-2010, Postdoc, Astronomy Dept., Peking University, China

Education

- 2003-2008, PhD, National Astronomy Observatory, Chinese Academy of Sciences, China

Role in the project

- Shear measurements and statistical analyses

Research Interests

- Weak gravitational lensing as a probe of dark matter, dark energy, and modified gravity
- Galaxy formation, large scale structures, clusters of galaxies

Fellowships and awards (PI only)

- 2013-2015, Marie-Curie International Incoming Fellowship
- 2011-2014, National Natural Science Foundation of China
- 2011, China Postdoctoral Grant

Selected Publications (Total Refereed Publications: 37, citations~810)

- **H.Y. Shan,** X.K. Liu, H. Hildebrandt et al., "KiDS-450: Cosmological Constraints from Weak Lensing Peak Statistics-I: Inference from Analytical Prediction of high Signal-to-Noise Ratio Convergence Peaks", 2018, MNRAS, 474, 1116
- **H.Y. Shan,** J.-P. Kneib, R. Li, et al., "The Mass-Concentration Relation and the Stellar-to-Halo Mass Ratio in the CFHT Stripe 82 Survey", 2017, ApJ, 840, 104
- D. Eckert, M. Jauzac, **H.Y. Shan**, et al., "Warm-hot baryons comprise 5-10 per cent of filaments in the cosmic web", 2015, Nature, 528, 105
- **H.Y. Shan**, J.-P. Kneib, J. Comparat, et al., "Weak lensing mass map and peak statistics in CFHT/Stripe82 survey", 2014, MNRAS, 442, 2534
- **H.Y. Shan**, J.-P. Kneib, C. Tao, et al., "Weak lensing measurement of galaxy clusters in the CFHTLS Wide Survey", 2012, ApJ, 748, 56

MEMBERS TEAM CV (1 page / core member team; 2 page / team leader/s)

NAME, First Name: **STARCK, Jean-Luc**

Affiliation CEA, Astrophysics Department

Role in the project: High order statistics and mass map recovery

Current position: Head of the CEA CosmoStat laboratory

Former Position(s): Researcher at CEA Astrophysics Department

Education: PhD/Habilitation

Services in National and/or International Committees (last ones): Chair of the COSMO21 conference.

Honors: International Astrostatistics Association (IAA) Fellow Prize (2016), EADS Prize of the French Academie des Sciences (2011), Advanced ERC grant (2008).

Selected Publications:

- J.L. Starck, F. Murtagh, and J. Fadili, Sparse Image and Signal Processing: Wavelets and Related Geometric Multiscale Analysis, Cambridge University Press, Cambridge (GB), 2015 (450-pp).
- Peel, F. Lanusse and J.-L. Starck, "Sparse reconstruction of the merging A520 cluster system", Astrophysical Journal, 847, 1, article id. 23, pp13, 2017.
- S. Farrens, J.-L. Starck and F.M. Ngolè Mboula "Space variant deconvolution of galaxy survey images", Astronomy and Astrophysics, 601, id.A66, 12 pp, 2017.
- F. M. Ngolè Mboula, J.-L. Starck, K. Okomura, J. Amiaux, P. Hudelot. "Constraint matrix factorization for space variant PSFs field restoration", Inverse Problems, 32, 12, 2016.
- F. Lanusse, J.-L. Starck, A. Leonard, S. Pires, "High Resolution Weak Lensing Mass-Mapping Combining Shear and Flexion", Astronomy and Astrophysics, 591, id.A2, 19 pp, 2016.

MEMBERS TEAM CV (1 page / core member team; 2 page / team leader/s)

NAME, First Name: TAO, Charling

Affiliation: CPPM, IN2P3/CNRS, France

Role in the project: statistical analysis and the impact of systematic effects in weak lensing measurements on multi-probe determination of cosmological parameters

Current position: Director of Research CNRS, co-lead of SN and Transients in Euclid

Former Position(s): Director Tsinghua Center for Astrophysics (2010-2017)

Education: U. Paris XI Orsay, PhD Harvard U., Habilitation U.Aix Marseille

Services in National and/or International Committees (last ones): CNRS, China

Selected Publications:

1) **Signatures of the Primordial Universe from Its Emptiness: Measurement of Baryon Acoustic Oscillations from Minima of the Density Field,** *Kitaura F., Chuang,C, Liang Y., Zhao C., Tao, C., et al..,* Phys. Rev. Lett. 116, 171301 (2016)

2) **Weak lensing mass map and peak statistics in Canada-France-Hawaii Telescope Stripe 82 survey,** Shan HY et al., MNRAS, (2014) 442, p.2534-2542

3) **Observational constraints on cosmic neutrinos and dark energy revisited**, Wang X. et al., JCAP (2012) Issue 11, article id. 018

4) Weak Lensing Measurement of Galaxy Clusters in the CFHTLS-Wide Survey, Shan HY, Kneib JP, Tao C. et al., ApJ, (2012) 748, Issue 1, article id. 56, 22 pp

5) Catastrophic Photo-z Errors and the Dark Energy Parameter Estimates with Cosmic Shear, Sun L., Fan ZH, Tao C, et al. ApJ (2009) 699, Issue 2, pp. 958-967

6) Prospects for dark energy evolution: a frequentist multi-probe approach, Yeche,C, Ealet, A, Refregier, A, Tao, C., et al., A&A (2006) 448, pp.831-842

7) Constraining cosmological parameters with observational data including weak lensing effects, Li H., Liu J., Xia JQ, Sun L., Fan ZH, Tao C. et al., Physics Letters B, (2009) 675 p. 164-169.

8) **The Supernova Legacy Survey: measurement of Omega_M, Omega_Lambda and w from the 1st year data set,** *Astier et al.* [*SNLS* Collaboration] A&A 447, 31-48 (2006)

9) Direct Detection of Dark Matter with NaI(Tl) Crystals
Bacci C. et *al*., *Phys*. *Lett*. B293 (*1992*), 460

10)Solar neutrinos observed by GALLEX at Gran Sasso., *Anselmann, P. et al. (GALLEX Collaboration)*, Phys. Lett. **B285** (1992) 376-389.

11) The UA1 experiment, a review *by C. Tao*, Int. J. of Modern Physics, A1 (1986), 749-880

MEMBERS TEAM CV (1 page / core member team; 2 page / team leader/s)

NAME, First Name: **ZHAN, Hu**

Affiliation: National Astronomical Observatories of China

Role in the project: communicating between the engineering team of the CSS-OS project and members of this project; optimizing the CSS-OS operations simulation and carrying out part of the image simulation; charactering detector effects.

Current position: Professor, National Astronomical Observatories of China

Former Position(s): Assistant Project Physicist, University of California at Davis

Education:

Ph.D., University of Arizona, USA, May 2004

M.S., Arizona State University, USA, May 2000

B.Eng, Beijing University of Aeronautics and Astronautics, China, July 1996

Services in National and/or International Committees (last ones):

International Steering Committee, COSMO series conference

Membership Committee, LSST Dark Energy Science Collaboration

Honors: none

Selected Publications:

1. Reconstructing the Cosmic Expansion History with a Monotonicity Prior, Y. Xu, H. Zhan & Y.-K. E. Cheung, Journal of Cosmology and Astroparticle Physics accepted (1710.02947)
2. Cosmology with the Large Synoptic Survey Telescope: an Overview, H. Zhan & J. A. Tyson, Reports on Progress in Physics accepted (1707.06948)
3. Likelihood of the Power Spectrum in Cosmological Parameter Estimation, L. Sun, Q. Wang & H. Zhan 2013, Monthly Notices of the Royal Astronomical Society, 42, 4
4. Distance, Growth Factor, and Dark Energy Constraints from Photometric Baryon Acoustic Oscillation and Weak Lensing Measurements, H. Zhan, L. Knox & J. A. Tyson 2009, Astrophysical Journal, 690, 923
5. Cosmic Tomographies: Baryon Acoustic Oscillations and Weak Lensing, H. Zhan 2006, Journal of Cosmology and Astroparticle Physics, JCAP8(2006)8
6. Effect of Hot Baryons on the Weak-Lensing Shear Power Spectrum, H. Zhan & L. Knox 2004, Astrophysical Journal Letters, 616, L75

Last Name, First Name: ZHANG, Jun

Affiliation: Shanghai Jiao Tong University

Role in the project: Leader of the CSS-OS simulations and shear measurements

Current position: June 2012–present: Associate Professor, Astronomy Department, Shanghai Jiao Tong University, Shanghai, China

Former Position(s):

Sept 2009– June 2012: Postdoc, Astronomy Dept, UT Austin, Austin, TX, USA;

Sept 2006–Aug 2009: Postdoc, Astronomy Dept, UC Berkeley, Berkeley, CA, USA.

Education:

Ph.D. in Physics — Columbia University, New York, NY, USA, Sept 2000 – Aug 2006;

B.S. in Physics — Fudan University, Shanghai, China, Sept 1996 – June 2000.

Honors:

1000Plan Program for Young Talents, China, 2012;

TCC Fellowship, UT Austin, 2009;

TAC Fellowship, UC Berkeley, 2006;

T.D.Lee Physics Scholarship, Fudan University, 1997;

Hao Lai Xi Scholarship, Fudan University, 1996.

Selected Publications:

1. “Approaching the Cramer-Rao Bound in Weak Lensing with PDF Symmetrization”, by **JZ ***, Pengjie Zhang, Wentao Luo, 2017, ApJ, 834, 8;

2. “Accurate Shear Measurement with Faint Sources”, by **JZ ***, Wentao Luo, Sebastien Foucaud, 2015, JCAP, 01, 024;

3. “Cosmic Shears Should Not Be Measured In Conventional Ways”, by **JZ ***, Eiichiro Komatsu, 2011, MNRAS, 414, 1047;

4. “How to Grow a Healthy Merger Tree”, by **JZ ***, Onsi Fakhouri, Chung-Pei Ma, 2008, MNRAS, 389, 1521;

5. “Measuring the Cosmic Shear in Fourier Space”, by **JZ ***, 2008, MNRAS, 383, 113;

6. “Isolating Geometry in Weak Lensing Measurements”, by **JZ**, Lam Hui *, Albert Stebbins, 2005, ApJ, 635, 806.