

1 Curriculum Vitae Yann Rasera (2022)

D.O.B 5th August 1979

French

Married, 2 children

LUTH, Observatoire de Paris

Université Paris Cité

yann.rasera@obspm.fr/01 45 07 74 54

Education and employment

2013 : : **Habilitation** : “Cosmology and formation of the large scale structures of the universe”, Paris Diderot-Paris 7 University

2007- : **Associate professor** in “Physics (teaching) and Numerical Cosmology (research)” , Paris Cité University and Laboratoire Univers et THéorie (LUTH-UMR 8102)

2005-2007 : **Postdoc** “AGN-driven convection in galaxy-cluster plasmas” - Benjamin Chandran - University of New Hampshire (UNH) - USA

2005 : **PhD** ”Cosmic history of the baryon budget”- Supervisor : Romain Teyssier and Jean-Pierre Chièze - SAp- CEA Saclay - Paris Diderot-Paris 7 University, ED 127

2002 : **Master Astrophysics and methods** final grade 77% - Paris observatory - Paris Diderot-Paris 7 University

Research keywords

NUMERICAL COSMOLOGY, DARK ENERGY, DARK MATTER, GRAVITY, GALAXY FORMATION, CLUSTER OF GALAXIES, RELATIVISTIC EFFECTS, WEAK-LENSING, REDSHIFT SPACE DISTORTIONS, MISSING BARYONS, NEW PHYSICS, DIFFUSE BACKGROUND

Science production

>**36** refereed publications (>16 first or second author publications). Most of them are very complete theoretical/numerical papers (with detailed physical background, important numerical developments, very large simulations, often ignored convergence tests and careful comparison to analytical predictions) with small number of authors, where I have major contributions

Websites : "Origin of the large scale structures and content of the Universe (personal website)", "Consortium Dark Energy Universe Simulation, DEUSS pages", "IDRIS website : DEUSS page", "Horizon Project : DEUSS page", "Simulations of the first ages : the wind from galaxies is shaping the universe", RayGal page of the COS team website, Website of the “Action Nationale Dark Energy”

More than »**50 oral presentations** in national and international conferences, workshops, laboratories
Various **international collaborations** USA, Belg., Switz., Ita., Ger., UK, Braz., S. Af., Japan., Austral.

Main Consortium and responsibilities

2018-2022 : **Action nationale Dark Energy, ~100 pers., ~10 kE (“Co-PI groupe outils”)** + **Website of the Action** : Gather most of the people working on Dark Energy in France

2021-2022 : **Exascale France, ~200 pers., (participant)** : Working Group (to prepare the future of High Performance Computing in France)

2011-2022 : **Euclid (participant), ~1000 pers., ~1 GE** : ESA mission, Cosmological Simulation Working Group

2011-2016 : **ERC EDECS**, ~10 pers., ~1 ME (participant) : warm dark matter, inhomogeneous dark energy and simulations

2009-2022 : **Dark Energy Universe Simulation Consortium**, ~30 pers. (co-PI simulations 2009-2018, participant 2019-) : Dark Energy, Grand Challenge Simulations (DEUSS, Full Universe Run), imprints of dark energy on cosmic structure formation

2009-2013 : **BINGO! ANR**, ~15 pers., ~400 kE (co-PI simulations, head of Paris node) :) : Intergalactic gas, circum-galactic gas, metals, Active Galactic Nuclei, supernovae feedback

2007-2022 : **Yearly national CPU-time proposal about dark energy and simulations**, ~10 pers., 100-200 kE/yr, PI : Among largest in France, corresponding to about 100-200 kE/yr granted. Plus DEUSS and FUR Grand Challenge demands (co-writer).

2007-2020 : **COS Team : simulation PI** : CPU-time demand, organization of petabytes of data, local cluster demands and storage device demands (130 kE), code developments etc

2004-2008 : **Horizon project ANR (participant)** : numerical cosmology, Grand Challenge simulations, galaxy formation

Teaching : 192h per year since 2007

From Licence to Master :

Parallel computing, Numerical methods, Modelling Master 2 (M.Sc.)

Numerical physics, Mathematics and simulation of physical problems, Cosmology Master 1 (M.Sc.)

Signal processing, EIDD 2A

Algorithmics and programming, Waves and vibrations, Modern physics, Digital electronics, Numerical methods Licence 3 (B.S.)

Electronics, Wave Optics, Numerical methods, EIDD 1A

Introduction to electronics, Digital/analog electronics, Optics, Algorithmics and programming, Numerical Simulations, Flux and conservation laws, Licence 2 (B.S.)

“Tuteur stage EIDD” (2018-2022)

Online resource : M1 cosmology course, M2 modelisation project

Proposal to the CENS working group “Teaching of numerical methods” at Paris 7 University (2018)

Students

3 PhD students : Vincent Reverdy (co-advisor, 50%), Michel-Andrès Breton (100%), Inigo Saez Casares (100%)

6 internships Master 2 (100%), 1 internship Master 1 (100%), 2 internships Licence (100%)

Participation to the supervision of 7 postdocs of the team (33% and 50%)

PhD referee (2017)

2 “comités de suivi” (2019-2021)

Administration

Selection committee : AIM (2009), APC (2011), LUTH (2013), AIM (2021)

Member of the Paris Observatory Bureau “Structuration of the Universe” (2011-2013)

Laboratory Council (2019-2022)

Member of the Paris Observatory Bureau “Galaxies and Large Scale Structure” (2021-2022)

Member of the Paris Cité University Scientific Council (2021-2022)

Computing skills

OS : Unix, MacOSX, Windows

Software : Mathematica, latex, emacs, openoffice, powerpoint, word...

Languages : FORTRAN 95, IDL, python, C

Libraries and API : MPI, FFTW, Open-MP

Codes (developments/optimizations) :MPGRAFIC (initial condition generation), RAMSES (cosmological N-body and hydrodynamics code), TVD MHD (MHD solver), PFOF (halo finding), POWERGRID (power spectrum estimator), Magrathea (ray-tracer, mostly developed by my former PhD students), etc.

Awards

Bull Joseph Fourier Awards to Dark Energy Universe Simulation team (role : co-PI simulations) for Full Universe Run (FUR), High Performance Computing (HPC), national, 2012

HPC Wire Awards to Dark Energy Universe Simulation team for FUR (role : co-PI simulations), HPC, international 2012

Special jury Prize Big Data to Dark Energy Universe Simulation team for FUR (role : co-PI simulations), HPC, national, 2013

HPC Wire Awards to Dark Energy Universe Simulation team for FUR (role : co-PI simulations), HPC, international 2013

Grants

ANR BINGO! (2009-2013, see above)

1 year CNRS “accueil en delegation” : realisation of Full Universe Run (2011-2012)

Cluster and Storage demand DIM-ACAV (90 kE, 2012)

PhD DIM-ACAV grant 100 kE (2015)

Paris Observatory CS demand (2016)

1/2 CRCT Europe : ERC CosmicFluidGravity ranked B

JSPS invitation fellowship : 5 monthes in Japan at YITP/Kyoto University (2017)

YITP Invitation 2016 : 15 days, YITP Invitation 2019 : 10 days

Cosmology and structuration grant Paris Observatory(PI, 2016-2017-2018-2019-2020-2021)

PEDR (Prime d’encadrement Doctoral et de Recherche) : 2020-2024

DIM ACAV+ 2020 : cluster Infinity (750 kE) for numerical cosmology in “Ile de France”, Role : representative of Paris Observatory and PI of CS demand (30kE).

LUTH & CSAA Demand for 1PB storage device (50kE, participant)

Paris Observatory CS 2021 grant for storage device (participant)

ProGraceRay ANR proposal (PI) : phase 2, waiting for the results

Yearly CPU time proposal (see above)

Outreach

Images of the movie “Vibrato ou la musique du monde” (2007)

UNESCO conference (LOC) : Invisible Universe (2009)

Workshop « BINGO! Paris » (2010)

Visit of the Paris Observatory (2010)

Grand Public conference at Atrium de Chaville (2011)

GENCI report (2011)

Our work about the first ever cosmological simulation of structure formation in the entire volume of the observable Universe (Full Universe Run or FUR) received good echos in the medias (Web/TV/Radio/Newspapers) : JT France 2, France Info radio, RFI radio, CNRS news (several websites), Le Monde newspaper, Ciel & Espace journal, ORAP, Ca se discute (2012-2013)

Supercomputers supplement La Recherche November 2012

Participation to the CNRS movie about Full Universe Run (2013)

Conference Galaxy Cluster (LOC) (2020)

Atelier outils de l'Action Dark Energy (LOC) (2019, 2020)

Atelier Modified Gravity and Simulations Action DE (LOC) (2021)

Sciences et avenir ("L'infini") (2020)

RayGal Futura-Sciences article by L.Sacco (2021)

Fête de la science (participant) (2021)

RayGal news Physics UFR Paris Cité University, RayGal news Paris Observatory, RayGal news LAM (2022)

Data (major contributions to the creation of the cosmological simulations data available through the web) : Dark Energy Virtual Observatory, Dark Energy Universe Simulation database, Dark Energy Universe Simulation Parallel Universe Run, RayGal relativistic halo catalogs

Websites (see above)

Spoken languages

French : Mother tongue – English : fluent - Japanese : learning

2 Publications

Main refereed publications

These publications are available through ADS. My name is in bold and I have underlined the name of my PhD students.

Saga, S., Taruya, A., Breton, M.-A., **Rasera, Y.** 2022, arXiv :2112.07727, *Cosmological test of local position invariance from the asymmetric galaxy clustering*, [ADS link](#)

Lewis, J. S. W., Ocvirk, P., Sorce, J. G., **et al.** 2022, arXiv :2202.05869, *The short ionizing photon mean free path at $z=6$ in Cosmic Dawn III, a new fully-coupled radiation-hydrodynamical simulation of the Epoch of Reionization*, [ADS link](#)

Saga, S., Taruya, A., **Rasera, Y.**, Breton, M.-A., 2022, MNRAS, 511, 2732, *Detectability of the gravitational redshift effect from the asymmetric galaxy clustering*, [ADS link](#)

Rasera, Y., Breton, M.-A., Corasaniti, P.-S., et al. 2022, arXiv :2111.08745, accepted for publication in A&A, *The RayGalGroupSims cosmological simulation suite for the study of relativistic effects : an application to lensing-matter clustering statistics*, [ADS link](#)

Blot, L., Corasaniti, P.-S., **Rasera, Y.**, et al. 2021, MNRAS, 500, 2532., *Cosmological model parameter dependence of the matter power spectrum covariance from the DEUSPUR Cosmo simulations*, [ADS link](#)

Parimbelli, G., Anselmi, S., Viel, M., **et al.** 2021, JCAP, 2021, 009, *The effects of massive neutrinos on the linear point of the correlation function*, [ADS link](#)

Saga, S., Taruya, A., Breton, M.-A., **Rasera, Y.**, 2020, MNRAS, 498, 981, *Modelling the asymmetry of the halo cross-correlation function with relativistic effects at quasi-linear scales*, [ADS link](#)

Sugiura, H., Nishimichi, T., **Rasera, Y.**, et al., *Phase-space structure of cold dark matter haloes inside splashback : multistream flows and self-similar solution*, 2020, MNRAS, 493, 2765, [ADS link](#)

Adamek, J., **Rasera, Y.**, Corasaniti, P. S., Alimi J.M., *Ray tracing the integrated Sachs-Wolfe effect through the light cones of the dark energy universe simulation-full universe runs*, 2020, Phys.Rev.D., 101, 023512, [ADS link](#)

Taruya, A., Saga, S., Breton, M.-A., **Rasera, Y.**, *Wide-angle redshift-space distortions at quasi-linear scales : cross-correlation functions from Zel'dovich approximation*, 2020, MNRAS, 491, 4162, [ADS link](#)

Augustin, R., Quiret, S., Milliard, B., **et al.**, *Emission from the circumgalactic medium : from cosmological zoom-in simulations to multiwavelength observables*, 2019, MNRAS, 489, 2417, [ADS link](#)

Corasaniti, P. S., & **Rasera, Y.** *Average dark matter halo sparsity relations as consistency check of mass estimates in galaxy cluster samples*, 2019, MNRAS, 487, 4382, [ADS link](#)

Breton, M.-A., **Rasera, Y.**, Taruya, A., Lacombe, O., Shohei, S., *Imprints of relativistic effects on the asymmetry of the halo cross-correlation function : from linear to non-linear scales*, 2019, MNRAS, 483, 2671, [ADS link](#)

Blake, C., Achitouv, I., Burden, A., & **Rasera, Y.**, *The environmental dependence of the baryon acoustic peak in the Baryon Oscillation Spectroscopic Survey CMASS sample*, 2019, MNRAS, 482, 578, [ADS link](#)

Corasaniti, P. S., Ettori, S., **Rasera, Y.**, Sereno, M, Amodeo S, Breton M.-A., et al *Probing Cosmology with Dark Matter Halo Sparsity Using X-Ray Cluster Mass Measurements*, 2018, ApJ, 862, 40, [ADS link](#)

Hashimoto, I., **Rasera, Y.**, & Taruya, A., *Precision cosmology with redshift-space bispectrum : A perturbation theory based model at one-loop order*, 2017, Phys.Rev.D, 96, 043526, [ADS link](#)

Agarwal, S., Corasaniti, P.S, Das, S., & **Rasera, Y.**, *Small scale clustering of late forming dark matter*, 2015, Phys.Rev.D, 92, 063502, [ADS link](#)

Bouillot, V.R., Alimi, J.-M., Corasaniti, P.-S., & **Rasera, Y.**, *Probing dark energy models with extreme pairwise velocities of galaxy clusters from the DEUSFUR simulations*, 2015, 450, 145 [ADS link](#)

Blot, L., Corasaniti, P.S., Alimi, J.-M., Reverdy, V., & **Rasera, Y.**, *Matter power spectrum covariance matrix from the DEUSPUR LCDM simulations : mass resolution and non-Gaussian errors*, 2015, MNRAS, 446, 1756 [ADS link](#)

Achitouv, I., Wagner, C., Weller, J., **Rasera, Y.** *Computation of the Halo Mass Function Using Physical Collapse Parameters : Application to Non-Standard Cosmologies*, 2014, JCAP, 10, 077, [ADS link](#)

Rasera, Y., Corasaniti, P-S., Alimi, J-M., Bouillot, V., Reverdy, V. & Balmès, I., *Cosmic variance limited BAO from DEUSFUR LCDM simulation*, 2014, MNRAS, 440, 1420, [ADS link](#)

Roy, F., Bouillot, V., **Rasera, Y.**, *pFoF : a highly scalable halo-finder for large cosmological data sets*, 2014, A&A, 564, AA13, [ADS link](#)

Balmès, I., **Rasera, Y.**, Corasaniti, P.-S., Alimi, J.-M. *Imprints of dark energy on cosmic structure formation - III. Sparsity of dark matter halo profiles* 2013, Monthly Notices of the Royal Astronomical Society 2736, [ADS link](#)

Achitouv, I., **Rasera, Y.**, Sheth, R. K., & Corasaniti, P. S., *Self-consistency of the Excursion Set Approach*, 2012, Physical Review Letters, 111, 231303, [ADS link](#)

Knebe *et al*, *Structure finding in cosmological simulations : the state of affairs*, 2013, MNRAS, 435, 1618-1658, [ADS link](#)

Alimi, J.-M., Bouillot, V., **Rasera, Y.**, Reverdy V. et al. 2012, IEEEComputer Soc. Press, CA, USA, SC2012, Article No 73., *Full Observable LCDM Universe Simulation : the numerical challenge*, Supercomputing2012 (be careful in the HPC community refereed conference articles are the most important

ones such as this one : 4 referee, acceptance rate 20%, Supercomputing conference is one of HPC high-light !),[ADS link](#)

Frank, S., **Rasera, Y.**, Vibert, D., et al. , *Observable signatures of the low-z circumgalactic and intergalactic media : ultraviolet line emission in simulations*, 2012, MNRAS, 420, 1731 ,[ADS link](#)

Knebe *et al*, *Haloes gone MAD : the halo-finder comparison project*, 2011, MNRAS, 415, 2293 ,[ADS link](#)

Courtin, J., **Rasera, Y.**, Alimi, J.-M., Corasaniti, P.-S., Boucher, V., Fuzfa, A., *Imprints of dark energy on cosmic structure formation : II) Non-Universality of the halo mass function*, 2011, MNRAS, 410, 1911,[ADS link](#)

Alimi, J.-M., Fuzfa, A., Boucher, V., **Rasera, Y.**, Courtin, J., Corasaniti, P.-S., *Imprints of dark energy on cosmic structure formation - I. Realistic quintessence models and the non-linear matter power spectrum*, 2010, MNRAS, 401, 775,[ADS link](#)

Devriendt, J., et al., *The dusty, albeit ultraviolet bright, infancy of galaxies*, 2010, MNRAS, 403, L84,[ADS link](#)

Rasera, Y., Lynch, B., Srivastava, K., Chandran, B., *Abundance Profiles in Cooling-core Clusters : a Fossil Record of Past AGN-driven Convection ?*, 2008, ApJ, 689, 825,[ADS link](#)

Rasera, Y., Chandran, B. 2008, *Numerical Simulations of Buoyancy Instabilities in Galaxy Cluster Plasmas with Cosmic Rays and Anisotropic Thermal Conduction*, ApJ, 685, 105,[ADS link](#)

Chandran, B., **Rasera, Y.**, *Convection and AGN Feedback in Clusters of Galaxies*, 2007, ApJ, 671, 1413,[ADS link](#)

Rasera, Y., Teyssier, R., Sizun, P., Casse, M., Fayet, P., Cordier, B., Paul, J., *Soft gamma-ray background and light dark matter annihilation*, 2006, Phys. Rev. D, 73, 103518,[ADS link](#)

Rasera, Y., Teyssier, R., *The history of the baryon budget. Cosmic logistics in a hierarchical universe*, 2006, A&A, 445, 1,[ADS link](#)

Main refereed conference publications

Reverdy, V., Alimi, J.-M., Bouillot, V., **Rasera, Y.**, Corasaniti, P.-S., Balmès, I., et al, 2013 , Full Observable Universe Simulations : the numerical challenge, EASC 2013

Rasera, Y., Alimi, J.-M., Courtin, J., Roy, F., Corasaniti, P.-S., Fuzfa, A., Boucher, V., *Introducing the Dark Energy Universe Simulation Series (DEUSS)*, 2010, American Institute of Physics Conference Series, 1241, 1134,[ADS link](#)

Courtin, J., Alimi, J.-M., **Rasera, Y.**, Corasaniti, P.-S., Fuzfa, A., Boucher, V., *Imprints of dark energy on structure formation : no universality in mass functions ?*, 2010, American Institute of Physics Conference Series, 1241, 804,[ADS link](#)

Popular science papers and websites

La Recherche, Suppléments supercalculateurs, November 2012, p28-29

Genci report 2011 p49

Science & Avenir, “L’infini”, article about the future of the Universe, 2020

Futura-Sciences, RayGal article by L.Sacco, 2021 [link](#)

RayGal news, 2022 Physics UFR [link](#), Paris Observatory [link](#), LAM [link](#)

RayGal website (2021) : [link](#)

Action Nationale Dark Energy website (2020) : [link](#)

Dark Energy Universe Simulation Consortium : DEUSS section, 2012, [link](#)

Personal website : origin of the large scale structure of the universe, 2010, [link](#)

Consortium BINGO! : contributions to the simulation section, 2010, [link](#)

Dark Energy Universe Simulation consortium database : data, 2010, [link](#)

DEUSS webpage at IDRIS, 2008, [link](#)

Horizon Project : DEUSS project, 2008, [link](#)

Simulation des premiers ages : le vent des galaxies façonne l’Univers, 2005, [link](#)