DiRAC Publications
2019

dp002: The COSMOS Consortium: Unveiling the Structure of the Universe
PI: Prof. Paul Shellard
Science Area: Astronomy & Astrophysics
Machines: Memory Intensive Durham, Data Intensive Cambridge, Data Intensive Leicester
Institute: University of Cambridge

Cosmic string loop collapse in full general relativity
Thomas Helfer, Josu C. Aurrekoetxea, and Eugene A. Lim
2019, PhRvD, 10.1103/PhysRevD.99.104028

CMB-S4 forecast on the primordial non-Gaussianity parameter of feature models
Wuhyun Sohn and James R. Fergusson
2019, PhRvD, 10.1103/PhysRevD.100.063536

General modal estimation for cross-bispectra
Maresuke Shiraishi, Michele Liguori, James R. Fergusson, et al.
2019, JCAP, 10.1088/1475-7516/2019/06/046

Cosmological evolution of semilocal string networks
A. Achúcarro, A. Avgoustidis, A. López-Eiguren, et al.

Creating a traversable wormhole
Gary T. Horowitz, Don Marolf, Jorge E. Santos, et al.
2019, CQGra, 10.1088/1361-6382/ab436f

Phases of Holographic Hawking Radiation on spatially compact spacetimes
Donald Marolf and Jorge E. Santos
2019, JHEP, 10.1007/JHEP10(2019)250

dp004: VIRGO Consortium
PI: Prof. Carlos Frenk
Science Area: Astronomy & Astrophysics
Machines: Memory Intensive Durham
Institute: Durham University

Atomic and molecular gas in IllustrisTNG galaxies at low redshift
Galaxy formation in the Planck Millennium: the atomic hydrogen content of dark matter halos  
C. M. Baugh, Violeta Gonzalez-Perez, Claudia del P Lagos, et al.  

The formation and assembly history of the Milky Way revealed by its globular cluster population  
J. M. Diederik Kruijssen, Joel L. Pfeffer, Marta Reina-Campos, et al.  

Ultra-diffuse galaxies in the Auriga simulations  
Shihong Liao, Liang Gao, Carlos S. Frenk, et al.  

Cosmological test of gravity using weak lensing voids  
Christopher T. Davies, Marius Cautun, and Baojiu Li  

Young star cluster populations in the E-MOSAICS simulations  
Joel Pfeffer, Nate Bastian, J. M. Diederik Kruijssen, et al.  

Simulating galaxy formation in f(R) modified gravity: matter, halo, and galaxy statistics  
Christian Arnold and Baojiu Li  

The total stellar halo mass of the Milky Way  
Alis J. Deason, Vasily Belokurov, and Jason L. Sanders  

Bondi-Hoyle-Lyttleton accretion by binary stars  

Screening maps of the local Universe I - Methodology  
Shi Shao, Baojiu Li, Marius Cautun, et al.  

The connection between halo concentrations and assembly histories: a probe of gravity?  
Piotr Oleśkiewicz, Carlton M. Baugh, and Aaron D. Ludlow  

The MUSE Ultra Deep Field (MUDF). II. Survey design and the gaseous properties of galaxy groups at 0.5 < z < 1.5  
Simulating cosmological substructure in the solar neighbourhood
Christine M. Simpson, Ignacio Gargiulo, Facundo A. Gómez, et al.

The Lyman-α forest as a diagnostic of the nature of the dark matter
Antonella Garzilli, Andrii Magalich, Tom Theuns, et al.

The prevalence of pseudo-bulges in the Auriga simulations

Galaxy structure with strong gravitational lensing: decomposing the internal mass
distribution of massive elliptical galaxies
James W. Nightingale, Richard J. Massey, David R. Harvey, et al.

Zoom-in cosmological hydrodynamical simulation of a star-forming barred, spiral
galaxy at redshift $z = 2$
Fiorenzo Vincenzo, Chiaki Kobayashi, and Tiantian Yuan

He abundances in disc galaxies. I. Predictions from cosmological chemodynamical
simulations
F. Vincenzo, A. Miglio, C. Kobayashi, et al.
2019, A&A, 10.1051/0004-6361/201935886

The self-similarity of weak lensing peaks
Christopher T. Davies, Marius Cautun, and Baojiu Li

Multiplanet systems in inviscid discs can avoid forming resonant chains
Colin P. McNally, Richard P. Nelson, and Sijme-Jan Paardekooper

Properties of Subhalos in the Interacting Dark Matter Scenario
Ángeles Moliné, Jascha A. Schewtschenko, Miguel A. Sánchez-Conde, et al.
2019, Galax, 10.3390/galaxies7040080

The nature of submillimetre and highly star-forming galaxies in the EAGLE simu-
lation
Stuart McAlpine, Ian Smail, Richard G. Bower, et al.

Baryon-induced dark matter cores in the EAGLE simulations
Alejandro Benítez-Llambay, Carlos S. Frenk, Aaron D. Ludlow, et al.

Dark Matter Haloes and Subhaloes
Jesús Zavala and Carlos S. Frenk  
2019, Galax, 10.3390/galaxies7040081

On the road to percent accuracy: non-linear reaction of the matter power spectrum to dark energy and modified gravity  

High-redshift test of gravity using enhanced growth of small structures probed by the neutral hydrogen distribution  
Matteo Leo, Christian Arnold, and Baojiu Li  
2019, PhRvD, 10.1103/PhysRevD.100.064044

Energy equipartition between stellar and dark matter particles in cosmological simulations results in spurious growth of galaxy sizes  
Aaron D. Ludlow, Joop Schaye, Matthieu Schaller, et al.  

Observable tests of self-interacting dark matter in galaxy clusters: BCG wobbles in a constant density core  
David Harvey, Andrew Robertson, Richard Massey, et al.  

The mass-size plane of EAGLE galaxies  
M. S. Rosito, P. B. Tissera, S. E. Pedrosa, et al.  
2019, A&A, 10.1051/0004-6361/201935162

Observable tests of self-interacting dark matter in galaxy clusters: cosmological simulations with SIDM and baryons  
Andrew Robertson, David Harvey, Richard Massey, et al.  

The distinct stellar metallicity populations of simulated Local Group dwarfs  
Anna Genina, Carlos S. Frenk, Alejandro Benítez-Llambay, et al.  

The abundance and physical properties of OVII and OVIII X-ray absorption systems in the EAGLE simulations  
Nastasha A. Wijers, Joop Schaye, Benjamin D. Oppenheimer, et al.  

Assembly of spheroid-dominated galaxies in the EAGLE simulation  
M. S. Rosito, P. B. Tissera, S. E. Pedrosa, et al.  
2019, A&A, 10.1051/0004-6361/201834720

The nature of strong HI absorbers probed by cosmological simulations: satellite accretion and outflows  
Evolution of galactic planes of satellites in the EAGLE simulation  
Shi Shao, Marius Cautun, and Carlos S. Frenk  

Numerical convergence of simulations of galaxy formation: the abundance and internal structure of cold dark matter haloes  
Aaron D. Ludlow, Joop Schaye, and Richard Bower  

The Cosmic Ballet II: spin alignment of galaxies and haloes with large-scale filaments in the EAGLE simulation  
Punyakoti Ganeshaiah Veena, Marius Cautun, Elmo Tempel, et al.  

The evolution of the UV luminosity function of globular clusters in the E-MOSAICS simulations  
Joel Pfeffer, Nate Bastian, Robert A. Crain, et al.  

Planetary giant impacts: convergence of high-resolution simulations using efficient spherical initial conditions and SWIFT  

Simulating Jupiter’s weather layer. Part II: Passive ammonia and water cycles  
Roland M. B. Young, Peter L. Read, and Yixiong Wang  

Painting with baryons: augmenting N-body simulations with gas using deep generative models  
Tilman Tröster, Cameron Ferguson, Joachim Harnois-Déraps, et al.  

Fluorescent rings in star-free dark matter haloes  
Calvin Sykes, Michele Fumagalli, Ryan Cooke, et al.  

No cores in dark matter-dominated dwarf galaxies with bursty star formation histories  
Sownak Bose, Carlos S. Frenk, Adrian Jenkins, et al.  

Simulating Jupiter’s weather layer. Part I: Jet spin-up in a dry atmosphere  
Roland M. B. Young, Peter L. Read, and Yixiong Wang  
2019, Icar, 10.1016/j.icarus.2018.12.005

The evolution of SMBH spin and AGN luminosities for z < 6 within a semi-analytic model of galaxy formation  
Andrew J. Griffin, Cedric G. Lacey, Violeta Gonzalez-Perez, et al.
Linear bias forecasts for emission line cosmological surveys  
Alexander Merson, Alex Smith, Andrew Benson, et al.  

Realistic simulations of galaxy formation in f(R) modified gravity  
Christian Arnold, Matteo Leo, and Baojiu Li  
2019, NatAs, 10.1038/s41550-019-0823-y

Formation histories of stars, clusters, and globular clusters in the E-MOSAICS simulations  
Marta Reina-Campos, J. M. Diederik Kruijssen, Joel L. Pfeffer, et al.  

Euclid preparation. III. Galaxy cluster detection in the wide photometric survey, performance and algorithm selection  
Euclid Collaboration, R. Adam, M. Vannier, et al.  
2019, A&A, 10.1051/0004-6361/201935088

A general framework to test gravity using galaxy clusters II: A universal model for the halo concentration in f(R) gravity  
Myles A. Mitchell, Christian Arnold, Jian-hua He, et al.  

Accurate method to determine the systematics due to the peculiar velocities of galaxies in measuring the Hubble constant from gravitational-wave standard sirens  
Jian-hua He  
2019, PhRvD, 10.1103/PhysRevD.100.023527

Super-Eddington accretion and feedback from the first massive seed black holes  
John A. Regan, Turlough P. Downes, Marta Volonteri, et al.  

The E-MOSAICS project: tracing galaxy formation and assembly with the age-metallicity distribution of globular clusters  

The star formation histories of dwarf galaxies in Local Group cosmological simulations  
Ruth Digby, Julio F. Navarro, Azadeh Fattahi, et al.  

A comparison between semi-analytical gas cooling models and cosmological hydrodynamical simulations  
Jun Hou, Cedric G. Lacey, and Carlos S. Frenk  
On the correlation between the local dark matter and stellar velocities
Nassim Bozorgnia, Azadeh Fattahi, David G. Cerdeño, et al.
2019, JCAP, 10.1088/1475-7516/2019/06/045

Lyα emitters in a cosmological volume - I. The impact of radiative transfer

Reverberation reveals the truncated disc in the hard state of GX 339-4
Ra’ad D. Mahmoud, Chris Done, and Barbara De Marco

Resolved galaxy scaling relations in the EAGLE simulation: star formation, metallic-
ity, and stellar mass on kpc scales
James W. Trayford and Joop Schaye

The velocity anisotropy of the Milky Way satellite system
Alexander H. Riley, Azadeh Fattahi, Andrew B. Pace, et al.

The local high-velocity tail and the Galactic escape speed
Alis J. Deason, Azadeh Fattahi, Vasily Belokurov, et al.

The first supermassive black holes: indications from models for future observations
Stergios Amarantidis, José Afonso, Hugo Messias, et al.

Galaxies with monstrous black holes in galaxy cluster environments
Lieke A. C. van Son, Christopher Barber, Yannick M. Bahé, et al.

The signal of decaying dark matter with hydrodynamical simulations
Mark R. Lovell, David Barnes, Yannick Bahé, et al.

The relationship between the morphology and kinematics of galaxies and its depen-
dence on dark matter halo structure in EAGLE

Large-scale redshift space distortions in modified gravity theories
César Hernández-Aguayo, Jiamin Hou, Baojiu Li, et al.

A new approach to finding galaxy groups using Markov Clustering
L. Stothert, P. Norberg, and C. M. Baugh
The Auriga stellar haloes: connecting stellar population properties with accretion and merging history
Antonela Monachesi, Facundo A. Gómez, Robert J. J. Grand, et al.

The gas fractions of dark matter haloes hosting simulated ~L* galaxies are governed by the feedback history of their black holes

Deep and narrow CO absorption revealing molecular clouds in the Hydra-A brightest cluster galaxy
Tom Rose, A. C. Edge, F. Combes, et al.

Disruption of satellite galaxies in simulated groups and clusters: the roles of accretion time, baryons, and pre-processing
Yannick M. Bahé, Joop Schaye, David J. Barnes, et al.

Evolution of the cold gas properties of simulated post-starburst galaxies
Timothy A. Davis, Freeke van de Voort, Kate Rowlands, et al.

The mass of the Milky Way from satellite dynamics
Thomas M. Callingham, Marius Cautun, Alis J. Deason, et al.

The origin of galactic metal-rich stellar halo components with highly eccentric orbits
Azadeh Fattahi, Vasily Belokurov, Alis J. Deason, et al.

Three-dimensional simulations of neutrino-driven core-collapse supernovae from low-mass single and binary star progenitors

An application of machine learning techniques to galaxy cluster mass estimation using the MACSIS simulations
Thomas J. Armitage, Scott T. Kay, and David J. Barnes

The origin of the red-sequence galaxy population in the EAGLE simulation
Camila A. Correa, Joop Schaye, and James W. Trayford

Simulating the Dark Matter Decay Signal from the Perseus Galaxy Cluster
Mark R. Lovell, Dmytro Iakubovskyi, David Barnes, et al.
The cosmic spectral energy distribution in the EAGLE simulation
Maarten Baes, Ana Trčka, Peter Camps, et al.

Correcting for fibre assignment incompleteness in the DESI Bright Galaxy Survey
Alex Smith, Jian-hua He, Shaun Cole, et al.

RELICS: Strong Lensing Analysis of MACS J0417.5-1154 and Predictions for Observing the Magnified High-redshift Universe with JWST
Guillaume Mahler, Keren Sharon, Carter Fox, et al.

Forced magnetic reconnection and plasmoid coalescence. I. Magnetohydrodynamic simulations
M. A. Potter, P. K. Browning, and M. Gordovskyy
2019, A&A, 10.1051/0004-6361/201833565

The core of the massive cluster merger MACS J0417.5-1154 as seen by VLT/MUSE
Mathilde Jauzac, Guillaume Mahler, Alastair C. Edge, et al.

The impact of black hole seeding in cosmological simulations
Ella Xi Wang, Philip Taylor, Christoph Federrath, et al.

Migrating super-Earths in low-viscosity discs: unveiling the roles of feedback, vortices, and laminar accretion flows

The diverse evolutionary pathways of post-starburst galaxies
2019, NatAs, 10.1038/s41550-019-0725-z

The Santiago-Harvard-Edinburgh-Durham void comparison II: unveiling the Vainshtein screening using weak lensing
Enrique Paillas, Marius Cautun, Baojiu Li, et al.

Galactic simulations of r-process elemental abundances
Christopher J. Haynes and Chiaki Kobayashi

Reconstructing the baryon acoustic oscillations using biased tracers
Jack Birkin, Baojiu Li, Marius Cautun, et al.

A search for warm/hot gas filaments between pairs of SDSS Luminous Red Galaxies
Hideki Tanimura, Gary Hinshaw, Ian G. McCarthy, et al.
The modified gravity light-cone simulation project - I. Statistics of matter and halo distributions
Christian Arnold, Pablo Fosalba, Volker Springel, et al.
The star formation rate and stellar content contributions of morphological components in the EAGLE simulations
James W. Trayford, Carlos S. Frenk, Tom Theuns, et al.
Calibrated, cosmological hydrodynamical simulations with variable IMFs III: spatially resolved properties and evolution
Christopher Barber, Joop Schaye, and Robert A. Crain
The aftermath of the Great Collision between our Galaxy and the Large Magellanic Cloud
Marius Cautun, Alis J. Deason, Carlos S. Frenk, et al.
The abundances and properties of Dual AGN and their host galaxies in the EAGLE simulations

dp005: Theoretical Astrophysics at Leicester
PI: Prof. Walter Dehnen
Science Area: Astronomy & Astrophysics
Machines: Data Intensive Leicester
Institute: University of Leicester

The Temporal Requirements of Directly Observing Self-gravitating Spiral Waves in Protoplanetary Disks with ALMA
Cassandra Hall, Ruobing Dong, Ken Rice, et al.

On the origin of wide-orbit ALMA planets: giant protoplanets disrupted by their cores
J. Humphries and S. Nayakshin

Dynamical modelling of dwarf spheroidal galaxies using Gaussian-process emulation
Amery Gration and Mark I. Wilkinson
Scattered light shadows in warped protoplanetary discs
Rebecca Nealon, Christophe Pinte, Richard Alexander, et al.
Giant planets and brown dwarfs on wide orbits: a code comparison project
M. Fletcher, S. Nayakshin, D. Stamatellos, et al.
ALMA observations require slower Core Accretion runaway growth
S. Nayakshin, G. Dipierro, and J. Szulágyi
Constraining the initial planetary population in the gravitational instability model
J. Humphries, A. Vazan, M. Bonavita, et al.
Galactic chimney sweeping: the effect of ‘gradual’ stellar feedback mechanisms on
the evolution of dwarf galaxies
Lilian Garratt-Smithson, Graham A. Wynn, Chris Power, et al.
Ring structure in the MWC 480 disk revealed by ALMA
Yao Liu, Giovanni Dipierro, Enrico Ragusa, et al.
2019, A&A, 10.1051/0004-6361/201834157

**dp006: Extreme QCD: Quantifying the QCD Phase Diagram lib**
**PI:** Prof. Chris Allton
**Science Area:** Particle Physics
**Machines:** Data Intensive Leicester, Extreme Scaling Edinburgh
**Institute:** Swansea University

Hyperons in thermal QCD: A lattice view
Gert Aarts, Chris Allton, Davide De Boni, et al.
2019, PhRvD, 10.1103/PhysRevD.99.074503

**dp007: Strong dynamics in the structure of matter**
**PI:** Dr Roger Horsley
**Science Area:** Particle Physics
**Machines:** Data Intensive Cambridge, Extreme Scaling Edinburgh
**Institute:** University of Edinburgh
Isospin splittings in the decuplet baryon spectrum from dynamical QCD+QED
R. Horsley et al.
2019, JPhG, 10.1088/1361-6471/ab32c1

Patterns of flavor symmetry breaking in hadron matrix elements involving $u$, $d$, and $s$ quarks
2019, PhRvD, 10.1103/PhysRevD.100.114516

dp008: UKQCD-DWF: physics with dynamical chiral quarks
PI: Dr Andreas Juettner
Science Area: Particle Physics
Machines: Data Intensive Cambridge, Extreme Scaling Edinburgh
Institute: University of Southampton

QED corrections to leptonic decay rates
P. A. Boyle, V. Guelpers, A. Juettner, et al.
2019, PoS Lattice, 10.22323/1.334.0267

Semi-leptonic form factors for $B_s \to K \ell \nu$ and $B_s \to D_s \ell \nu$
2019, PoS Lattice, 10.22323/1.334.0290

Electromagnetic finite-size effects to the hadronic vacuum polarization
J. Bijnens, J. Harrison, N. Hermansson-Truedsson, et al.
2019, PhRvD, 10.1103/PhysRevD.100.014508

dp009: Non perturbative BSM dynamics
PI: Dr Antonio Rago
Science Area: Particle Physics
Machines: BG/Q
Institute: Plymouth University

Master-field simulations of $O(a)$-improved lattice QCD: Algorithms, stability and exactness
Anthony Francis, Patrick Fritzsch, Martin Lüscher, et al.
2019, CPhCo, 10.1016/j.cpc.2020.107355

dp010: UKMHD Consortium: 2) Solar Atmosphere
**PI: Prof. Alan Hood**  
**Science Area: Astronomy & Astrophysics**  
**Machines: Memory Intensive Durham, Data Intensive Cambridge**  
**Institute: University of St Andrews**

Contribution of observed multi frequency spectrum of Alfvén waves to coronal heating  
P. Pagano and I. De Moortel  
2019, A&A, 10.1051/0004-6361/201834158

MHD simulations of the in situ generation of kink and sausage waves in the solar corona by collision of dense plasma clumps  
2019, A&A, 10.1051/0004-6361/201935539

Partitioning of Magnetic Helicity in Reconnected Flux Tubes  
Andrew N. Wright  

A New Space Weather Tool for Identifying Eruptive Active Regions  
Paolo Pagano, Duncan H. Mackay, and Stephanie L. Yardley  

A Prospective New Diagnostic Technique for Distinguishing Eruptive and Noneruptive Active Regions  
Paolo Pagano, Duncan H. Mackay, and Stephanie L. Yardley  

Active Region evolution prior to magnetic flux rope ejections  
P. Pagano and D. H. Mackay  
2019, NCimC, 10.1393/ncc/i2019-19034-9

First Determination of 2D Speed Distribution within the Bodies of Coronal Mass Ejections with Cross-correlation Analysis  
Beili Ying, Alessandro Bemporad, Silvio Giordano, et al.  

Measuring the 2D distribution of the expansion speed of solar eruptions: A first test based on synthetic coronagraphic data  
B. Ying, A. Bemporad, S. Giordano, et al.  
2019, NCimC, 10.1393/ncc/i2019-19036-7

Magnetohydrodynamic waves in braided magnetic fields  
T. A. Howson, I. De Moortel, J. Reid, et al.  
2019, A&A, 10.1051/0004-6361/201935876

Evolution and characteristics of forced shear flows in polytropic atmospheres: large and small Péclet number regimes  
V. Witzke, L. J. Silvers, and B. Favier
dp012: Hydrodynamical Simulations of Cosmic Structure Formation at KICC  
PI: Dr Debora Sijacki  
Science Area: Astronomy & Astrophysics  
Machines: Memory Intensive Durham, Data Intensive Cambridge  
Institute: University of Cambridge

Constraints on chameleon f(R)-gravity from galaxy rotation curves of the SPARC sample  
Aneesh P. Naik, Ewald Puchwein, Anne-Christine Davis, et al.  

Fast and energetic AGN-driven outflows in simulated dwarf galaxies  
Sophie Koudmani, Debora Sijacki, Martin A. Bourne, et al.  

Tracing the sources of reionization in cosmological radiation hydrodynamics simulations  

Modelling the observed luminosity function and clustering evolution of Ly α emitters: growing evidence for late reionization  
Lewis H. Weinberger, Martin G. Haehnelt, and Girish Kulkarni  

Consistent modelling of the meta-galactic UV background and the thermal/ionization history of the intergalactic medium  
Ewald Puchwein, Francesco Haardt, Martin G. Haehnelt, et al.  

Predictions and sensitivity forecasts for reionization-era [C II] line intensity mapping  
Sebastian Dumitru, Girish Kulkarni, Guilaine Lagache, et al.  

Large Ly α opacity fluctuations and low CMB τ in models of late reionization with large islands of neutral hydrogen extending to z < 5.5  
Girish Kulkarni, Laura C. Keating, Martin G. Haehnelt, et al.  

Understanding the escape of LyC and Lyα photons from turbulent clouds  
AGN jet feedback on a moving mesh: lobe energetics and X-ray properties in a realistic cluster environment
Martin A. Bourne, Debora Sijacki, and Ewald Puchwein

The redshift evolution of X-ray and Sunyaev-Zel’dovich scaling relations in the FA-BLE simulations
Nicholas A. Henden, Ewald Puchwein, and Debora Sijacki

Cosmological simulations of dwarfs: the need for ISM physics beyond SN feedback alone
Matthew C. Smith, Debora Sijacki, and Sijing Shen

dp015: High Performance Computing Support for Exeter Astrophysics
PI: Prof. Matthew Bate
Science Area: Astronomy & Astrophysics
Machines: Memory Intensive Durham, Data Intensive Cambridge, Data Intensive Leicester
Institute: University of Exeter

The statistical properties of stars and their dependence on metallicity
Matthew R. Bate

Disc formation and fragmentation using radiative non-ideal magnetohydrodynamics
James Wurster and Matthew R. Bate

Synthetic molecular line observations of the first hydrostatic core from chemical calculations
Alison K. Young, Matthew R. Bate, Tim J. Harries, et al.

There is no magnetic braking catastrophe: low-mass star cluster and protostellar disc formation with non-ideal magnetohydrodynamics
James Wurster, Matthew R. Bate, and Daniel J. Price

Massive star feedback in clusters: variation of the FUV interstellar radiation field in time and space
Ahmad A. Ali and Tim J. Harries

The TORUS radiation transfer code

Multiple Spiral Arms in the Disk around Intermediate-mass Binary HD 34700A
John D. Monnier, Tim J. Harries, Jaehan Bae, et al.

The Limits of the Primitive Equations of Dynamics for Warm, Slowly Rotating Small Neptunes and Super Earths
N. J. Mayne, B. Drummond, F. Debras, et al.

Fully scalable forward model grid of exoplanet transmission spectra
Jayesh M. Goyal, Hannah R. Wakeford, Nathan J. Mayne, et al.

Eigenveectors, Circulation, and Linear Instabilities for Planetary Science in 3 Dimensions (ECLIPS3D)
F. Debras, N. Mayne, I. Baraffe, et al.
2019, A&A, 10.1051/0004-6361/201935582

Idealised simulations of the deep atmosphere of hot Jupiters. Deep, hot adiabats as a robust solution to the radius inflation problem
2019, A&A, 10.1051/0004-6361/201936445

Comparing the properties of GMCs in M33 from simulations and observations

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dp016: Modelling galaxy baryon physics: from cosmological to sub-galactic scales
PI: Prof. Adrianne Slyz
Science Area: Astronomy & Astrophysics
Machines: Memory Intensive Durham, Data Intensive Leicester
Institute: University of Oxford

Zooming in on supermassive black holes: how resolving their gas cloud host renders their accretion episodic
R. S. Beckmann, J. Devriendt, and A. Slyz

Growth of massive scalar hair around a Schwarzschild black hole
Katy Clough, Pedro G. Ferreira, and Macarena Lagos
2019, PhRvD, 10.1103/PhysRevD.100.063014
On the observed diversity of star formation efficiencies in Giant Molecular Clouds
Kearn Grisdale, Oscar Agertz, Florent Renaud, et al.

Probing cosmic dawn with emission lines: predicting infrared and nebular line emission for ALMA and JWST

Probing cosmic dawn: modelling the assembly history, SEDs, and dust content of selected $z \sim 9$ galaxies
Harley Katz, Nicolas Laporte, Richard S. Ellis, et al.

Magnetogenesis at Cosmic Dawn: tracing the origins of cosmic magnetic fields

Understanding the escape of LyC and Ly$\alpha$ photons from turbulent clouds

Massive spheroids can form in single minor mergers

The formation and evolution of low-surface-brightness galaxies

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dp019: High Precision B physics from Lattice QCD (HPQCD)
PI: Prof. Christine Davies
Science Area: Particle Physics
Machines: Data Intensive Cambridge
Institute: University of Glasgow

Quark mass determinations with the RI-SMOM scheme and HISQ action
2019, PoS Lattice, 10.22323/1.334.0213

Meson Electromagnetic Form Factors from Lattice QCD
2019, PoS Lattice, 10.22323/1.334.0298

$B_s \to D_s^{(*)} \ell \nu$ form factors using heavy HISQ quarks
Lattice QCD form factor for $B_s \rightarrow D_s^* l \nu$ at zero recoil with non-perturbative current renormalisation
2019, PhRvD, 10.1103/PhysRevD.99.114512

Neutral B-meson mixing from full lattice QCD at the physical point
2019, PhRvD, 10.1103/PhysRevD.100.094508

Renormalizing vector currents in lattice QCD using momentum-subtraction schemes
2019, PhRvD, 10.1103/PhysRevD.100.114513

Hadronic-vacuum-polarization contribution to the muon’s anomalous magnetic moment from four-flavor lattice QCD
C. T. H. Davies et al.
2019, PhRvD, 10.1103/PhysRevD.101.034512

dp040: Stellar Hydrodynamics, Evolution and Nucleosynthesis (SHEN)
PI: Dr Raphael Hirschi
Science Area: Astronomy & Astrophysics
Machines: Memory Intensive Durham, Data Intensive Cambridge
Institute: Keele University

Dependence of convective boundary mixing on boundary properties and turbulence strength
A. Cristini, R. Hirschi, C. Meakin, et al.

3D Simulations and MLT. I. Renzini’s Critique
W. David Arnett, Casey Meakin, Raphael Hirschi, et al.

NuGrid stellar data set - III. Updated low-mass AGB models and s-process nucleosynthesis with metallicities $Z= 0.01$, $Z= 0.02$, and $Z= 0.03$

Uncertainties in $\nu p$-process nucleosynthesis from Monte Carlo variation of reaction rates
N. Nishimura, T. Rauscher, R. Hirschi, et al.
**dp047: DISCSIM: The Formation and Evolution of Planets in the Era of ALMA**

**PI:** Prof. Cathy Clarke  
**Science Area:** Astronomy & Astrophysics  
**Machines:** Data Intensive Cambridge, Data Intensive Leicester  
**Institute:** University of Southampton

Is the ring inside or outside the planet?: the effect of planet migration on dust rings
Farzana Meru, Giovanni P. Rosotti, Richard A. Booth, et al.  

Revealing signatures of planets migrating in protoplanetary discs with ALMA multiwavelength observations
Pooneh Nazari, Richard A. Booth, Cathie J. Clarke, et al.  

Characterizing gravito-turbulence in 3D: turbulent properties and stability against fragmentation
Richard A. Booth and Cathie J. Clarke  

Dust accretion in binary systems: implications for planets and transition discs

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**dp050: Simulating Gravitational Instabilities that Drive Vertical Structure Formation in Quiescent Prominences**

**PI:** Dr Andrew Hillier  
**Science Area:** Astronomy & Astrophysics  
**Machines:** Data Centric  
**Institute:** University of Exeter

Ion-neutral decoupling in the nonlinear Kelvin-Helmholtz instability: Case of field-aligned flow
A. Hillier  
2019, PhPl, 10.1063/1.5103248

Coronal Cooling as a Result of Mixing by the Nonlinear Kelvin-Helmholtz Instability
Andrew Hillier and Iñigo Arregui  
**dp051: Hadron Resonances from Lattice QCD**  
**PI:** Dr Christopher Thomas  
**Science Area:** Particle Physics  
**Machines:** Data Intensive Cambridge  
**Institute:** University of Cambridge  

b₁ resonance in coupled π ω , π ϕ scattering from lattice QCD  
Antoni J. Woss, Christopher E. Thomas, Jozef J. Dudek, et al.  
2019, PhRvD, 10.1103/PhysRevD.100.054506

**dp058: Galaxy-scale Simulations of Star Formation**  
**PI:** Dr Rowan Smith  
**Science Area:** Astronomy & Astrophysics  
**Machines:** Memory Intensive Durham  
**Institute:** University of Manchester  

Strong Excess Faraday Rotation on the Inside of the Sagittarius Spiral Arm  

Synthetic Large-scale Galactic Filaments: On Their Formation, Physical Properties, and Resemblance to Observations  
Catherine Zucker, Rowan Smith, and Alyssa Goodman  

The geometry of the gas surrounding the Central Molecular Zone: on the origin of localized molecular clouds with extreme velocity dispersions  

**dp060: Spectroscopy of Hot Exoplanets**  
**PI:** Dr Sergey Yurchenko  
**Science Area:** Astronomy & Astrophysics  
**Machines:** Data Intensive Cambridge, Data Intensive Leicester  
**Institute:** University College London  

ExoMol molecular line lists - XXXV. A rotation-vibration line list for hot ammonia  
Phillip A. Coles, Sergei N. Yurchenko, and Jonathan Tennyson  

Spectroscopy of YO from first principles  
2019, PCCP, 10.1039/C9CP03208H
ExoMol molecular line lists XXXVI: X^2Π - X^2Π and A^2Σ^+ - X^2Π transitions of SH
Maire N. Gorman, Sergei N. Yurchenko, and Jonathan Tennyson
ExoMol line list - XXXIV. A rovibrational line list for phosphinidene (PH) in its
X^3Σ^- and a^1∆ electronic states
Nonresonant Raman spectra of the methyl radical ^12CH_3 simulated in variational
calculations
Ahmad Y. Adam, Per Jensen, Andrey Yachmenev, et al.
2019, JMoSp, 10.1016/j.jms.2019.06.005
Variationally Computed IR Line List for the Methyl Radical CH3
Ahmad Y. Adam, Andrey Yachmenev, Sergei N. Yurchenko, et al.
2019, JPCA, 10.1021/acs.jpca.9b02919
ExoMol line lists - XXXII. The rovibronic spectrum of MgO
Heng Ying Li, Jonathan Tennyson, and Sergei N. Yurchenko
Theoretical rotation-vibration spectroscopy of cis- and trans-diphosphene (P_2H_2)
and the deuterated species P_2HD
Alec Owens and Sergei N. Yurchenko
2019, JChPh, 10.1063/1.5092767
A variationally computed room temperature line list for AsH3
2019, PCCP, 10.1039/C8CP07110A
Analysis of gaseous ammonia (NH_3) absorption in the visible spectrum of Jupiter -
Update

dp064: First Principle Predictions of Large Nuclei and Nucleonic Matter
PI: Dr Carlo Barbieri
Science Area: Particle Physics
Machines: Data Intensive Leicester
Institute: University of Surrey
Shape staggering of midshell mercury isotopes from in-source laser spectroscopy
compared with density-functional-theory and Monte Carlo shell-model calculations
S. Sels et al.
2019, PhRvC, 10.1103/PhysRevC.99.044306

Novel chiral Hamiltonian and observables in light and medium-mass nuclei
V. Somà, P. Navrátil, F. Raimondi, et al.
2019, PhRvC, 10.1103/PhysRevC.101.014318

Lepton Scattering from $^{40}$Ar and Ti in the Quasielastic Peak Region
C. Barbieri, N. Rocco, and V. Somà
2019, PhRvC, 10.1103/PhysRevC.100.062501

Quasifree Neutron Knockout from $^{54}$Ca Corroborates Arising $N = 34$ Neutron Magic Number
S. Chen et al.
2019, PhRvL, 10.1103/PhysRevLett.123.142501

Ab Initio Optical Potentials and Nucleon Scattering on Medium Mass Nuclei
A. Idini, C. Barbieri, and P. Navrátil
2019, PhRvL, 10.1103/PhysRevLett.123.092501

Dissipation Dynamics of Nuclear Fusion Reactions
K. Wen, M. C. Barton, A. Rios, et al.
2019, APPB, 10.5506/APhysPolB.50.567

dp065: UKMHD Consortium: 1) Solar and Planetary Interiors
PI: Prof. David Hughes
Science Area: Astronomy & Astrophysics
Machines: Memory Intensive Durham, Data Intensive Leicester
Institute: University of Sheffield

Scale Selection in the Stratified Convection of the Solar Photosphere
Mouloud Kessar, David W. Hughes, Evy Kersalé, et al.

Force balance in convectively driven dynamos with no inertia
David W. Hughes and Fausto Cattaneo
2019, JFM, 10.1017/jfm.2019.709

Turbulent convective length scale in planetary cores
Céline Guervilly, Philippe Cardin, and Nathanaël Schaeffer
2019, NAT, 10.1038/s41586-019-1301-5

Anelastic torsional oscillations in Jupiter’s metallic hydrogen region
K. Hori, R. J. Teed, and C. A. Jones
2019, E&PSL, 10.1016/j.epsl.2019.04.042
PI: Prof. Sam Falle
Science Area: Astronomy & Astrophysics
Machines: Memory Intensive Durham
Institute: University of Leeds

Angular momentum transport by the GSF instability: non-linear simulations at the equator
A. J. Barker, C. A. Jones, and S. M. Tobias

Sheets, filaments, and clumps - high-resolution simulations of how the thermal instability can form molecular clouds
C. J. Wareing, S. A. E. G. Falle, and J. M. Pittard

Nonaxisymmetric Hall instability: A key to understanding magnetars
K. N. Gourgouliatos and José A. Pons
2019, PhRvR, 10.1103/PhysRevResearch.1.032049

Magnetic-field evolution in a plastically failing neutron-star crust
S. K. Lander and K. N. Gourgouliatos

Magnetic inhibition of centrifugal instability
Serguei S. Komissarov, Konstantinos N. Gourgouliatos, and Jin Matsumoto

Momentum and energy injection by a supernova remnant into an inhomogeneous medium
J. M. Pittard

dp079: Understanding the Milky Way and Disc Galaxies with Gaia
PI: Dr Ralph Schoenrich
Science Area: Astronomy & Astrophysics
Machines: Data Intensive Cambridge, Data Intensive Leicester
Institute: University of Oxford

Galactic rotation from Cepheids with Gaia DR2 and effects of non-axisymmetry
Daisuke Kawata, Jo Bovy, Noriyuki Matsunaga, et al.

More than just a wrinkle: a wave-like pattern in $U_g$ versus $L_z$ from Gaia data
Jennifer K. S. Friske and Ralph Schönrich

Distances and parallax bias in Gaia DR2
Ralph Schönrich, Paul McMillan, and Laurent Eyer

The chemical evolution of r-process elements from neutron star mergers: the role of a 2-phase interstellar medium
Ralph A. Schönrich and David H. Weinberg

dp080: The Early Phases of Protostellar Disc Evolution (E-DISCS)
PI: Dr Dimitris Stamatellos
Science Area: Astronomy & Astrophysics
Machines: Data Intensive Cambridge, Data Intensive Leicester
Institute: University of Central Lancashire

Giant planets and brown dwarfs on wide orbits: a code comparison project
M. Fletcher, S. Nayakshin, D. Stamatellos, et al.

Observational signatures of outbursting protostars - I: From hydrodynamic simulations to observations
Benjamin MacFarlane, Dimitris Stamatellos, Doug Johnstone, et al.

Observational signatures of outbursting protostars - II. Exploring a wide range of eruptive protostars
Benjamin MacFarlane, Dimitris Stamatellos, Doug Johnstone, et al.

ALMA reveals a pseudo-disc in a proto-brown dwarf
B. Riaz, M. N. Machida, and D. Stamatellos

dp100: Photoevaporation and Properties of the Circumstellar Environment
PI: Dr James Owen
Science Area: Astronomy & Astrophysics
Machines: Data Intensive Leicester
Institute: Imperial College London
The first multidimensional view of mass loss from externally FUV irradiated protoplanetary discs
Thomas J. Haworth and Cathie J. Clarke

Testing the stability of supersonic ionized Bondi accretion flows with radiation hydrodynamics

Thermal emission from bow shocks. I. 2D hydrodynamic models of the Bubble Nebula
Samuel Green, Jonathan Mackey, Thomas J. Haworth, et al.
2019, A&A, 10.1051/0004-6361/201834832

Observing substructure in circumstellar discs around massive young stellar objects
M. R. Jankovic, T. J. Haworth, J. D. Ilee, et al.

dp101: Engineering Dwarfs at Galaxy Formations Edge
PI: Prof. Justin Read
Science Area: Astronomy & Astrophysics
Machines: Data Intensive Leicester
Institute: University of Surrey

EDGE: The Origin of Scatter in Ultra-faint Dwarf Stellar Masses and Surface Brightnesses
Martin P. Rey, Andrew Pontzen, Oscar Agertz, et al.

dp104: Simba: New Cosmological Simulations to Study Galaxy-Black Hole Co-evolution
PI: Prof. Romeel Davé
Science Area: Astronomy & Astrophysics
Machines: Memory Intensive Durham
Institute: University of Edinburgh

SIMBA: Cosmological simulations with black hole growth and feedback

Black hole - Galaxy correlations in SIMBA
Nicole Thomas, Romeel Davé, Daniel Anglés-Alcázar, et al.

The dust-to-gas and dust-to-metal ratio in galaxies from $z = 0$ to 6
Qi Li, Desika Narayanan, and Romeel Davé

Mergers, starbursts, and quenching in the SIMBA simulation
Francisco Rodríguez Montero, Romeel Davé, Vivienne Wild, et al.

dp105: Impact of Reionization on the Intergalactic Medium
PI: Dr Jose Oñorbe
Science Area: Astronomy & Astrophysics
Machines: Memory Intensive Durham
Institute: University of Edinburgh

Anomaly in the Opacity of the Post-reionization Intergalactic Medium in the Lyα and Lyβ Forest
Anna-Christina Eilers, Joseph F. Hennawi, Frederick B. Davies, et al.

dp121: Dynamic Accretion in Astrophysics
PI: Dr Chris Nixon
Science Area: Astronomy & Astrophysics
Machines: Data Intensive Leicester
Institute: University of Leicester

Tidal Disruption Events: The Role of Stellar Spin
Elen C. A. Golightly, Eric R. Coughlin, and C. J. Nixon

What is wrong with steady accretion discs?
C. J. Nixon and J. E. Pringle
2019, A&A, 10.1051/0004-6361/201935852

On the Diversity of Fallback Rates from Tidal Disruption Events with Accurate Stellar Structure
E. C. A. Golightly, C. J. Nixon, and E. R. Coughlin
dp122: UKMHD3: Astrophysical MHD
PI: Dr Graeme Sarson
Science Area: Astronomy & Astrophysics
Machines: Data Intensive Leicester
Institute: Newcastle University

Three-dimensional Simulations of Massive Stars. I. Wave Generation and Propagation

Evolution of galactic magnetic fields

dp124: Three-Dimensional Models of Variability in Astrophysical Masers
PI: Dr Malcolm Gray
Science Area: Astronomy & Astrophysics
Machines: Data Intensive Leicester
Institute: University of Manchester

Maser flare simulations from oblate and prolate clouds

dp125: RAFMUS Gen: Radiations Feedback in Multiscale Stellar Genesis
PI: Dr Bert Vandenbroucke
Science Area: Astronomy & Astrophysics
Machines: Data Intensive Leicester
Institute: University of St Andrews

Radiation hydrodynamics simulations of the evolution of the diffuse ionized gas in disc galaxies
Bert Vandenbroucke and Kenneth Wood

dp127: Galactic Dynamics in the Era of Gaia
PI: Prof. Victor Debattista  
Science Area: Astronomy & Astrophysics  
Machines: Data Intensive Cambridge  
Institute: University of Central Lancashire

The Formation of Compact Elliptical Galaxies in the Vicinity of a Massive Galaxy: The Role of Ram-pressure Confinement  
Min Du, Victor P. Debattista, Luis C. Ho, et al.  
2019, ApJ, 10.3847/1538-4357/ab0e0c

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**dp128: Extreme Gravity and Gravitational Waves**  
PI: Dr Ulrich Sperhake  
Science Area: Astronomy & Astrophysics  
Machines: Data Intensive Cambridge  
Institute: University of Cambridge

Amplification of superkicks in black-hole binaries through orbital eccentricity  
2019, PhRvD, 10.1103/PhysRevD.101.024044

High-energy collision of black holes in higher dimensions  
Ulrich Sperhake, William Cook, and Diandian Wang  
2019, PhRvD, 10.1103/PhysRevD.100.104046

Inverse-chirp signals and spontaneous scalarisation with self-interacting potentials in stellar collapse  
Roxana Rosca-Mead, Christopher J. Moore, Michalis Agathos, et al.  
2019, CQGra, 10.1088/1361-6382/ab256f

End point of nonaxisymmetric black hole instabilities in higher dimensions  
Hans Bantilan, Pau Figueras, Markus Kunesch, et al.  
2019, PhRvD, 10.1103/PhysRevD.100.086014

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**dp129: Wave-Particle Diffusion in the Inhomogeneous Magnetic Fields of the Earth’s Outer Radiation Belt**  
PI: Dr Oliver Allanson  
Science Area: Astronomy & Astrophysics  
Machines: Data Intensive Cambridge  
Institute: University of Reading

Particle-in-cell Experiments Examine Electron Diffusion by Whistler-mode Waves:  
1. Benchmarking With a Cold Plasma
dp130: SNDUST: Dust Survival Rates in Supernova Remnants
PI: Prof. Mike Barlow
Science Area: Astronomy & Astrophysics
Machines: Data Intensive Cambridge
Institute: University College London

Dust survival rates in clumps passing through the Cas A reverse shock - I. Results for a range of clump densities
Florian Kirchschlager, Franziska D. Schmidt, M. J. Barlow, et al.

dp131: Exploring Fundamental Fields With Strong Gravity
PI: Dr Katy Clough
Science Area: Astronomy & Astrophysics
Machines: Data Intensive Cambridge
Institute: University of Oxford

Growth of massive scalar hair around a Schwarzschild black hole
Katy Clough, Pedro G. Ferreira, and Macarena Lagos
2019, PhRvD, 10.1103/PhysRevD.100.063014

The fate of dense scalar stars
Francesco Muia, Michele Cicoli, Katy Clough, et al.
2019, JCAP, 10.1088/1475-7516/2019/07/044

dp136: Simulation of Sp(2N) Gauge Theories for Composite Higgs Models
PI: Prof. Biagio Lucini
Science Area: Particle Physics
Machines: Data Intensive Cambridge
Institute: Swansea University

Sp(4) gauge theories on the lattice: $N_f = 2$ dynamical fundamental fermions
Ed Bennett, Deog Ki Hong, Jong-Wan Lee, et al.
2019, JHEP, 10.1007/JHEP12(2019)053