

MATTEO VIEL

Date of birth: September 5, 1975 **Place of birth:** Udine (Italy)

Nationality: Italian

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Curriculum vitae

- **1994:** High School. Diploma maturità scientifica Liceo Scientifico “G. Marinelli” - Udine (grade: 60/60).
- **1999:** Degree in Physics, Università di Padova, Italy. Thesis: **A merger tree for the formation of cosmic structures**. Thesis supervisors: Prof. Sabino Matarrese, Dr. Giuseppe Tormen. (grade: full mark 110/110 cum laude).
- **9/1999 - 3/2000:** Fellowship of Università di Padova for a period of six months at Max-Planck-Institut für Astrophysik (Garching, Germany).
- **11/1999 - 11/2002:** PhD position at the Physics Department of Università di Padova (Italy).
- **02/2001 - 04/2001:** Visiting period at Max-Planck-Institut für Astrophysik (Garching, Germany).
- **04/2001 - 10/2001:** EARA-Marie Curie Fellowship at Max-Planck-Institut für Astrophysik (Garching, Germany).
- **02/2002 - 07/2002:** EARA-Marie Curie Fellowship at Institute of Astronomy (Cambridge, UK)
- **11/2002 - 10/2003:** Research Associate, Institute of Astronomy (Cambridge, UK)
- **02/2003:** PhD from Università di Padova (Italy), Thesis “**Numerical Models of the Intergalactic Medium**”. Thesis supervisor: Prof. Sabino Matarrese.
- **10/2003 - 10/2006 :** Research Associate - PPARC (Particle Physics Astronomy Research Council) fellowship, Institute of Astronomy (Cambridge, UK)
- **11/2004 - 12/2004 :** Visiting period at KAVLI institute (Santa Barbara) for the program ‘Galaxies-Intergalactic Medium interaction’

- **10/2004 - 10/2006:** Research Fellow Clare Hall College (Cambridge, UK)
- **10/2006 – present: Researcher staff position** at Trieste Observatory (INAF-OATS) (won on Dec. 30/12/2005 but started on Oct 2006)
- **July 2009:** visiting scientist at the IoA, Cambridge (UK)
- **August 2010: European Research Council - Starting Grant cosmoIGM: the Intergalactic Medium as a cosmological tool**
- **July 2011:** elected as a member of INAF “Comitato di Macroarea-1: Galassie e Cosmologia”.

RESEARCH INTERESTS

- **Evolution of the Intergalactic Medium (IGM) and Galaxy/IGM Interplay.** Evolution of the Lyman- α forest, thermal history and metal enrichment of the Intergalactic Medium. Thermal, dynamical and chemical properties of the Intergalactic Medium. Reionization of the universe and evolution and nature of the Ionizing Background. Impact of galactic winds on the Intergalactic Medium. Low redshift intergalactic gas detectability. HeliumII reionization. Impact of galactic winds and black hole feedback on galaxy evolution and on the IGM. Metal enrichment mechanisms in the high redshift universe.
- **Cosmological parameters.** Absorption lines as a probe of fundamental physics. Recovery of cosmological parameters and properties of the dark matter density field. Effect of dark energy, warm dark matter, neutrinos on the Lyman- α forest structures. Early dark energy models. Cross-correlation of large scale structure and cosmic microwave background data. Multi dimensional likelihood estimation of cosmological parameters using Monte Carlo Markov Chains methods.
- **Numerical simulations of structure formation.** Hydrodynamical and N-body codes. Evolution of cosmic structures in the high redshift universe. Density profiles of dark matter halos. Comparison of SPH and Eulerian codes for the physics of the IGM. Use of international parallel super computer (COSMOS, HPCS and CINECA in particular) to simulate the IGM.
- **Fundamental physics.** Nature of dark matter and its impact on large scale structures. Constraints on the coldness of cold dark matter and warm dark matter models. Constraints on sterile neutrino particles using the Lyman- α forest. Measuring the cosmic expansion using the Lyman- α forest with the ESO-ELT (Extremely Large Telescope). Dark energy constraints at high redshift ($z > 2$). Constraints on inflationary models and primordial non gaussianity using the IGM. Cross-correlation of the CMB (lensing and temperature) with large scale structure tracers.
- **Quasar (QSO) absorption lines.** Analysis of observed and simulated quasar spectra: Lyman- α forest and metal lines. Mean flux, flux probability distribution function, power spectrum and bispectrum flux statistics. Statistics of Voigt profile fitted lines. Thermal state of the IGM from line-widths. Low and high resolution data sets (SDSS, Keck and UVES/VLT spectra): systematic and statistical errors.

CURRENT RESEARCH

I have recently obtained from the European community a Starting Grant that officially started on Dec 1st 2010: this grant will last for 5yrs and can be moved to other institutions and amounts to 891 kE. This grant is giving me the possibility to build up my own group to investigate the role of the IGM as a cosmological tool (it covers the joining of the SDSS-III/BOSS survey, 50% of my salary and 4 postdoctoral fellows).

There are three main areas that I am investigating at the moment: the IGM as a tracer of the large scale structure, the IGM as a probe of fundamental physics and the IGM/galaxy interplay.

I summarize here my current *recent* research on each of the three topics above.

1-IGM as a LSS (Large Scale Structure) tracer

The importance of this topic relies in the fact that IGM structures are expected to be tracers of the underlying matter density field: a systematic study of several IGM statistics can thereby shed light on the distribution of matter over a significant fraction of the cosmic time and at scales not probed by other observables ($z = 2 - 6$ and scales of about 1-100 com. Mpc/h). In 2004 I have improved a method originally proposed by Croft et al. (2002) to recover the matter power from the observed flux power of Lyman- α forest data. This method has now been superseded by two different techniques: one proposed by McDonald et al. (2006) and the other by Viel & Haehnelt (2006). The first is a numerical technique that aims at exploring fully with approximate hydrodynamic simulations the parameter space of astrophysical and cosmological parameters influencing the properties of the IGM, while the second is based on a 2nd-order Taylor expansion of the flux power in the multidimensional parameter space. These techniques should now be applied to the new low-resolution low signal to noise data of the SDSS-III BOSS survey in order to reliably constrain cosmological parameters and Baryonic Acoustic Oscillations at high redshift ($z > 2$). I am currently running simulations of the IGM LSS and create mock data sets with properties as close as possible to those of the SDSS QSOs thereby mimicking metal contamination, continuum fitting, different thermal histories and cosmological parameters. Given the large number of SDSS QSOs (about 140,000 in the final data release and about 20/deg²) it is also expected to probe the *transverse correlation* (Slosar et al. 2011): this method was first suggested in Viel et al. (2002) to remove continuum fluctuations and it will now be used to measure BAOs in the transmitted Lyman- α flux. I am also comparing the mock data sets and the recovery of the underlying matter power methods with other medium resolution (X-shooter) and high-resolution (UVES/VLT) QSO spectra.

2-IGM as a probe of fundamental physics

The nature of the dark matter can be probed by analysing the clustering properties of matter at small scales and at high redshift. The advantage of addressing the high redshift regime is that the matter power is closer to the linear one and primordial differences are not erased by non-linear evolution. Among the different observables the IGM is currently providing the tightest limits on the coldness of cold dark matter particles (Viel et al. 2008) and the tightest constraints on the total mass of neutrinos species (Seljak et al. 2006). These limits have been obtained by combining the estimate of the matter power obtained from SDSS Lyman- α QSO spectra with other large scale structure probes. I have currently estimated with high-resolution N-body and hydrodynamic simulation the non-linear matter power with unprecedented precision at small scales and at high redshift for warm dark matter simulations (Viel et al. 2011) and for cosmologies that include massive neutrinos (Viel, Haehnelt & Springel 2010). In the first case I have provided a general fitting formula that accurately predict the non-linear matter power for several cosmologies and can also be useful for weak lensing forecasts (e.g. EUCLID). In the second case I have modified the code Gadget in order to account for neutrino particles either by using a particle implementation or by using a grid technique. In both cases I have quantified the impact of such particles on cosmological observables related to the IGM (flux Lyman- α statistics) or other observables (weak lensing shear power spectra, redshift space distortion, halo mass functions etc.). Furthermore, absorption lines can be used to probe fundamental properties of the universe such

as its expansion: this is a scientific goal of the ultra-stable *E-ELT spectrograph CODEX* and I am currently investigating systematic errors that can affect such a measurement.

3-IGM/galaxy interplay

The IGM consists of 80% of the baryons at high redshift and can be considered as a baryonic sink and reservoir. The galaxies are expected to pollute the IGM with metals and to modify the thermal, physical and chemical properties of this medium in their surrounding. Together with my collaborators, I have implemented different feedback mechanisms in the form of galactic winds (momentum or energy driven) and AGN/Black Hole feedback in a modified chemodynamical version of the Gadget code (Tree-SPH code). These mechanisms have been recently tested and results presented in (Tescari et al. 2009, 2011) and (Tornatore et al. 2010). Now I am investigating the metal enrichment process when such feedback mechanisms are active and I am trying to understand how far the metals can travel and what is their physical state. Recently, we have carefully analysed the properties of *Damped-Lyman- α systems* and *triply ionized carbon* in the low density IGM but now we want to carefully implement the Active Galactic Nuclei feedback and compare this feedback mechanisms with the one provided by galactic winds. I am focussing on the following properties as extracted from the simulations: halo mass functions; star formation rates; mock quasar spectra for different metal species; distribution of metals and their ionized species around galaxies; properties of metals and their dynamical state (wind profile and wind velocity); different metal phases (cold IGM, Warm Hot Intergalactic Medium, Intra Cluster Medium) and their evolution as a function of redshift for the feedback mechanisms investigated; properties of metal lines and HI and HeII at high redshift. I am developing a comprehensive set of statistics able to shed light on the galaxy/IGM interplay at a crucial stage of the galaxy formation processes. The simulated results are then compared with high/medium and low resolution data sets from QSO spectra and with the data of the SDSS collaboration for the galaxy properties.

Conferences and Schools

- **9/2000**: Joint 2000 annual meeting: European TMR network ‘The Formation and Evolution of galaxies’ and European RTN network ‘The Physics of the Integalactic Medium’, Durham, UK. Oral presentation.
- **9/2000**: National School of Cosmology and Astrophysics, Asiago, Italy. Oral presentation.
- **04/2001**: RTN workshop ‘Computational Investigations of the Intergalactic Medium’, Garching, Germany. Oral presentation.
- **06/2001**: IAP colloquium: ‘Gaseous Matter in Galaxies and in the Intergalactic Space’, Paris, France. Poster presentation.
- **06/2001**: RTN workshop ‘The First Stars and the Reionization of the Universe’, Florence, Italy
- **08/2001**: ‘Lighthouses of the Universe’, Garching (Germany)
- **10/2001**: National School of Astrophysics, Trieste, Italy. Oral presentation.
- **10/2001**: RTN network ‘The Physics of the Intergalactic Medium’, Eibsee, Germany. Oral presentation.
- **02/2002**: ‘Lyman- α emission at high redshift’, Institute of Astronomy, Cambridge (UK)
- **06/2002**: Elba (Italy) 2002 conference. ‘Early cosmic structures and the end of the dark ages’. Oral presentation.
- **07/2002**: Cambridge, UK. ‘Making light of gravity’. Poster presentation.
- **09/2002**: Gargonza (Italy) RTN annual meeting ‘The Physics of the IGM’. Oral presentation.
- **11/2002**: Roma (Italy). Convegno nazionale di Cosmologia. Oral presentation.
- **06/2003**: Blois (France). XVth rencontres de blois “Physical Cosmology”. Oral presentation.
- **09/2003**: Ile d’Oleron (France). RTN annual meeting ‘The Physics of the IGM’. Oral presentation.
- **10/2003**: Vulcano (Italy). International workshop on “Modelling the intergalactic and intracluster media”. Oral presentation.
- **04/2004**: La Thuile (Italy). XXXIXth Rencontres de Moriond on Exploring the Universe. Oral presentation.
- **05/2004**: Haifa (Israel). Meeting “Mass and Light in the Universe”. Oral presentation.

- **09/2004:** Leiden (Holland). RTN annual meeting ‘The Physics of the IGM’. Oral presentation.
- **10/2004:** Novigrad (Croatia). Conference “Baryons in dark matter halos”. Oral presentation.
- **11/2004:** Santa Barbara (US). Workshop “Galaxies-Intergalactic Medium Interactions”. Oral presentation.
- **03/2005:** Shanghai (China). IAU 1999 Colloquium “Probing galaxies through quasar absorption lines”. Oral presentation.
- **04/2005:** Granada (Spain). Cosmology Workshop. Oral presentation.
- **06/2005:** Trieste (Italy). Conference on Computational Cosmology. Oral Presentation.
- **08/2005:** Chiemsee (Germany). IGM Workshop. Oral Presentation.
- **10/2005:** Austin (Texas, US). Invited review “The Lyman- α forest as a cosmological probe” at the Frank N. Bash 2005 symposium.
- **06/2006:** Valencia (Spain). Talk. ‘BERNARD’S COSMIC STORIES’ conference.
- **09/2006:** Conca Specchiulla (Lecce, Italy). Invited talk. “Constraints on neutrinos from Lyman- α ”
- **09/2006:** Conca Specchiulla (Lecce, Italy). Invited talk. “Constraints on neutrinos from Lyman- α ”
- **01/2007:** Virgo Meeting (Leiden, Holland) oral presentation: “The high redshift Lyman- α forest and the nature of dark matter”
- **04/2007:** IFAE conference (Naples, Italy). Invited talk. “Fundamental Physics with the Intergalactic Medium”
- **07/2007:** Conference “HI survival trough cosmic time”. Talk.
- **02/2008:** Entapp (DESY, Hamburg) Invited chair of DM session and Talk.
- **02/2008:** Conference at APC (Paris) “Dark matter at small scales”. Talk.
- **04/2008:** IFAE 2008 Bologna. Talk.
- **06/2008:** IAP colloquium 2008 (Paris). “The universe above $z=3$ ”. Talk.
- **02/2009:** Galilei Institute Florence (Italy). “Dark Matter”. Talk.
- **02/2010:** La Thuile (Italy). Rencontres de Moriond on Cosmolgy. Talk.
- **06/2010:** ESF workshop “The almost Gaussian Universe”. Talk.
<http://ipht.cea.fr/Meetings/GaussUniverse2010/> **09/2010:** Workshop “H-Metal” presso El Escorial Madrid. Chairman/organizer of a parallels session.

- **07/2010**: International Conference “Darkness Visible” (Cambridge, UK). Oral presentation.
- **05/2011**: CosmoFirstObjects conference in Marseille, France. Invited talk.
- **06/2011**: PPC workshop at CERN (Geneva, Switzerland): Vth international workshop on the interconnection between particle physics and cosmology. Invited Talk.
- **07/2011**: Cosmology School in Santa Fe (New Mexico). Invited talk.

Seminars

- **03/2001**: Institute Seminar at MPA.
- **03/2001**: Cosmology Seminar at MPA.
- **11/2001**: Institute Seminar at Dipartimento di Astronomia di Padova (Italy)
- **11/2001**: Cosmology Seminar at Osservatorio Astrofisico di Arcetri (Florence, Italy).
- **11/2001**: Institute Seminar at Osservatorio Astronomico di Trieste (Italy).
- **11/2002**: Institute Seminar at Institute of Astronomy Cambridge (UK)
- **09/2003**: Institute Seminar at Osservatorio Astronomico di Trieste (Trieste, Italy).
- **10/2003**: Institute Seminar at SISSA (Trieste, Italy).
- **10/2003**: Institute Seminar at Dipartimento di Astronomia di Bologna (Bologna, Italy)
- **10/2003**: Institute Seminar at Osservatorio Astronomico di Padova (Bologna, Italy)
- **03/2004**: Institute Seminar at Department of Astronomy, University of Sussex (Brighton, UK)
- **11/2004**: Cosmology Seminar at Department of Astronomy, University of Oxford (Oxford, UK)
- **11/2004**: Lyman- α forest seminar, University of Berkeley (US)
- **12/2004**: Astrophysics Colloquium, Fermilab (US)
- **12/2004**: Seminar at the Astronomy Department, Princeton (US)
- **07/2005**: Institute Seminar at Institute of Astronomy Cambridge (UK)
- **10/2006**: Institute Seminar at Trieste Observatory (Italy)
- **11/2006**: Institute Seminar at Scuola Normale Superiore di Pisa (Italy)

- **03/2007**: Institute Seminar at ICTP (Institute Cosmology and Theoretical Physics (Trieste, Italy)
- **05/2007**: Seminar at IASF/BO. Institute for astrophysics (Bologna, Italy).
- **07/2009**: Seminar at osservatorio Astronomico di Palermo (Italia).
- **12/2010**: Colloquium in Heidelberg (Germany): Joint Astronomical Colloquium.

Teaching experience

- Supervisor, Part III Physics “ Gravitational Astrophysics and Cosmology ” a course held by Professors Lasenby, Fabian, Rees and Hobson (Physics Department - University of Cambridge).
- Supervisor, Part III Maths “Physical Cosmology ”, a course held by Prof. Pettini and Dr. Weller (DAMTP - University of Cambridge).
- Lecturer at Università La Sapienza, Cosmology course for PhD students “Intergalactic Medium Cosmology”, 2007, 12 hrs course
- Lecturer at SISSA (Trieste) “Structure formation” for PhD students, during years 2009, 2010, 2011 – 12 hrs course.
- 2011: 20hrs lecturing at Università degli Studi di Trieste for the Cosmology course of Prof. Borgani.
- 2011: 6hrs lecturing at Università degli Studi di Bologna for the PhD curriculum in Astronomy.
- 2011: Lecturer at the PhD school on neutrinos organized by INFN in Padova.

Conferences organized

- July 2004, Cambridge (UK) Institute of Astronomy, workshop “Cosmology with Lyman- α ”
- NOVICOSMO 2008, Trieste October 2008, International conference : “The impact of Simulations in Cosmology and Galaxy Formation
- ICTP (Trieste, Italy) Cosmology school 2010:
<http://cdsagenda5.ictp.trieste.it/fulldisplay.php?ida=a07163> (school for 300 students partly supported by ICTP funding)

Outreach

- Physorg: <http://www.physorg.com/news76328087.html>
- <http://www.fnal.gov/pub/today/archive2006/today06-09-06.html>
- ESI-TOPICS: Emerging Research Fronts Comments
<http://www.esi-topics.com/erf/2006/october06-MatteoViel.html>
- FEST (Festival Editoria Scientifica Triestina) 2007 Trieste. Talk.
- SPACE ART at immaginario scientifico Trieste. October 2008.
- On average 5/6 public talks per year.

Main collaborations

- **CODEX** and **ESPRESSO** instruments: high resolution spectrographs on the E-ELT (ESO - Extremely Large Telescope)
- **ORIGIN** proposal
- **EUCLID** member of theory Working Group, Simulation Working Group, manager of the OU-LE3 Unit of Validation for Galaxy Clustering (together with Prof. Baugh in Durham)
- Cambridge - UK (Institute of Astronomy); Garching - Germany (MPA, ESO), CERN (Switzerland), Padua University (Italy), Princeton University and Princeton Observatory (US)
- **X-Shooter** instrument
- member of the **BOSS/SDSS-III** collaboration since April 2011
- member of the light core team of **PLANCK** for a project to compute cross-correlation between CMB maps and the large-scale structure (since June 2011) – ISW effect and constraints on non-gaussianities by using cross-correlation of LSS tracers.
- Computational projects on european parallel **supercomputers**: COSMOS, HPCS-Darwin (Cambridge, UK); CINECA (Italy); Marenostrum (Barcelona, Spain).

Citations

~ 2200 citations (~ 1100 as a first author) h-index = 24 (October 2011: from NASA/ADS web site and SPIRES)

Referee activity

Astronomy and Astrophysics, MNRAS, MNRAS Letters, Physical Review D, JCAP, Astrophysical Journal, Physical Review Letters.

PhD-Students

E. Tescari (Thesis defended in April 2010) “Chemical and Physical Properties of the Intergalactic Medium” (full supervision)

PhD-Students co-supervised

J. Regan (2004-2007 Cambridge, UK), J. Bolton (2003-2006 Cambridge, UK), A. Garzilli (2009-SISSA, Italia), D. Fabjan (2007-2010, Università di Trieste)

GRANTS

- **Member of research unit** of PRIN-MIUR 2007 “The cosmic cycle of baryons” P.I. Prof. S. Borgani (~ 140 kE – total grant).
- PRIN-INAF 2009: 110 kE (4 unità di ricerca, role **P.I. of the national research project**);
- ASI/AAE Grant 2006-2009 (Theory: High Energy Astrophysics) 60 kE for 3 yrs (**role: P.I. of the local research unit** at INAF-OATS (national P.I. Prof. Moscardini).
- **Member of research unit** of ITN (European Network) Computational Cosmology - COSMOCOMP: P.I. Prof. Baugh (Durham), local coordinator Prof. Borgani (Università di Trieste) - Trieste node 540 kE + 90 kE (da progetto LACEGAL) for students and researchers.
- **Winner of ERC-StG (European Research Council - Starting Grants) with the 5yrs project “cosmoIGM: the intergalactic medium as a cosmological tool”** (role: **P.I.**; amount: 891,500 Euros to cover the joining of the Sloan Digital Sky Survey – BOSS survey for the acoustic baryonic oscillations – 4 postdoctoral fellows + part of my salary.).

List of five selected publications representative of my research:

1) metal enrichment models; 2) non-gaussianity in the large scale structure; 3) non-gaussianity in the IGM; 4) properties of dark matter at small scales with QSO spectra; 5) methods to measure the matter power spectrum at the Lyman- α forest scale. These papers are included in the present PDF file.

- 1) 'Cosmic evolution of the CIV in high-resolution hydrodynamic simulations', Tesconi E., **M. Viel**, D'Odorico V., Cristiani S., Calura F., Borgani S., Tornatore L., 2011, MNRAS, 411, 826
- 2) 'Primordial Non-Gaussianity and the NRAO VLA Sky Survey', Xia, Jun-Qing; **M. Viel**; Baccigalupi, Carlo; De Zotti, Gianfranco; Matarrese, Sabino; Verde, Licia, 2010, ApJ Letters, 717, 17
- 3) 'Primordial non-Gaussianities in the Intergalactic Medium', **M. Viel**; Branchini, E.; Dolag, K.; Grossi, M.; Matarrese, S.; Moscardini, L., 2009, MNRAS, 393, 774
- 4) 'Constraints on Warm Dark Matter from WMAP and the Lyman- α forest', **M. Viel**, J. Lesgourgues, M. Haehnelt, S. Matarrese, A. Riotto, 2005, Physical Review, D71, 063534
- 5) 'Inferring the dark matter power spectrum from the Lyman- α forest in high-resolution QSO absorption spectra', **M. Viel**, M.G. Haehnelt, V. Springel, 2004, MNRAS, 354, 684

Publications

101 total publications on international journals of which 70 published in peer-review international journals. 32 publications as first author. The publications below can be found at:

<http://xxx.lanl.gov/>

MNRAS (<http://mc.manuscriptcentral.com/mnras>),

ApJ (<http://iopscience.iop.org/0004-637X/>),

Physical Review (<http://publish.aps.org/DLO/DLLISTD.html>)

JCAP (<http://jcap.sissa.it/jcap/>)

List of refereed publications (published only)

- ‘Probing the Intergalactic Medium with the Lyman- α forest along multiple lines of sight to distant quasars’, **M. Viel**, S. Matarrese, H.J. Mo, M. Haehnelt, T. Theuns, 2002, MNRAS, 329, 848
- ‘Modelling the IGM and the Lyman- α forest at high redshift from the dark matter distribution’, **M. Viel**, S. Matarrese, H.J. Mo, T. Theuns, M. Haehnelt, 2002, MNRAS, 336, 685
- ‘Galactic winds in the IGM’, T. Theuns, **M. Viel**, S. Kay, J. Schaye, B. Carswell, P. Tzanavaris, 2002, ApJL, 578, 5
- ‘Detecting X-ray filaments in the low redshift IGM with XEUS and Constellation-X’, **M. Viel**, E. Branchini, R. Cen, S. Matarrese, P. Mazzotta, J.P. Ostriker, 2003, MNRAS, 341, 792
- ‘Dark energy effect on the Lyman- α forest’, **M. Viel**, S. Matarrese, T. Theuns, D. Munshi, Y. Wang, 2003, 340, 47L
- ‘The power spectrum of the flux distribution in the Lyman- α forest of a Large sample of UVES QSO Absorption Spectra (LUQAS)’, T.-S. Kim, **M. Viel**, M.G. Haehnelt, R.F. Carswell, S. Cristiani, 2004, MNRAS, 347, 355
- ‘The effect of (strong) discrete absorption systems on the Lyman- α forest flux power spectrum’, **M. Viel**, M.G. Haehnelt, R.F. Carswell, T.-S. Kim, 2004, MNRAS, 349, 33L
- ‘The bispectrum of the Lyman- α forest at z 2-2.4 from a Large sample of UVES QSO Absorption Spectra (LUQAS)’, **M. Viel**, S. Matarrese, A. Heavens, M.G. Haehnelt, T.-S. Kim, V. Springel, L. Hernquist, 2004, MNRAS, 347L, 26
- ‘Inferring the dark matter power spectrum from the Lyman- α forest in high-resolution QSO absorption spectra’, **M. Viel**, M.G. Haehnelt, V. Springel, 2004, MNRAS, 354, 684
- ‘Constraints on the Primordial Power Spectrum from High Resolution Lyman- α Forest Spectra and WMAP’, **M. Viel**, J. Weller, M.G. Haehnelt, 2004, MNRAS, 355, 23L
- ‘The Lyman- α forest opacity and the metagalactic hydrogen ionization rate at z 2-4’, J. Bolton, M. Haehnelt, **M. Viel**, V. Springel, 2005, MNRAS, 357, 1178

- ‘ Tracing the Warm Hot Intergalactic Medium in the local Universe ’, **M. Viel**, E. Branchini, R. Cen, J.P. Ostriker, S. Matarrese, P. Mazzotta, B. Tully, 2005, MNRAS, 360, 1105
- ‘ Constraints on Warm Dark Matter from WMAP and the Lyman- α forest ’, **M. Viel**, J. Lesgourgues, M. Haehnelt, S. Matarrese, A. Riotto, 2005, Physical Review, D71, 063534
- ‘ Expansion and Collapse in the Cosmic Web’, M. Rauch, G. Becker, **M. Viel**, W.L.W. Sargent, A. Smette, R.A. Simcoe, T.A. Barlow, M.G. Haehnelt, 2005, ApJ, 632, 58
- ‘Squeezing the window on isocurvature modes with the Lyman- α forest’, M. Beltran, J. Garcia-Bellido, J. Lesgourgues, **M. Viel**, 2005, Physical Review, D72, 103515
- ‘ Testing the accuracy of the Hydro-PM approximation in numerical simulations of the Lyman- α forest’, **M. Viel**, M.G. Haehnelt, V. Springel, 2006, MNRAS, 365, 231
- ‘ Cosmological and astrophysical parameters from the SDSS flux power spectrum and hydrodynamical simulations of the Lyman- α forest ’, **M. Viel**, M.G. Haehnelt, 2006, MNRAS, 365, 231
- ‘Spatial fluctuations in the spectral shape of the UV background at $z \gtrsim 3$ and the reionization of helium ’, J. Bolton, M. Haehnelt, **M. Viel**, R.F. Carswell, 2006, MNRAS, 366, 1378
- ‘The matter power spectrum at small scales: an estimate from the inverted Lyman- α forest optical depth’, S.Zaroubi, **M. Viel**, A. Nusser, M.G. Haehnelt, T.-S. Kim, 2006, MNRAS, 369, 374
- ‘The Lyman- α forest and WMAP year three’, **M. Viel**, Haehnelt M. G., Lewis A., 2006, MNRAS Letters, 370, 51
- ‘On the formation of dwarf galaxies and stellar haloes’, Read J. I., Pontzen A. P., **M. Viel**, 2006, MNRAS, 371, 885
- ‘Can Sterile Neutrinos Be Ruled Out as Warm Dark Matter Candidates?’, **M. Viel**, J. Lesgourgues, M. Haehnelt, S. Matarrese, A. Riotto, 2006 Physical Review Letters, 97, 071301
- ‘Tomography of the intergalactic medium with Lyman- α forests in close QSO pairs’, D’Odorico, V.; **M. Viel** ; Saitta, F.; Cristiani, S.; Bianchi, S.; Boyle, B.; Lopez, S.; Maza, J.; Outram, P., MNRAS, 2006, 372, 1333
- ‘ Numerical Simulations of the Lyman- α forest - A comparison of Gadget-2 and Enzo’, Regan J. A., Haehnelt M. G., **M. Viel**, 2007, MNRAS, 374, 196
- ‘Strong MgII systems in quasar and gamma-ray burst spectra’, Porciani C., **M. Viel**, S. Lilly , 2007, ApJ, 659, 218
- ‘Is the Concentration of Dark Matter Halos at Virialization Universal?’, Ricotti M., Pontzen A., **M. Viel**, 2007, ApJ, 664, 53

- 'A combined analysis of 3D weak lensing, Lyman- α forest and WMAP year three data', Lesgourgues, J., **M. Viel** ; Haehnelt, M. G, Massey, R., 2007, JCAP, 11, 008L
- 'Neutrinos and the Lyman- α forest: myth or reality?', **M. Viel**, 2007, Nuclear Physics B Proceedings Supplements, Volume 168, p. 54.
- 'An improved measurement of the flux distribution of the Lyman- α forest in QSO absorption spectra: the effect of continuum fitting, metal contamination and noise properties', Kim, T.-S.; Bolton, J. S.; **M. Viel**; Haehnelt, M. G.; Carswell, R. F., 2007, MNRAS, 382, 1657
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