Curriculum Vitae – Dr.rer.nat. Shiva Kumar. Malapaka

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CONTACT INFORMATION

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Present address:
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DOB & NATIONALITY

Date of Birth : 28-04-1977, Hyderabad, Andhra Pradesh, Citizenship: India, Married, 1 Infant daughter

EDUCATION

Ph.D: Max-Planck Institute for Plasma Physics (IPP), Garching bei München, Germany. Registered at: Physics Department, University of Bayreuth, Bayreuth, Germany, *Graduated with **cum laude***, October 2009

M.Tech (Master of Technology): Physics Department, University of Hyderabad, Hyderabad, India, *First class in Computational Techniques*, October 2004

M.Sc. (Master of Science): Department of Astronomy, under the University, College of Science, Osmania University, Hyderabad, India, *First class with distinction in Astronomy*, June 2001

B.Sc. (Bachelor of Science): Government City College (An Autonomous College under Osmania University), Hyderabad, India, *First class, major in Electronics*, June 1999

AMIETE (Associate Membership of IETE, Equivalent to Bachelor of Engineering): IETE (The Institute of Electronics and Telecommunication Engineers), New Delhi, India, *Second class, Electronics and Telecommunication Engineering*, April 2002

POSITIONS & RESEARCH EXPERIENCE

Assistant Professor: Direct Numerical Simulations (DNS) of 3D Hydrodynamic (HD) and Magneto hydrodynamic (MHD) Turbulence,*IIIT - Bangalore, Bangalore, India* **From July 27, 2015 to Present..**

- Work: Teaching Physics to Undergraduates of iMtech Program, Continuing Research in Computational Physics involving High performance computing covering areas of 3D simulations of hydrodynamic and magnetohydrodynamic turbulence, magnetic confinement of Plasma (ITER), n-body simulations for planetary formation.*Also interested in modeling of Indian Monsoon.*

European Research Council (ERC) Postdoctoral Fellow & Visiting Scientist: Direct Numerical Simulations (DNS) of 3D Hydrodynamic (HD) and Magneto hydrodynamic (MHD) Turbulence, *Department of Physics, University of Rome 'Tor Vergata'*, Rome, Italy, (March 15, 2014 to May 15, 2015)

- Supervisor : Prof. Luca Biferale
- Work: I am working on statistical properties of Fractally decimated Fourier Turbulence. This is an new emerging field of studies in Turbulent research, where in by decimating wave modes in a controlled manner effect the intermittent properties of hydrodynamic turbulence.

Visiting Postdoctoral Fellow: Direct Numerical Simulations of Rotating Turbulence, *Tata Institute of Fundamental Research(TIFR) Centre for Interdisciplinary Sciences* , Hyderabad, India, (8, December, 2013 to 8, March, 2014)

- Supervisor : Dr. Prasad Perlekar
- Work: This three month study is specifically intended to implement and understand helical forcing in rotating turbulent flows, study non-rotating, highly rotating turbulent

flows and to see the influence of various levels of helicity on both these flows. It is also intended to verify the spectral power of energy (in its inertial range) in all the studied cases and to obtain various statistics like PDFs, QR plots etc.. of the turbulent structures in the flow.

Research Associate: Numerical studies of Anelastic dynamo, *Department of Applied Mathematics*, School of Mathematics, University of Leeds, Leeds, UK, (20, October, 2011 to 31, March, 2013)

- Supervisors : Prof. David Hughes & Prof. Steve Tobias
- Work: As a part of larger objective of developing a code for Anelastic dynamo, to understand Solar convection, this time period was (is being) used to improve an already existing Anelastic code (Cartesian co-ordinates) to run faster and then to bench mark it.

CNRS Postdoctoral Fellow: Understanding the Current-Hole Confinement in ITER Plasmas, *JLL Laboratory*, UPMC, Paris VI, France, (1, October, 2010 to 31, May, 2011)

- Supervisor : Prof. Bruno Després
- Work: Numerical simulations of reduced-resistive MHD model to achieve Current-Hole confinement have been carried out and significant improvements to previously existing model have been obtained, increasing the flexibility to parameters that are used in the model.

Research Associate: Shock Turbulence Interactions, *Department of Aerospace Engineering Sciences*, University of Colorado at Boulder, Boulder, CO, USA, (15, January, 2010 to 1, July, 2010)

- Supervisor : Prof. Kamran Mohseni

Ph.D Student: Computational Studies of Turbulence in Magnetized Plasmas *(An Independent Max-Planck Junior Research Group)*, Max-Planck Institute for Plasma Physics, Garching bei München, Germany, (April 2006 to 12, January, 2010)

- Thesis Topic: Inverse Cascade of Magnetic Helicity in Decaying and Forced 3D MHD Turbulence
- Supervisor & Head: Prof. Wolf-Christian Müller

Graduate Student: M.Sc. (Astroparticle Physics), *School of Engineering and Science*, International University Bremen (now Jacobs University in Bremen), Bremen, Germany (October 2004 - December 2005), *discontinued here to take up the Ph.d position at IPP, Garching bei München.*

- **Student Assistant**: For the project 'The CME (coronal mass ejections) source region in LOFAR(Low frequency array) related simulations' (January 2005 - May 2005) Performed literature studies which formed a part of the DFG (German Science Foundation) project proposal *DFG GEPRIS Project No: 16606065, The CME source region in LOFAR related simulations: Numerical studies of Coronal Mass Ejections to prepare observations of the LOw Frequency ARray*, additionally worked on 'Possible sites for a Radio Telescope on the Moon' a collaborative project with EADS (European Aeronautic Defence and Space Company), Bremen, Germany

Project Trainee: PLANEX division of Physical Research Laboratory, Ahmedabad, India, for M.Tech Project (October 2003 - September 2004)

- Thesis Topic: Numerical Studies on the formation of the Moon using N-body Simulations
- Supervisor: Prof. Dr. Narendra Bhandari

Research Interests

Direct Numerical Simulations of Turbulence (HD & MHD), Inverse Cascade Processes in Turbulence (HD & MHD), Large-scale structure formations (magnetic and non-magnetic), Statistics of the turbulent structures, Rotating turbulent flows, Astrophysical & Geophysical Dynamos, Modeling and Simulations of MHD & MHD turbulence processes in Tokamaks (reduced resistive MHD approach), Simulations of formation of Planets and Moons (involving N-body simulations)

Computational Skills

- Scientific computing in FORTRAN 95/2000, C
- Parallel programing in FORTRAN and C using OpenMP and MPI with experience on IBM p-series super computers
- Experience with Pseudospectral codes for 3D-MHD turbulence simulations and Anelastic dynamo simulations, Reduced resistive MHD code for Tokamak simulations and N-body code for planetary formation studies

- IDL, Matlab, Mathematica, **FreeFem**$^{++}$(an open source software developed at LJLL, UPMC, Paris VI., France)
- Amira / Aviso (a commercial visualization software) and Visit (open source visualization software by LLNL, USA)
- Microsoft Windows XP/2000, IBM AIX, Linux
- LaTex, BibTex, Microsoft Office and other common productivity packages for Windows and Linux
- Good understanding of Electronics and Telecommunication Hardware, Microprocessor and Microcontroller programming

Publications & Reports

International and Peer Reviewed

- A. Lanotte, **S. K. Malapaka** and L.Biferale, *On the Vortex Dynamics in fractal Fourier Turbulence* **Eur. Phys. J . E**, 2016,394, 49
- A. Lanotte, R. Benzi, **S. K. Malapaka**, F. Toschi and L. Biferale, *Turbulence on a Fractal Fourier Set,* **Phys. Rev. Lett.**, 2015, 115, 264502
- **S. K. Malapaka**, B. Després and R. Sart, *Unconditionally stable numerical simulations of a new generalized reduced resistive magneto-hydrodynamics model*, **International Journal for Numerical Methods in Fluids,**, 2014, 74, Issue 4, pp 231 (first published online October, 2013, *DOI:10.1002/fld.3847*)
- **S. K. Malapaka**, Müller, W.-C., *Large-scale magnetic structure formation in 3D-MHD turbulence,* **The Astrophysical Journal**, 2013, 778, 21
- **S. K. Malapaka**, Müller, W.-C., *Modeling Statistical properties of Solar Active Regions through DNS of 3D-MHD Turbulence*, **The Astrophysical Journal**, 2013, 774, 84
- Müller, W.-C. & **S. K. Malapaka**, *Role of helicities for the dynamics of turbulent magnetic fields*, **Geophysical** & **Astrophysical Fluid Dynamics**, 2013, 107, Nos: 1-2, 93. *DOI:10.1080/03091929.2012.688292*
- Müller, W.-C., **S. K. Malapaka** & Busse, A., *Inverse cascade of magnetic helicity in magnetohydrodynamic turbulence*, **Physical Review E** 2012, 85, 015302.
- Müller, W.-C., **S. K. Malapaka**, *Understanding nonlinear cascades in magnetohydrodynamic turbulence by statistical closure theory*, **ASP Conference Series**, Vol: 429, Numerical Modeling of Space Plasma Flows, Astronum-2009, October 2010, pp. 28
- **Malapaka Shivakumar**, N.Bhandari, *Capture of interplanetary bodies in geocentric orbits and early lunar evolution*, **J.Earth Syst.Sci.**, 114, No.6, December 2005, pp.601607

Thesis, Reports & Conference Proceedings

- F. Toschi, A. Lanotte, R. Benzi, **S. K. Malapaka** and L. Biferale, *Turbulence on a fractally decimated Fourier set*, **Detailed Abstract submitted for XXIV ICTAM, 21-26 August 2016, Montreal, Canada.**
- A. Lanotte, L. Biferale, **S. K. Malapaka** and F. Toschi *Hydrodynamic Turbulence by Fractal Fourier Decimation*, **Detailed Abstract of 15th European Turbulence Conference, 25-28 August, 2015, Delft, The Netherlands.**
- **Shiva Kumar. Malapaka**, *A Study of Magnetic Helicity in Decaying and Forced 3D MHD Turbulence*, **Ph.D Thesis** Can be accessed at http://edoc.mpg.de/display.epl?mode=doc&id=464051&col=33&grp=1311
- **Shiva Kumar. Malapaka**, Vogt, J., *Possible sites for a Radio Telescope on the Moon*, **Survey Report submitted to EADS, Bremen**, (June, 2005)
- **Shiva Kumar. Malapaka**, *Simulation of an Alternative Scenario for the formation of the Moon*, **M. Tech Thesis** (September, 2004)
- **Shiva Kumar. Malapaka**, *Study of giant impact theories for the formation of the Moon*, **Summer project report** (July, 2003)
- **Shiva Kumar. Malapaka**, *Design, Assembling and Testing of a Digital Cable Fault Locator*, **AMIETE Project work** (December, 2001)

Manuscripts Submitted & in Preparation

- **S. K. Malapaka**, Müller, W.-C., *Some peculiar statistical properties observed in DNS of forced and decaying 3D-MHD turbulence* to be submitted to New Journal of Physics
- Y. Ramah, **S. K. Malapaka** and Müller, W.-C., *Triadic interactions in forced and decaying 3D-MHD turbulence* to be submitted to Physical Review E
- P. Perlekar, **S. K. Malapaka**, *A study of helical and non-helical rotating turbulent flows* manuscript under preparation (final title may vary)

Selected Presentations

- **Shiva Kumar. Malapaka**, **Invited talk** *Vanishing Intermittency in Fractal Fourier Turbulence*, Garuda-NKN Partners Meet 2016, Organized by CDAC & NKN, Bangalore, India, 8-9, September, 2016
- F. Toschi, A. Lanotte, R.Benzi **S. K. Malapaka** and L. Biferale, *Turbulence on a fractally decimated Fourier set*, XXIV ICTAM, Montreal, Canada, 21-26 August, 2016
- **Shiva Kumar. Malapaka**, **Invited talk** *Large-Scale Magnetic Structures - Inverse Cascade of Magnetic Helicity*, Shanghai Astronomical Observatory, Shanghai, China, 18, December, 2015
- A. Lanotte, L. Biferale, **S. K. Malapaka** and F. Toschi, *Hydrodynamical Turbulence by Fractal Fourier Decimation*,15th European Turbulence Conference 2015, , 25-28 August, 2015
- L. Biferale, A. Lanotte, **S. K. Malapaka** and F. Toschi, *Turbulence under Fractal Fourier Decimation*, 56th Annual Meeting of the American Physical Society Division of Fluid Dynamics , SanFranciso, USA, November 23 - 25, 2014
- **Shiva Kumar. Malapaka**, *Some peculiar statistical properties observed in DNS of forced and decaying 3D-MHD turbulence*, Discussion Meeting on Transport of Particles in turbulent flows: Experimental, Computational and Theoretical investigations from 14 -18 October 2013, TIFR-ICTS, Bangalore, India, 14, October 2013
- **Shiva Kumar. Malapaka**, **Invited talk** *Inverse Cascade of Magnetic Helicity in Forced and Decaying 3D-MHD Turbulence*, IUCAA, Pune, India, 20, August 2013
- **Shiva Kumar. Malapaka**, **Invited talks / Seminars** *A study of magnetic helicity in forced and decaying 3D-MHD turbulence*
  Indian Institute of Technology, Kanpur, India, 3, December, 2012
  Indian Institute of Astrophysics, Bangalore, India, 7, July, 2011
  High Altitude Observatory, NCAR, Boulder, Colorado, USA., 10, March, 2010
- **Shiva Kumar. Malapaka**, *Inverse cascade of magnetic helicity*, Tangled Magnetic Fields in Astro- and Plasma Physics, ICMS, Edinburgh, UK.,(October 15 - 19, 2012)
- **Shiva Kumar. Malapaka**, *Role of helicities for the dynamics of turbulent magnetic fields*, UK MHD days, The University of Sheffield, Sheffield, UK.,(May, 24 - 25, 2012)
- **Shiva Kumar. Malapaka**, *A study of magnetic helicity in forced and decaying 3D-MHD turbulence*, Rädler Fest: Alpha Effect and Beyond, NORDITA, Stockholm, Sweden.,(February 14 - 18, 2011)
- Müller, W.-C., **S. K. Malapaka**, *The inverse cascade of magnetic helicity*, American Geophysical Union Fall Meeting, San Francisco, USA, *Eos Trans. AGU, 89(53), Fall Meet. Suppl.*, Abstract: NG44A-01 (December 15 - 19, 2008)
- **Shiva Kumar. Malapaka**, Wolf-Christian Müller, **German MHD days**, *Large-scale magnetic structure formation and inverse cascade of magnetic helicity*, 11th MHD Days, Technical University Ilmenau, Ilmenau, Germany (December 1 - 3, 2008)
  High resolution simulations for inverse cascade of magnetic helicity, 10th MHD Days, Max-Planck Institute for Plasma Physics, Garching bei München, Germany (November 26 - 29, 2007)
- **Shiva Kumar. Malapaka**, **Theory Group meetings of Max-Planck Institute for Plasma Physics**, *The Inverse cascade of magnetic helicity*, Ringberg Theory Meeting, Ringberg Castle, Tegernsee, Germany (November 17 - 21, 2008)
  Inverse cascade of magnetic helicity in decaying and forced MHD turbulence, Sellin Theory Meeting, Sellin, Island of Rügen, Germany (November 19 - 23, 2007)

- **Shiva Kumar. Malapaka**, **Invited talk** *Alternative scenario for the formation of the Moon*
  Kipenheuer-Institute for Solar Physics, Freiburg, Germany, 23,February, 2006
  Institute for Astronomy and Astrophysics Tübingen, Eberhard Karls Universität Tübingen, Germany, 16,January, 2006
- **Shiva Kumar. Malapaka**, *Sites for Radio Telescope on the Moon*, Special presentation for EADS delegation, Jacobs University in Bremen, Bremen, Germany, June, 2005
- **Shiva Kumar. Malapaka**, **invited talk** *Origin of the Moon*, selected on the basis of the abstract 'Alternative scenarios for formation of the Moon', **M.Shiva Kumar**, N.Bhandari, XIII National Space Science Symposium-2004, Kottayam, India, Abstract: 3 SLR-17, *the abstract was submitted for a poster presentation* (February 17 - 20, 2004)

Posters

- *Understanding Structure functions of Solar Flares through DNS of 3D-MHD Turbulence*, **Shiva Kumar. Malapaka**, European GDR Dynamo & MHD Days, Nice, France. (October 1 - 4, 2012)
- *A Reduced Resistive MHD Model for Current-Hole Plasmas in ITER*, **Shiva Kumar. Malapaka**, Bruno Després and Remy Sart, Dynamics and turbulent transport in plasmas and conducting fluids, Winter-school and Workshop, Les Houches, France. (February 28 - March 11, 2011)
- *Large-scale magnetic structure formation in 3D-MHD Turbulence*, **Shiva Kumar. Malapaka**, Wolf-Christian. Müller, DPG Frühjahrstagung (Germany Physical Society- Spring meeting), Greifswald, Germany, Abstract: EP 7.21 (March 30- April 2, 2009)
- *Capture of interplanetary bodies in geocentric orbits and early lunar evolution* , **M. Shiva Kumar**, N. Bhandari, The International Conference on Exploration and Utilization of the Moon (ICEUM-6), Udaipur, India (November 22 - 26, 2004).
- *Alternative scenarios for formation of the Moon*, **M. Shiva Kumar**, N. Bhandari, XIII National Space Science Symposium - 2004, Kottayam, India, Abstract: 3 SLR-17 (February 17 - 20, 2004)

Workshops, Conferences & Summer Schools Attended

- Royal Astronomical Society Specialist Discussion Meeting : Mean Field Electrodynamics and Large-Scale Cosmic Magnetic Fields: Present Problems and Future Trends, Royal Astronomical Society, London, February 10, 2012
- Workshop on Turbulence and Hydrodynamical Instabilities, Max-Planck Institute for Plasma Physics, Garching bei München, Germany (November 17 - 19, 2008)
- Instabilities and Turbulence in MHD flows, Joint Workshop and Graduate summer school under Warwick Turbulence Symposium 2005/2006, Mathematics Research Center, University of Warwick, Coventry, United Kingdom (June 26 - July 1, 2006)
- 8th MHD Days, Astrophysical Institute Potsdam, Germany (November 28 - 29, 2005)
- Summer Program for Students and Teachers, Physical Research Laboratory, Ahmedabad, India (May - July, 2003)
  - Worked under the Supervision of Prof.Dr. Narendra Bhandari on the topic 'Origin of the Moon'
- PLANEX Workshop on Planetary Atmospheres, Ionospheres and Magnetospheres, Space Physics Laboratory, Vikram Sarabhai Space Center, Indian Space Research Organization(ISRO), Tiruvanthapuram, India (February 17 - 22, 2003)
  - Presented a short talk on *Solar Dynamo* and chaired one student session
  - One among the 5 students selected for further projects (the summer project mentioned above and my M.Tech thesis) out of approximately 50 student participants
- Workshop on Telescope Making, Inter University Center for Astronomy and Astrophysics (IUCAA), Pune, India (October - November, 2001)
  - A 6" Newtonian reflector starting from plain glass slabs was constructed.
- International Workshop on Automated Data Analysis, IUCAA, Pune, India (October 9 - 12, 2000)

Memberships & Associateship

- Visiting Associate at IUCAA, Pune starting August 2016 for 3 years
- Fellow of the Royal Astronomical Society, London, UK, from February 2012
- Life time Fellow of The Institute of Electronics and Telecommunication Engineers, New Delhi, India,from May 2016 (earlier a Life time Member of IETE)

Teaching, Course Design & Mentoring

IIIT-Bangalore (August 2015 - Present).

- Teaching a Theory papers (core courses) 'Physics - I and Physics - II' in 3rd and fourth semester for iMtech Students
- Teaching the Elective Papers ' Scientific Computing -I and Scientific Computing-II' as an Elective course for iMtech and M.Tech Students
- Two external students one from IISER, Tiruvanathapuram & one from BITS, Goa are being mentored this Summer (May -July 2016) on n-body studies, simulations and planetary formation modeling

Part time Lecturer: Department of Astronomy, Osmania University, Hyderabad, India (December 2001 - April 2002).

- Teaching a Theory paper 'Astronomical Techniques' for second year M.Sc.
- Supervising the Lab class 'Photometry of Stars' for second year M.Sc.

Other Experience

- Student volunteer for 'Leonid Meteor Shower Studies (visual observations)', at the National M.S.T. RADAR Facility of ISRO, Gadanki, for Prof.B.Lokanadham of Osmania University, Hyderabad, India (November, 1999)
- Created a software package in 'C', which calculates eclipses, position of planets and other astronomical data (May, 2000)
- Founding member of Association at Hyderabad of Amateur Astronomers (AHAA) 1999

Honors & Awards

- First Rank in the University in M.Sc, Astronomy, 2001
- National Merit Scholarship for 2 Academic Years 1992-94 for 10^{th} class marks

References

1) Prof. Wolf-Christian Müller
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2) Prof. Bruno Després,
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Laboratoire Jacques-Louis Lions,
Université Pierre et Marie Curie,
Boîte courrier 187,
75252 Paris, Cedex 05, France.

3) Prof. Steve Tobias,
Astrophysical and Geophysical Fluids group,
Department of Applied Mathematics
School of Mathematics, University of Leeds,
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4) Prof. Annick Pouquet,
Geophysical Turbulence Program,
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USA.

5) Prof. Luca Biferale,
Dept. of Physics,
University of Rome, Tor Vergata,
Via della Ricerca Scientifica 1,
00133, Roma, Italy

6) Prof. Narendra Bhandari,
Retired Professor,
Physical Research Laboratory,
Ahmedabad, Gujarat, India,
Currently: Honorary Scientist,
Indian National Science Academy.