Prakriti Pal Choudhury

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CURRENT POSITION

Graduate student(Integrated-PhD), Astrophysics,
Indian Institute of Science, Bangalore, India
Advisor: Prof. Prateek Sharma

RESEARCH INTEREST

- Gas evolution in the circumgalactic medium (CGM)
- Thermal instability in the intracluster medium (ICM)
- Feedback mechanisms of black hole jets
- Magnetohydrodynamics, MRI

EDUCATION

Master of Science in Physics (part of my Integrated-PhD program), 2012-2014
Indian Institute of Science, Bangalore, India
CGPA 6.2/8
Master's Project (in Astrophysics): Accretion Disk Dynamics

Bachelor of Science, 2009-2012
St. Xavier's College, Kolkata
(Autonomous)
University of Calcutta, India
Major: Physics (Honours)
Minor: Mathematics and Computer Science
Grade A, *CGPA* 8.2/10 (78%, First Class with Honours)

COMPUTATIONAL SKILLS

Languages & Softwares: Python, C, Fortran, Matlab
Hydrodynamic Packages: ZEUS, PLUTO, HARM(GRMHD package)
Self-written codes

- Used **python to develop a pseudospectral code for 2D geometry** in order to calculate the eigenvalues and eigenfunctions of the global radial modes in a cluster due to the local thermal instability (links available in my website)
- Used **python and cython to develop a 1D Lagrangian hydrodynamic code** to study diffuse gas in the galaxy clusters and smaller haloes over a range of redshift, in the smooth cosmological accretion regime (links soon to be available)

RESEARCH EXPERIENCE

- Designed a "semi-cosmological" hydrodynamic model for gas evolution in dark matter halos of a wide range of masses (cluster+group+galaxy) and redshifts including radiative cooling and feedback. Used a self-written Lagrangian 1D code to study the model. Currently the model is being studied using a 2D Eulerian code (PLUTO). The long-term goals are to understand the spatial

distribution, source and role of cold gas in galaxy formation along with the effects of central feedback.

- Analysed the relative role of $t_{\rm cool}/t_{\rm ff}$ and density fluctuations, $\delta\rho/\rho$, on the condensation of gas in cluster cores under varying physical conditions. This is a generalization of the local thermal instability (also called "precipitation") model for condensation of gas in a globally thermally stable medium. Used ZEUS for simulations.
- Working on the large scale structure of astrophysical jets with special interest in AGN jets. The main goal of the project is to understand the jet-medium interaction at large scales and to perform intensive simulations to understand why implementation of some jets could cause mixing of the jet and the medium effectively while others cannot. Using PLUTO for simulations.
- Worked on the formation of multiphase medium in the cluster cores. The main goal of the project was to study the dynamics of cold gas by analysing the thermally unstable g-wave modes which otherwise oscillate with Brunt-Vaisala frequency. The second part of the study included non-linear simulations of inter cluster medium showing evolution of cold gas in different geometries and gravitational potential wells. Used ZEUS code for simulations.
- Worked on accretion disk dynamics for Master's Project, with Prof. Prateek Sharma, IISc, Bangalore, India, in April-July, 2014. Studied non-axisymmetric instability in hydrodynamic disks, MRI instability in Magnetohydrodynamic disks and effect of high magnetic fields in GRMHD disks. Used ZEUS, PLUTO and HARM packages for simulations.
- Indian Academy of Science fellow at Harish Chandra Research Institute, Allahabad, India, in May-July,2012. Worked with Dr. Sudhakar Panda and learned Tensor algebra, General Relativity and Black holes.
- Visiting student with Dr. Avinash Deshpande at Raman Research Institute, bangalore, India in October, 2011. Worked on the data analysis of pulsating sources:technique for the estimation of rotation measure(RM).
- Summer intern with Prof. Pradip Sengupta, Biophysics division, Saha Institute of Nuclear Physics, Kolkata, India, in May-June, 2010.

PUBLICATIONS

- **Prakriti Pal Choudhury**, Prateek Sharma
  "Cold gas in cluster cores: Global stability analysis and non-linear simulations of thermal instability in spherical and plane-parallel atmospheres"
  arXiv: 1512.01217
  MNRAS, 457, 2554-2568 (2016)
- **Prakriti Pal Choudhury**, Guinevere Kauffmann, Prateek Sharma
  "A 1-dimensional hydrodynamic model of the cooling and heating of gas in dark matter haloes from $z = 6$ to $z = 0$"
  arXiv: 1808.05231 (submitted to MNRAS)
- **Prakriti Pal Choudhury**, Prateek Sharma, Eliot Quataert
  "Multiphase gas in the circumgalactic medium: relative role of $t_{\rm cool}/t_{\rm ff}$ and density fluctuations"
  arXiv: 1901.02903 (submitted to MNRAS)

FELLOWSHIPS

- Graduate research fellowship as a visiting PhD student at Max Planck Institute for Astrophysics, Garching, Germany, twice, from October, 2016 to March, 2017 and October, 2018 to March, 2019
- Indian Institute of Science Fellowship for the Integrated Master's (2012-2014) and PhD program (since 2014)

- Indian Academy of Sciences Summer Research Fellowship, May-July, 2012(Harish Chandra Research Institute, Allahabad, India)
- Visiting Student Fellowship(VSP) at Raman Research Institute, Bangalore, India, October, 2011
- INSPIRE-DST(Department of Science and Technology, India) Fellowship for Undergraduate Studies, 2009-2012

TALKS AND POSTERS

- Invited talk at "The Physics of the intracluster medium: theory and observations", March 2019, Budapest, Hungary.
- Lunch talk at Space Telescope Science Institute, Baltimore, January 2019.
- Astro lunch talk at Yale University, Connecticut, January 2019.
- CIERA lunch talk at Northwestern University, Evanston, Chicago, January 2019.
- Astro lunch talk at CCA, Flatiron Institute, New York, January 2019.
- Invited talk at "ICM Physics and modeling, October, 2018 " titled "Multiphase gas in cluster cores and CGM", at Garching, Germany.
- Presented a poster on 'Multiphase gas in circumgalactic medium: role of $t_{\rm cool}/t_{\rm ff}$ and $\delta\rho/\rho$' in Snowcluster, 2018 at Salt Lake City, Utah, USA, in March, 2018.
- KIPAC tea talk on 'Multiphase gas in cluster cores', Stanford University, USA in March, 2018
- Talk in the group meeting of Prof. Eliot Quataert on 'Gas evolution in dark matter haloes: CGM & ICM' at UC Berkeley in March, 2018
- Talk for 'MPA-workshop on SAMs' at Garching, Germany in July, 2017. 'Hot gas in accreting dark matter halos: A simple 1D model'
- Talk for 'Institute Seminar' at Max Planck Institute for Astrophysics, Garching, Germany in February,2017. 'Cold gas formation in galaxy cluster cores'
- Presented a poster on "Cold gas in cluster cores: Global stability analysis and non-linear simulations" at the In-house symposium, Indian Institute of Science, in November, 2015. Received **"Best poster award in theory"**.
- Delivered multiple talks on recent reviewed journal articles(mainly on topics of epoch of reionization, binary black holes, accretion)in 2015, in the departmental journal club at Indian Institute of Science.
- Delivered a poster presentation titled "Numerical global eigen mode analysis on thermal instability in the intercluster medium" at the recent meeting of Astronomical Society of India, in February, 2015.
- Delivered a talk on the Master's project, "Accretion Disk Dynamics" in August, 2014 at Indian Institute of Science in front of a panel of five faculty members.
- Delivered a talk on "Studies on the Supermassive black hole at the galactic center" in April, 2014, as a part of Master's coursework at Indian Institute of Science.
- Delivered a talk on "Raman and Infrared Spectroscopy" in September, 2013, at Indian Institute of Science, as a part of Master's coursework.

SCHOOLS AND CONFERENCES

- ICM Physics and modeling, October, 2018 at Garching, Germany
- Bubbles big and small, June, 2018 at IISc Bangalore, India
- Snowcluster-2018, March, 2018 at Salt Lake City, Utah, USA
- MPA workshop on SAMs, July, 2017 at Garching, Germany
- Astronomical Society of India Meeting, February, 2015
  Presented a poster titled "Numerical global eigen mode analysis on thermal instability in the intercluster medium"
- Radio Astronomy Winter School jointly organized by National Center for Radio Astronomy(NCRA-TIFR) and Inter University Center for Astronomy and Astrophysics(IUCAA), Pune, December, 2010
  Presented a poster as a group of 5, titled "High Redshift Universe". Our group won the second prize.

TEACHING ASSISTANTSHIP

Course: Classical Mechanics
August-December Semester, 2014
For a class of UG third years and Integrated-PhD first years

SCIENCE OUTREACH

- Presented a handmade toy showing prism-refraction apparatus to school kids of classes four to ten, in the Physics department open day at Indian Institute of Science, as a part of Science outreach programs, in early 2015.
- Working on a self-planned agenda for STEM outreach which includes designing an online platform that contains visually attractive demonstration of simple physics concepts for children.

REFERENCES

- Prof. Prateek Sharma
  Associate Professor
  Department of Physics and Joint Astronomy Program,
  Indian Institute of Science, Bangalore, India.
  Email: prateek@iisc.ac.in
- Prof. Eliot Quataert
  Professor
  Astronomy and Physics,
  University of California, Berkeley,
  Email: eliot@berkeley.edu
- Prof. Guinevere Kauffmann
  Director
  Max Planck Institute for Astrophysics, Garching, Germany
  Email: gamk@mpa-garching.mpg.de