

Senior Research Scholar  
Inter-University Centre for Astronomy and Astrophysics  
Pune, India  
Email: premv@iucaa.in  
Mobile: +91-8056837468

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Search Committee  
Department of Physics and Astronomy  
University of South Carolina

Dear members of the search committee,

I express my enthusiasm for the postdoctoral position in the Extragalactic Magnetism Group led by Prof. Enrique Lopez-Rodriguez at the University of South Carolina. The opportunity to contribute to the development of high-resolution cosmological magnetohydrodynamic (MHD) simulations and to study the role of magnetic fields and dust in galaxy formation and evolution is perfectly aligned with my research expertise and interests.

During my PhD at the Inter-University Centre for Astronomy and Astrophysics, I gained substantial experience in working with state-of-the-art cosmological hydrodynamic simulations such as IllustrisTNG, EAGLE, and CAMELS. My work has primarily focused on exploring the interplay between dark matter haloes and baryonic astrophysical processes, including feedback mechanisms and their effects on halo properties. I have developed expertise in analyzing large simulations and implementing computational pipelines to extract cosmological and galactic properties such as matter power spectra, halo profiles, and galaxy morphologies.

While my prior work has largely employed simulations with existing galaxy formation prescriptions, I am eager to further develop and perform high-resolution MHD simulations. My goal is to build a deeper theoretical understanding of the evolution of magnetic fields and their interactions with cosmic dust, cosmic rays, and the surrounding medium. Additionally, I aim to improve modeling approaches to produce more realistic simulations that are consistent with observations across the electromagnetic spectrum.

Beyond simulation development, I am also interested in collaborative research environments. I am also keen to mentor students and contribute to a vibrant research group, as outlined in your job description.

The position at the Extragalactic Magnetism Group provides an exceptional opportunity to address fundamental questions about extragalactic magnetic fields and their role in galaxy evolution. I am confident that my expertise in hydrodynamic cosmological simulations, my computational skills, and my passion for advancing our understanding of cosmic phenomena make me a strong candidate for this role.

Thank you for considering my application. I look forward to the possibility of contributing to your research program and would be delighted to discuss how my skills and experience align with your

group's goals.

Sincerely,

Premvijay Velmani