Raju S. Khatiwada

Aspiring Physicist

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Research Experience

Gravitational Friction Framework Development   **(2020–2023)**

Project: Co-authored a study investigating gravitational friction using d'Alembert's principle of virtual work. Derived theoretical insights and contributed to the analytical framework. Conducted under Dr. Carlos Ortiz on photon energy dissipation mechanisms, this work was published in *Scientific Reports* (2023).

Role: Contributed as a co-author, jointly interpreted the results, and co-wrote the manuscript. Contributed to the Gravitational Friction representation.

Correction to Celestial Orbits using Method of Multiple Scales   **(2022–Present)**

Project: Developed a framework using the Method of Multiple Scales to investigate corrections in the precession of planetary orbits within general relativity. This study introduces a density-dependent correction to the Schwarzschild metric, accounting for energy dissipation due to interactions with the low-density interplanetary medium. The model offers perturbative corrections with broader implications for understanding solar densities.

Role: Lead Researcher responsible for writing the manuscript and making the theoretical development and application of multiple scales analysis.

Dissipative Forces in Photon-Medium Interactions   **(2023–Present)**

Project: Used non-degenerate perturbation theory to study dissipative forces acting on photons in a quantum fluid. Analyzed photon-Helium interactions at atomic scales to isolate short-range energy corrections, revealing a peak at 0.1 nm. This work introduces a Hamiltonian framework that emphasizes individual atomic interactions, providing new insights into photon energy loss. Conducted under the guidance of Prof. Dr. Narayan Prasad Adhikari at the Central Department of Physics, Tribhuvan University, Nepal.

Role: Lead researcher who wrote the manuscript, formulated the Hamiltonian model, and did analytical calculations.

Energy Dissipation and Temperature Anomaly in the Solar Corona   **(2023–Present)**

Project: Investigated the coronal heating problem by proposing that energy dissipation mechanisms contribute significantly to the observed high temperatures in the solar corona. Examined photon energy loss mechanisms responsible for spectral shifts, utilizing gravitational redshift principles to model temperature anomalies in the corona. This study provides a novel framework that unifies solar limb observations with the coronal heating problem.

Role: Lead researcher who wrote the manuscript and was responsible for theoretical modeling, analytical derivations, and interpreting results.

Hubble Law from First Principles   **(2024–Present)**

Project: Explored gravitational friction as a non-conservative mechanism for redshift, offering an alternative to the Doppler effect. Derived Hubble's law from first principles, incorporating the work done by the medium on photons, and proposed density-dependent formulations and experimental tests for the mechanism.

Role: Second author who contributed to the analytical derivations and manuscript preparation. Assisted in refining the gravitational friction model and designing validation experiments.

Publications and Preprints

•C. Ortiz, R. S. Khatiwada, "Gravitational friction from d'Alembert's principle," *Scientific Reports*, vol. 13, article 10364, 2023. doi:10.1038/s41598-023-36977-6

•[Preprint]Raju S.Khatiwada, C.Ortiz, and Basanta R. Giri, Nonlinear Dissipative Forces in Celestial Motion Using the Method of Multiple Scales, arXivpreprint, arXiv:submit/6025206.

•[Preprint]Raju S.Khatiwada, N.P.Adhikari, and C.Ortiz,Dissipative Forces in Photon-Medium Interactions Using Perturbation Theory, arXiv preprint, arXiv:submit/6027464.

•[Preprint] Energy Dissipation and Temperature Anomaly in the Solar Corona.

•[Preprint] Hubble Law from First Principles.

•S. Khatiwada, R. (2024). The Measurement Problem and the Search for Fundamental Theory. Preprints. https://doi.org/10.20944/preprints202411.1988.v1

Skills

Programming: Python for Data Analysis, Modeling, Web apps, Data Visualization with Matplotlib, Seaborn
AI/ML: Experience with machine learning techniques (Scikit-Learn)

Education

Institute of Science and Technology, Tribhuvan University, Nepal
Master's Degree in Physics, Graduated with First Division — 2020

Institute of Science and Technology, Tribhuvan University, Nepal
Bachelor's Degree in Physics, Graduated with First Division — 2014

HSEB, Nepal
High School, First Division — 2010

Nepal Government Board
School Leaving Certificate, First Division — 2008

Note: For a more detailed/ latest CV, please email me at rsharmakhatiwada@gmail.com