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[Abstract]

gLOWCOST: Establishing a Distributed Network of Portable Muon Detectors for Space Weather Studies

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Abstract: Monitoring both space and terrestrial weather is crucial for protecting lives, infrastructure, and technology, while supporting agriculture, transportation, energy systems, and public safety, particularly during extreme solar activity events. Muon flux variations, influenced by atmospheric factors like pressure and temperature, are also sensitive to space weather phenomena. The Global Low-Cost

Observation of Weather and Space weather with Cosmic Rays and Terrestrial Sensors (gLOWCOST) is a network of affordable, portable cosmic ray muon detectors designed to monitor cosmic ray flux changes with high precision and near real-time capability, offering a powerful tool for observing dynamic shifts in both space and terrestrial weather (Mubashir et al., 2023). Additionally, the network promotes international STEM outreach and collaboration. This work presents an ongoing interdisciplinary initiative led by Georgia State University to establish a global network of these detectors, currently deployed in nine countries, with plans for further installations across diverse environmental and geophysical conditions. We discuss the detector hardware setup (He et al., 2021) and preliminary global measurements during extreme events of the ongoing solar cycle 25 (Mubashir et al., 2025).

Keywords: Worldwide network, Cosmic rays, Muon detectors, Space weather

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References

Mubashir A., Ashok A., Connors M., He X., Tharindu H.A., Hettiarachchi G., et al., 2025, Time lag analysis of the space weather effects on muon and neutron flux at different geomagnetic cutoff rigidities, in press, *Advances in Space Research* ,https://doi.org/10.1016/j.asr.2025.04.032

Mubashir, A., Ashok, A., Bourgeois, A. G., Chien, Y. T., Connors, M., Potdevin, E., et al., 2023. Muon flux variations measured by low-cost portable cosmic

ray detectors and their correlation with space weather activity. *Journal of Geophysical Research: Space Physics*, 128, e2023JA031943. https://doi.org/10.1029/2023JA031943

He X., Butler C., Syed S., Potdevin E., Tarrant P., Chen N., Wei T.C., Development and production of modular cosmic ray telescopes, 2021, *Proceedings of 37th International Cosmic Rays Conference*, available at https://pos.sissa.it/395/1257/pdf [20.8.2025]