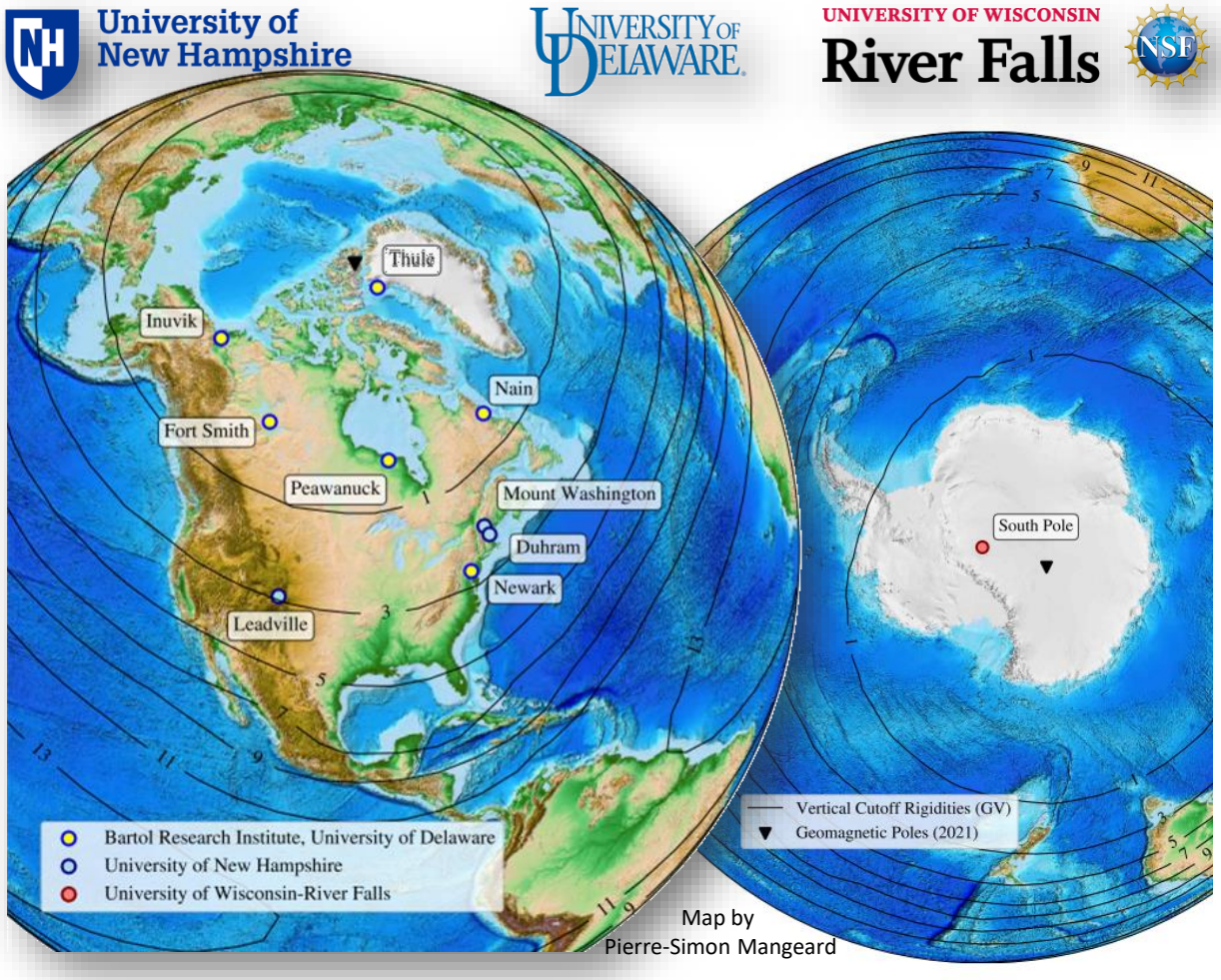
The Simpson Neutron Monitor Network

John Clem[1], James Ryan[2], Surujhdeo Seunarine[3], for the Simpson Neutron Monitor Network Collaborators

Introduction: A neutron monitor is a ground-based particle detector, designed to record the nucleonic component of air showers, typically observing ones initiated by Galactic cosmic rays and solar energetic particles[1]. Because of the relatively large detector volume achieved by ground-based stations, neutron monitors continue to be the state-of-the-art instrumentation for measuring >1GV cosmic rays. Viewed as a network [2] the collection of neutron monitors provide data required for spectral and anisotropy studies. Worldwide, neutron monitors have operated for seven decades, with stations strategically located to provide complementary data based on local rigidity cutoffs. A rich and growing data set, spanning multiple decades, provide information on cosmic ray modulation over many solar cycles [3].



The Project: The US owned and operated neutron monitor network, now called the *Simpson Neutron Monitor Network* in honor of its inventor John Simpson, is operated and maintained by the Universities of New Hampshire, Delaware and Wisconsin-River Falls. A goal of the project is to place the US stations under one umbrella for a comprehensive system of neutron monitors covering the United States, Canada, Antarctica, and Greenland, which will more effectively address science goals and operations needs.

Science Goals: The Simpson Neutron Monitor Network scientists and international collaborators are pursuing multiple science goals:

1) Extending the science capabilities of a neutron monitor station through the development of electronics that measures time delays between neutron detections of a full array of proportional tubes in a neutron monitor. It has been shown that this data provides primary spectral information from a single station [4].

2) Implement a Forbush Decrease and Interplanetary Magnetic Field prediction model for Interplanetary Corona Mass Ejections and Geomagnetic Storms.

3) Throughout the prolonged deep solar minima of the past two solar cycles, the GCR intensity reached record high levels at Earth. We will examine data from long-running neutron monitors and other sources to evaluate the GCR intensity and consequent ground-level rates during these epochs.

4) Understand and model the transport of solar energetic particles from their release point to 1 AU using the anisotropy behavior of well-connected Ground Level Enhancements.

5) Investigate the spectra and composition of Solar Energetic Particles using co-located instruments with different yield functions.

Broader Impacts: Undergraduate students will have significant involvement in the project. The network provides real time data for radiation dosimetry at aircraft altitudes and serve national space weather objectives including a variety if interests in the impacts of cosmic radiation on human activity and infrastructure.

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[1]University of Delaware, [2]University of New Hampshire, [3]University of Wisconsin-River Falls