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We are constructing a regional ground-based fluxgate magnetometer array in northern New England that will facilitate the study of local ionospheric dynamics with data available to everyone in the scientific community. Each instrument is constructed from SAM-III fluxgate kits by high school students at schools distributed across New England. The magnetometers have a 1 nT sensitivity and 1 sec data cadence. A completed fluxgate with weatherproof housing, photovoltaics, radio data downlink, and GPS for accurate time tags costs $1100. Our goal is to have in excess of 15 sites distributed across Maine, Massachusetts, New Hampshire, Vermont and upstate New York. We currently have 5 sites already producing data, 2 of which are now feeding data into the SWUG Data Center that exists in a preliminary form. The technology is developed and proven to work. The array and data center are scalable. Our goal is to involve motivated high school students in the building of scientific instruments, the analysis of real scientific data, and to use that effort to provide motivation for learning core math, physics, engineering, and computer programming lessons as they explore possible career paths for the future. In the process, we will be generating useful scientific data that will be available to all.

209.03 — Gamma-rays from Jupiter

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This project aims to detect and study gamma-ray emission from Jupiter using data from the Fermi Gamma-ray Space Telescope for the full mission elapsed time. Young dwarf stars are the most abundant in the Milky Way and many host planets that are potentially habitable. However, their extreme magnetic activity (e.g. flares and auroras) is not well understood and may prove detrimental to the formation of life on these planets. The most extreme magnetic events on the Sun show evidence for ion acceleration and gamma-ray emission, but the Sun is, so far, the only isolated star we have detected at GeV energies. Jupiter is our local analog for young dwarf stars and is known to have auroral emissions and a significant population of radio-emitting, nonthermal electrons, motivating our search.

Poster Session 210 — The Sun

210.01 — Improving the Forecasting of Drivers of Severe Space Weather with the New MAG4 HMI Vector Magnetogram Database

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MAG4 (MAGnetogram FOREcasting) is a large-database space-weather forecasting tool that makes near-real-time forecasts of a solar active regions (AR's) next-day chance of producing major eruptions (e.g., major flares or major Coronal Mass Ejections [CMEs]) that can drive severe space weather. The centerpiece of MAG4 is a pair of AR-event-rate forecasting curves obtained from a large database of (1) AR major-eruption histories and (2) an AR free-magnetic-energy proxy computed from magnetograms of the ARs. The pair of curves currently used for forecasting major flares are from MAG4's large database built from Solar and Heliospheric Observatory (SOHO)/Michelson Doppler Imager (MDI) AR line-of-sight (LOS) magnetograms and major-flare histories. Because MDI is now defunct, to forecast a current AR's major-flare rate, MAG4 presently uses the vertical-field component of the AR's Solar Dynamics Observatory (SDO)/ Helioseismic and Magnetic Imager (HMI) vector magnetogram to approximate the AR's MDI LOS magnetogram. Now that MAG4 has compiled a new comparably large database of AR major-flare histories and several alternative AR free-energy proxies computed from HMI vector magnetograms, we can quantify the improvement in MAG4's AR major-flare forecasts resulting from using the AR's HMI vector magnetogram with the pair of forecasting curves from MAG4's new HMI database instead of the presently-used pair from MAG4's MDI database. Using the Heidke Skill Score (HSS) and the statistical methods of *Falconer et al. (2014),* we show that this change gives for an optimized free-energy proxy (1) gives a 10-σ improvement in MAG4's major-flare forecasting performance, and (2) forecasting performance that ties or significantly exceeds that of the alternative AR free-energy proxies that are in the new database.